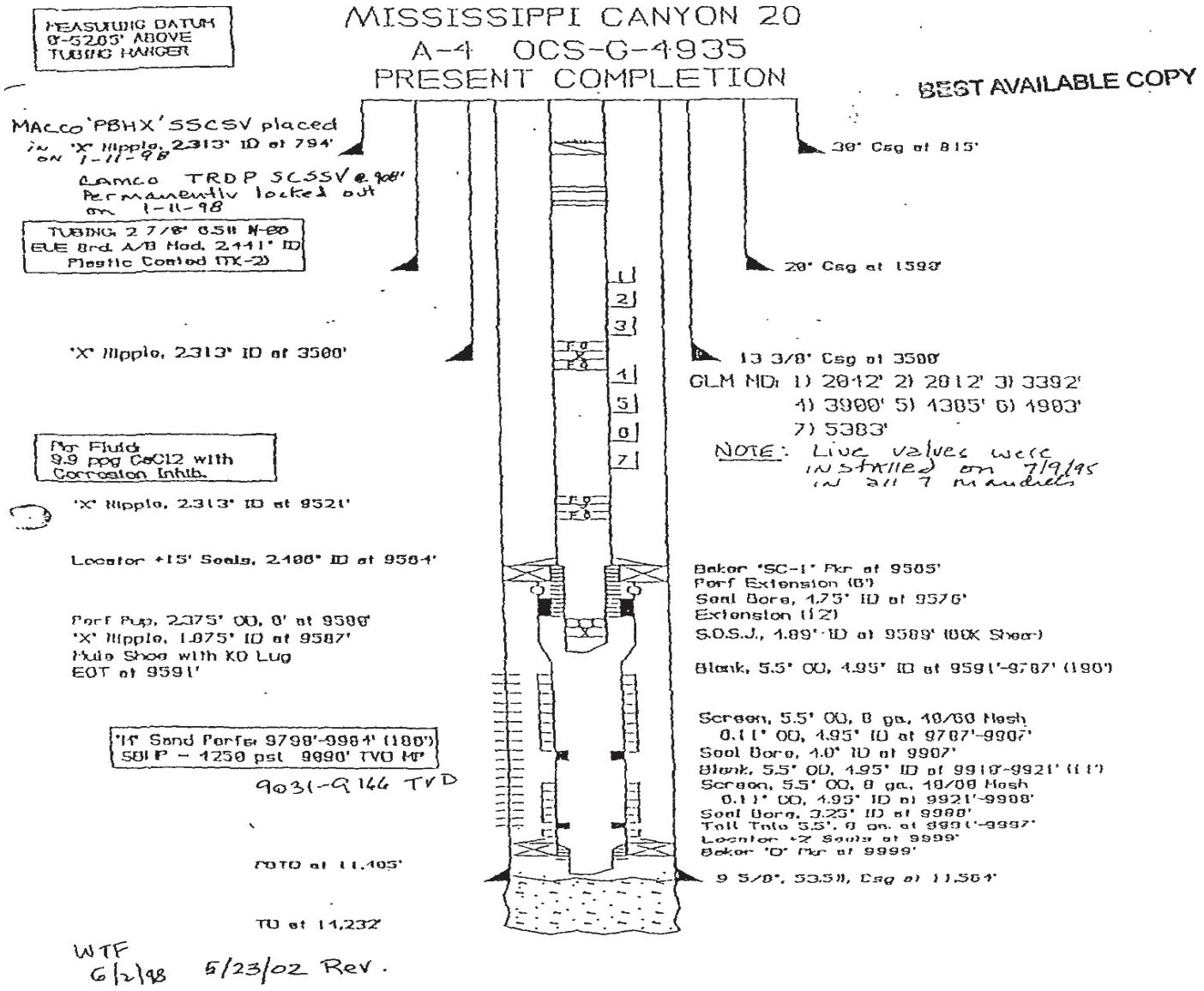
TOC MC 20 Platform Wells Barrier Component Review

Sub Surface Safety Valves (SSSV), Gas Lift Valves (GLV) and Production Packers were analyzed as part of downhole barrier component review. The operators on MC 20 Platform wells employed similar designs allowing for a generalized representation and analysis of the 7" and the 9-5/8" completions. In 1995 & 1996 Taylor Energy performed well re-completions/workovers on the A-2, A-4, A-7, A-10, A-13, & A-17 wells replacing the gas lift mandrel dummies which were installed on the original well completions with live gas lift valves. Taylor then drilled & completed wells A-19 to A-26 with production coming on in the years of 2000 & 2001. Wells A-5, A-15, & A-27 were temporarily abandoned before hurricane Ivan hit the platform in 2004. See (Figure 1) for an example of a MC 20 Platform Well Completion Schematic, (Figure 2) for an as installed tubing detail for a 9-5/8" production casing completion, and (Figure 3) for the 7" casing completion.



(Figure 1) MC 20 Platform Well AS IS Wellbore Completion Schematic

BAKER SAND CONTROL
A BAKER OIL TOOLS COMPANY

WELL PROFILE
BSC-154-A

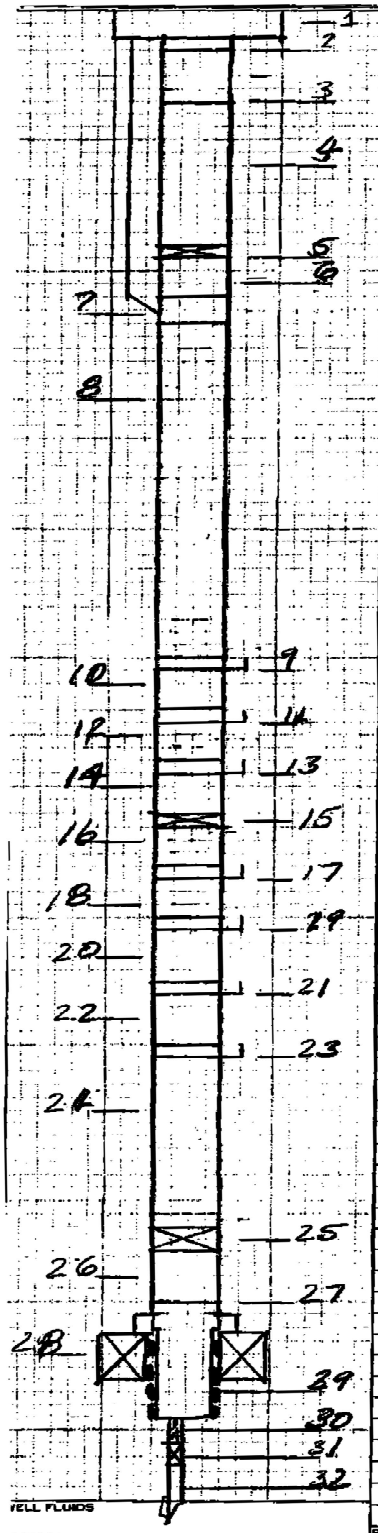
DISTRICT PERFORMING SERVICE: Houma, LA
PHONE NUMBER: 504 851-0331

OPERATOR: B.P. Exploration
COMPANY REP.: Tom Duncan
WELL NO.: A-4
FIELD: M.C. 20 OCS-G-4935
COUNTY: Offshore
STATE: Louisianan
DATE: 2-23-90

☐ NEW COMPLETION ☒ WORKOVER

	SIZE	WEIGHT	GRADE	THREAD
CASING	9-5/8	53.5		
LINER				
TUBING LONG STRING	2-7/8	6.5	N-80	8RD A/B MOD
TUBING SHORT STRING				

TYPE COMPLETION FLUID IN CASING: 9.9 PPG CACL2



NO.	DEPTH	LENGTH	OD	ID	DESCRIPTION
	52.65				Elevation
1	52.65	.43			Cameron Hanger PC/PFBB
2	53.08	3.80	2.875	2.441	2-7/8 6.5# N-80 P X P
3	56.88	31.65	2.875	2.441	2-7/8 6.5 N-80 A/B MOD TBG Hanger JT.
4	88.53	695.40	2.875	2.441	22 Jts. of TBG
	783.93	4.15	2.875	2.441	Pup Jt.
	788.08	6.25	3.70	2.441	Flow Coupling
5	794.33	.77	3.30	2.313	2-7/8 6.5# 9CR X-Nipple S/N8909050178
	795.10	5.82	3.70	2.441	Flow Coupling
	800.92	4.15	2.875	2.441	Pup Jt.
6	805.07	93.01	2.875	2.441	3 Jts. of TBG
	898.08	4.16	2.875	2.441	Pup Jt.
	902.24	6.25	3.70	2.441	Flow Coupling
7	908.49	8.03	5.30	2.312	CAMCO SubSurface Safety Valve
					TRDP2ASSA S/N HES 997
	916.52	5.83	3.70	2.441	Flow Coupling
	922.35	4.12	2.875	2.441	Pup Jt.
8	926.47	1111.18	2.875	2.441	36 Jts. of TBG
	2037.65	4.15	2.875	2.441	Pup Jt.
9	2041.80	6.68	4.35	2.441	Gas Lift Mandrel W/Dummy
	2048.46	3.72	2.875	2.441	Pup Jt.
10	2052.20	755.71	2.875	2.441	24 Jts. of TBG
	2807.91	4.15	4.875	2.441	Pup Jt.
11	2812.06	6.68	4.35	2.441	Gas Lift Mandrel W/Dummy
	2818.74	3.72	2.875	2.441	Pup Jt.
12	2822.46	565.72	2.875	2.441	18 Jts. of TBG
	3388.18	4.15	2.875	2.441	Pup Jt.
13	3392.33	6.68	4.35	2.441	Gas Lift Mandrel W/Dummy
	3399.01	3.71	2.875	2.441	Pup Jt.
14	3402.72	93.35	2.875	2.441	3 Jts. of TBG
	3496.07	4.16	2.875	2.441	Pup Jt.
	3500.23	6.25	3.70	2.441	Flow Coupling
15	3506.48	.77	3.70	2.313	2-7/8 6.5# 9CR X-Nipple S/N8911200l6
	3507.25	5.82	3.70	2.441	FlowCoupling
	3513.07	4.15	2.875	2.441	Pup Jt.
16	3517.22	378.58	2.875	2.441	12 Jts. of TBG
	3895.80	4.15	2.875	2.441	Pup JT.
17	3899.95	6.67	4.35	2.441	Gas Lift Mandrel W/Dummy
	3906.62	3.72	2.875	2.441	Pup Jt.
18	3910.34	470.12	2.875	2.441	15 Jts. of TBG
	4380.46	4.15	2.875	2.441	Pup Jt.
19	4384.61	6.68	4.35	2.441	Gas Lift Mandrel W/Dummy
	4391.29	3.72	2.875	2.441	Pup Jt.
20	4395.01	504.05	2.875	2.441	16 Jts. of TBG
	4899.06	4.15	2.875	2.441	Pup Jt.
21	4903.21	6.67	4.35	2.441	Gas Lift Mandrel W/Dummy
	4909.88	3.71	2.875	2.441	Pup Jt.
22	4913.59	465.63	2.875	2.441	15 Jts. of TBG
	5379.22	4.15	2.875	2.441	Pup Jt.
23	5383.37	6.67	4.35	2.441	Gas Lift Mandrel W/Dummy
	5390.04	3.72	2.875	2.441	Pup Jt.
24	5393.76	4117.08	2.875	2.441	131 Jts of TBG
	9510.84	4.16	2.875	2.441	Pup Jt.
	9515.00	6.25	3.70	2.441	Flow Coupling
25	9521.25	.77	3.30	2.313	2-7/8 6.5# 9CR X-Nipple S/N8909050198
	9522.02	5.82	3.70	2.441	FlowCoupling
	9527.84	4.15	2.875	2.441	Pup Jt.

WELL FLUIDS
INITIAL
FINAL

PREPARED BY: Ray Macias

BAKER SAND CONTROL
A BAKER OIL TOOLS COMPANY

PAGE 2 of 2

WELL PROFILE
BSC-154-A

DISTRICT PERFORMING SERVICE: Houma, LA
PHONE NUMBER: 504 851-0331

OPERATOR: B.P. Exploration
COMPANY REP.: Tom Duncan
WELL NO.: A-4
FIELD: M.C. 20 OCS-G-4935
COUNTY: Offshore
STATE: Louisiana
DATE: 2-23-90

☐ NEW COMPLETION ☒ WORKOVER

		SIZE	WEIGHT	GRADE	THREAD
CASING		9-5/8	53.5		
LINER					
TUBING	LONG STRING	2-7/8	6.5	N-80	8RD A/BMOD
	SHORT STRING				

TYPE COMPLETION FLUID IN CASING: 9.9 PPG CACL2

NO.	DEPTH	LENGTH	OD	ID	DESCRIPTION
26	9531.99	31.67	2.875	2.441	1 Jt. of TBG
27	9563.66	1.05	4.88	2.437	190-47 Locator W/2-7/8 EU 8RD A/B MOD Box
28	9564.71		8.281	4.75	96A2-47 SC-1 PKR
29	9564.71	15.70	4.75	3.00	190-47 MOLDED Seals
30	9580.41	6.11	2.37	2.00	2-3/8 PERF Pup Jt.
31	9586.52	1.29	2.40	1.875	2-3/8 4.6# 9CR X-Nipple S/N 9001200104
32	9587.81	3.24	2.37	2.00	2-3/8 Prod. Tube W/½ M.S. W/Kickover Lug
	9591.05				
					297 Jts. of 2-7/8" 6.5# N-80 A/B MOD TBG in Hole

WELL FLUIDS
INITIAL
FINAL

PREPARED BY: Ray Macias

(Figure 2) MC 20 Platform Well As Installed Tubing Detail for a 9-5/8" production casing completion

BAKER SAND CONTROL
A BAKER OIL TOOLS COMPANY

WELL PROFILE
BSC-154-A

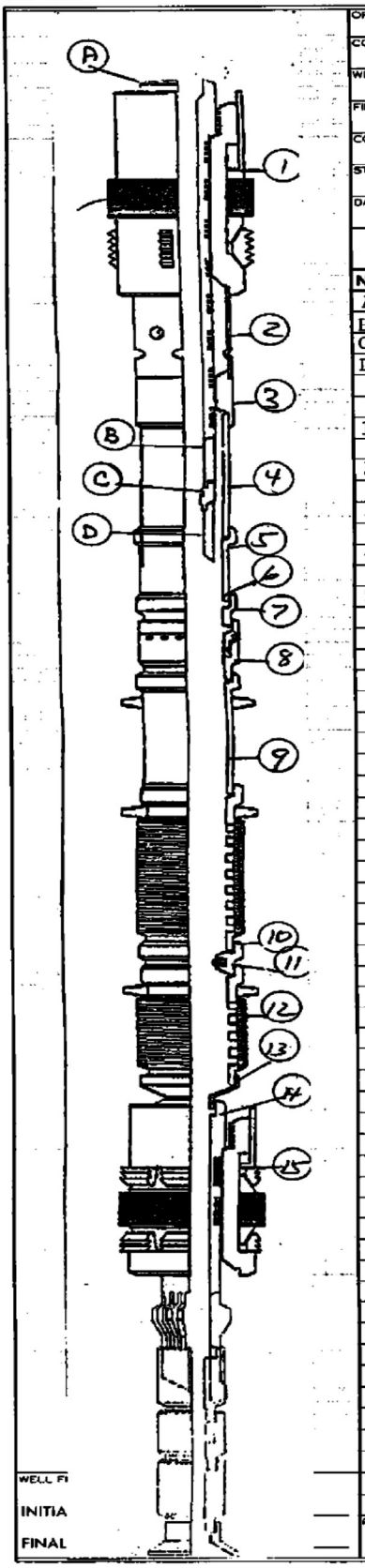
DISTRICT PERFORMING SERVICE: Houma, LA
PHONE NUMBER: 504 851-0331

OPERATOR: B.P. Exploration
COMPANY REP.: Mr. Mitch Bullock
WELL NO.: A-3 OCS-G-4935
FIELD: Miss. Canyon 20
COUNTY: Offshore
STATE: Louisiana
DATE: 3-5-90

☐ NEW COMPLETION ☐ WORKOVER

		SIZE	WEIGHT	GRADE	THREAD
CASING		7"	29#	N-80	LTC
LINER					
TUBING	LONG STRING	2-7/8	6.5	N-80	ABCMOD
	SHORT STRING				

TYPE COMPLETION FLUID IN CASING: 8348-8375



NO.	DEPTH	LENGTH	OD	ID	DESCRIPTION
A	8246.36	1.05	3.46	2.406	80-32 Locator W/15.96' Seals
B		6.10	2.375	1.99	2-3/8 Perf. Nipple
C		1.29	2.68	1.875	Otis "X" Nipple
D		1.66	2.375	1.99	2-3/8 Per Pup Jt.
		GRAVEL	PACK		DETAIL (TOP TO BOTTOM)
1	8247.41	4.41	5.96	3.25	70B2-32 Model SC-1 PKR
2	8251.82	4.31	4.50	4.00	80-32 Perf. EXT
3	8256.13	1.26	4.50	3.25	80-32 Seal Bore
4	8257.39	11.66	4.00	3.56	80-32 Lower EXT
5	8269.05	4.12	4.00	3.56	4' x 4' TBG Nipple
6	8273.17	1.61	4.62	2.93	K.O. Isolation Valve
7	8274.78	.58	4.12	2.43	4" NU 8RD Box x 3½ NU 10RD Pin
8	8275.36	2.04	4.56	3.00	GP-12 Shear Out Safety Jt. 43,00
9	8277.40	64.00	3.50	3.00	3½ Blank Pipe
10	8341.40	38.34	4.13	3.00	3½ x .008 GA Baker SlimPack Scn
11	8379.74	.54	4.25	2.062	3½ x 2.062 "O" Ring Seal Sub
12	8380.28	6.13	4.13	3.00	3½ x .008 GA Bakerweld TellTale
13	8386.41	.52	4.25	2.44	3½ Nu 10RD Box x 2-7/8 EU8RD PIN
14	8386.93	1.07	3.46	2.406	80-32 Locator W/1.96' Seals
15	8388.00	3.41	5.68	3.25	84-32 Model "D" Sump PKR
		3.67	2.875	2.44	2-7/8 TBG Nipple
		1.67	3.50	2.44	3.25 IND Collet
		20.22	2.37	1.99	2-3/8 PERF Pup Jt.

WELL FI
INITIA
FINAL

PREPARED BY: Todd Dabbs, Jr.

BAKER SAND CONTROL
A BAKER OIL TOOLS COMPANY

WELL PROFILE
REC-154-A

DISTRICT PERFORMING SERVICE: Houma, LA
PHONE NUMBER: 504 851-0331

OPERATOR: B.P. Exploration
COMPANY REP: Mr. Mitch Bullock
WELL NO.: A-3 OCS-G-4935
FIELD: Ms.Canyon 20
COUNTY: Offshore
STATE: Louisiana
DATE: 3-7-90

☐ NEW COMPLETION ☒ WORKOVER

		SIZE	WEIGHT	GRADE	THREAD
CASING		7"	29#	N-80	BTC
LINER					
TUBING	LONG STRING	2-7/8	6.5	N-80	ABCMOD
	SHORT STRING				

TYPE COMPLETION FLUID IN CASING: 10.2 INHIB CACL2

NO.	DEPTH	LENGTH	OD	ID	DESCRIPTION	
	-0-	53.90			Original Elevation	
	53.90	.67			Hanger	
	54.57	.76	3.18	2.44		
	55.33	3.71	2.87	2.44	2-7/8 Pup Jt.	
	59.04	739.04	2.87	2.44	2-7/8 TBG	25 Jts.
	798.08	4.62	2.87	2.44	2-7/8 Pup Jt.	
	802.70	5.82	3.62	2.44	2-7/8 FlowCoupling	
	808.52	.75	3.18	2.313	Otis "X" Nipple	
	809.27	5.82	3.62	2.44	2-7/8 Flow Coupling	
	815.09	4.16	2.87	2.44	2-7/8 Pup Jt.	
	819.25	62.58	2.87	2.44	2-7/8 TBG	2 Jt.
	881.83	4.18	2.87	2.44	2-7/8 Pup Jt.	
	885.95	5.80	3.62	2.44	Flow Coupling	
	891.76	8.04	5.125	2.313	CAMCO	
	899.80	5.81	3.62	2.44	Flow Coupling	
	905.60	4.12	2.87	2.44	2-7/8 Pup Jt.	
	909.71	1147.69	2.87	2.44	2-7/8 TBG	37 Jts.
	2057.40	4.75	2.87	2.44	2-7/8 Pup Jt.	
	2062.15	6.97	4.50	2.44	GLM 1	
	2069.12	3.96	2.87	2.44	2-7/8 Pup	
	2073.08	1164.71	2.87	2.44	2-7/8 TBG	37 Jts.
	3237.79	4.15	2.87	2.44	2-7/8 Pup Jt.	
	3241.94	6.97	4.50	2.44	GLM 2	
	3248.91	3.96	2.87	2.44	2-7/8 Pup Jt.	
	3252.87	839.39	2.87	2.44	2-7/8 TBG	27 Jts.
	4092.26	4.15	2.87	2.44	2-7/8 Pup Jt.	
	4096.41	6.95	4.50	2.44	GLM 3	
	4103.36	3.70	2.87	2.44	2-7/8 Pup Jt.	
	4107.06	93.42	2.87	2.44	2-7/8 TBG	3 Jts.
	4200.48	4.59	2.875	2.44	2-7/8 Pup Jt.	
	4205.07	5.81	3.62	2.44	Flow Coupling	
	4210.88	.77	3.18	2.313	Otis "X" Nipple	
	4211.65	5.84	3.62	2.44	Flow Coupling	
	4217.49	4.17	2.875	2.44	2-7/8 Pup Jt.	
	4221.66	531.28	2.875	2.44	2-7/8 TBG	17 Jts.
	4752.94	4.14	2.875	2.44	2-7/8 Pup Jt.	
	4757.08	6.96	4.50	2.44	GLM 4	
	4764.04	3.77	2.875	2.44	2-7/8 Pup Jt.	
	4667.81	467.67	2.875	2.44	2-7/8 TBG	15 Jts.
	5235.48	4.15	2.875	2.44	2-7/8 Pup Jt.	
	5239.63	6.95	4.50	2.44	GLM 5	
	5246.58	3.76	2.875	2.44	2-7/8 Pup Jt.	
	5250.34	498.59	2.87	2.44	2-7/8 TBG	16 Jts.
	5748.93	4.12	2.87	2.44	2-7/8 Pup Jt.	
	5753.05	6.96	4.50	2.44	GLM 6	
	5760.01	3.75	2.87	2.44	2-7/8 Pup Jt.	
	5763.76	497.76	2.87	2.44	2-7/8 Tbg	16 Jts.
	6261.52	4.12	2.87	2.44	2-7/8 Pup Jt.	
	6265.64	6.97	4.50	2.44	GLM 7	
	6272.61	3.67	2.87	2.44	2-7/8 Pup Jt.	
	6276.28	1917.44	2.87	2.44	2-7/8 TBG	61 Jts.
	8193.72	4.62	2.87	2.44	2-7/8 Pup	
	8198.34	5.81	3.62	2.44	Flow Coupling	
	8204.15	.77	3.18	2.313	Otis "X" Nipple	
	8204.92	5.84	3.62	2.44	Flow Coupling	
	8210.76	4.17	2.87	2.44	2-7/8 Pup Jt.	

WELL FLUIDS
INITIAL _____
FINAL _____

PREPARED BY: Larry Rousseau

BAKER SAND CONTROL
A BAKER OIL TOOLS COMPANY

WELL PROFILE
BSC-154A

DISTRICT PERFORMING SERVICE: Houma, Louisiana
PHONE NUMBER: 504 851-0331

OPERATOR: B.P. Exploration
COMPANY REP.: Mr. Mitch Bullock
WELL NO.: A-3 OCS-G-4935
FIELD: Ms. Canyon 20
COUNTY: Offshore
STATE: Louisiana
DATE: 3-7-90

☐ NEW COMPLETION ☒ WORKOVER

		SIZE	WEIGHT	GRADE	THREAD
CASING		7"	29#	N-80	BTC
LINER					
TUBING	LONG STRING	2-7/8	6.5	N-80	ABCMOD
	SHORT STRING				

TYPE COMPLETION FLUID IN CASING: 10.2 INHIB CACL2

NO.	DEPTH	LENGTH	OD	ID	DESCRIPTION
	8214.93	31.70	2.87	2.44	2-7/8 TBG 1 Jt.
	8246.63	1.05	3.46	2.406	80-32 Locator Seal Assy.
	8247.68			3.25	70B2-32 SC-1 PKR
					Total Jts. 257 Run
					Total on Location 277

WELL FLUIDS
INITIAL
FINAL

PREPARED BY: Todd Dabbs, Jr.

(Figure 3) MC 20 Platform Well As Installed Tubing Detail for a 7" production casing completion

Production Packers:

The Baker SC-1 type production packer used on MC-20 has 15 ft. of seals. It would only take 15.7 ft. of tubing movement upward to separate the seals from the respective SC-1 Packer bore. This loss of integrity event would break the seal barrier and expose the reservoir fluids to the A annulus and any other potential leak paths higher in the well.

Baker SC-1, Schlumberger Quantum, and OSCA Comp Set Packers, which are also set in gravel pack completions, all have this same type seal/seal bore configuration and similar spacing.

Only 2 wells appear to have an extended seal bore of 20 ft. long or greater, the A-7 and A-13 wells where a Baker Model D permanent packer is set.

In the A-17, the Baker FH retrievable type production packer was set. This packer would shear out/unseat with approx. 30-40k lbs. of pull from above also breaking the seal barrier and exposing the reservoir fluids to the tubing by casing annulus.

Breaching the seals/packer interface in a well completion will always result in immediate failures downhole. Once a well's tree, wellhead, valve, and/or production casing is damaged, the integrity of the well is compromised and hydrocarbons from the perforated intervals will flow in the path of least resistance.

Well	Packer
A-1	SLB Quantum
A-2	BKR SC-1
A-3	BKR SC-1
A-4	BKR SC-1
A-6	BKR SC-1
A-7	Bkr DB
A-8	BKR SC-1
A-9	BKR SC-1
A-10	BKR SC-1
A-11	OSCA Comp Set II HP
A-12	BKR SC-1
A-12D	BKR A5 Dual
A-13	Bkr D
A-14	BKR SC-1
A-16 D	BKR A-5 Dual
A-17	BKR FH
A-17	BKR SC-1
A-18	BKR SC-1
A-19	SLB Quantum
A-20	SLB Quantum
A-21	SLB Hydrow I
A-22	SLB Quantum
A-23	OSCA Comp Set II HP
A-24	OSCA Comp Set II HP
A-25	OSCA Comp Set II HP
A-26	SCH Quantum
A-28	SCH Quantum

(Figure 8) Model &Type of Production Packers set in the MC 20 Platform Wells

TechnicalUnit

Sand Control Tools - Gravel Pack and Frac Pack Packers

New SC-1 Packer™

Product Family H48820

Description

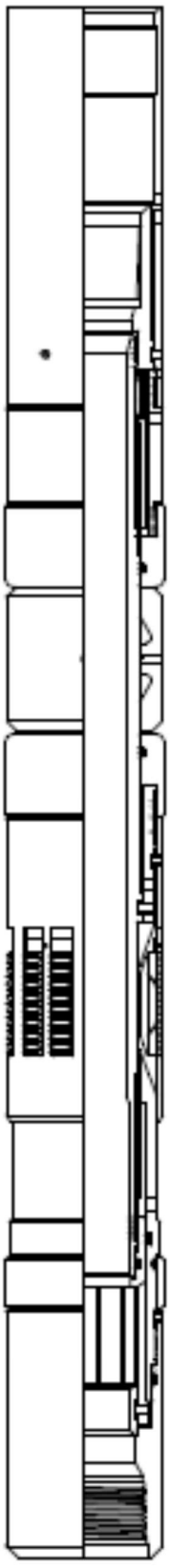
The new SC-1 Packer™ is a fully retrievable, high-performance sand control packer. It was developed to improve the SC-1 and SC-1L packers. Except for the packing element system and gage rings, all parts are interchangeable with the corresponding size of the SC-2 Packer™. The new SC-1 Packer and the SC-2 Packer use the same packer size designations for any given casing size and weight range.

The Packer is fully compatible with standard sealing accessories, including retrievable and expendable plugs.

Refer to the "specifications guide" in the appropriate unit for packer/accessory size and packer size/model availability.

Features and Benefits

- Short overall length facilitates easy running and retrieving through doglegs, tight spots, and short radius curves
- Single, self-energizing, "cup-forming" packing element for repeated low and high differential pressure reversals
- Hydraulically operated mechanical interlock incorporated into the setting sleeve, preventing the setting of the packer during retrieval, should it be impossible to reach the setting depth
- Cast iron construction of the exterior components above the slips to enhance emergency milling procedures of the packer, should it be impossible to retrieve by conventional methods



Drawing 662-484

Conversion To Bridge Plugs

The B™ expendable plug (product family H66540) can be used to convert the new SC-1 Packer to a temporary bridge plug, except 96-40, 107-60 and 117-60.

Expendable Plug Installation

For complete information, refer to the units from Baker Hughes on "expendable plugs".

1. Remove bottom sub.
2. Remove shear screws and slide collet support from inside collet.
3. Insert proper size expendable plug, latch release end first, through lower end of collet.
4. Slide collet support into collet and install shear screws.
5. Reinstall bottom sub.

NOTE: The expendable plug must be pushed out of the packer bore before the packer can be retrieved from the well. The retrieving tool can be used to push the expendable plug out of the bottom of the packer if the packer is to be retrieved at the same time the plug is to be pushed out.

Operating Procedure

Setting on Tubing

When used in a one-trip gravel pack application, the new SC-1 Packer is run with the appropriate setting and crossover tool listed in the "tubing setting compatibility and force analysis" table.

When setting the new SC-1 Packer on tubing in standard nongravel pack applications, the setting tool shown in the table is used with the SC™ hydro-set adapter kit (product family H44548).

NOTE: When used in a nongravel pack operation, special care must be made to ensure crossover subs of mill-out extensions are the proper OD.

Setting Procedure

1. Packers should be set as close to neutral weight as possible. Maximum recommended set-down weight is 2,000 lb for sizes 45-25 and 50-26 and 5,000 lb for larger sizes.
2. Raise tubing pressure to P_1■ and hold for 5 minutes.
3. Bleed pressure to zero.
4. Raise tubing pressure to P_2■and hold for 5 minutes.
5. Bleed pressure to zero.
6. Establish neutral tubing weight at the packer, if not already in this condition.
7. Raise tubing pressure to P_3■ and hold for 5 minutes.

CAUTION!

P_3■ is a minimum pressure. If the ball seat shears at a lower pressure, use the backup ball and pressure to P_3■.

Performance Chart
Standard Service

Packer Size	Packing Element Temperature Rating (°F)	Pressure Ratings (psi)												**Tail Pipe (lb)	
		Anchored Seals in Packer		Floating Seals in Packer		Floating Seals in Seal Bore Ext.		Packer Plug in Packer		Expendable Plug in Packer		Plug in Tail Pipe			
		Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Run In Max.	Net
45-25	Ambient-250	6,000				5,700		6,000				5,700		71,000	33,000
50-26						5,400		6,000	5,600	5,400		5,400		93,000	40,000
55-26						5,900		6,000				5,900		115,000	50,000
66-32						6,000								167,000	75,000
70-32														211,000	108,000
76-32														183,000	113,000
70-40						5,300		6,000	4,800	5,300	4,800	5,300	4,800	162,000	72,000
76-40						5,100		6,000	5,600	5,100				183,000	113,000
96-40		6,000												400,000	165,000
96-47															
107-60		5,000												477,000	180,000
117-60														481,000	180,000

** While running in, the top, sub, body, collet, and bottom sub are subjected to, and will support, this tensile load; however, the joint strength of the running/setting tools and companion equipment must also be taken into consideration when running heavy assemblies below the packer.

Note: The "run in maximum" tailpipe rating may be carried in the hole on the packer but prior to setting the packer any tailpipe weight in excess of the net tail pipe rating must be relieved through slackoff on sump packer, horizontal positioning, etc.

H_2S Service

Packer Size	Packing Element Temperature Rating (°F)	Pressure Ratings (psi)												**Tail Pipe (lb)	
		Anchored Seals in Packer		Floating Seals in Packer		Floating Seals in Seal Bore Ext.		Packer Plug in Packer		Expendable Plug in Packer		Plug in Tail Pipe			
		Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Above	Below	Run In Max.	Net
45-25	Ambient-250	5,000												71,000	28,000
50-26														93,000	33,000
55-26														115,000	50,000
66-32														167,000	62,000
70-32														211,000	90,000
76-32														183,000	94,000
70-40		5,000							4,800	5,000	4,800	5,000	4,800	162,000	72,000
76-40		5,000												183,000	94,000
96-40														400,000	138,000
96-47															
107-60		-													
117-60															

** While running in, the top, sub, body, collet, and bottom sub are subjected to, and will support, this tensile load; however, the joint strength of the running/setting tools and companion equipment must also be taken into consideration when running heavy assemblies below the packer.

Note: The "run in maximum" tailpipe rating may be carried in the hole on the packer but prior to setting the packer any tailpipe weight in excess of the net tail pipe rating must be relieved through slackoff on sump packer, horizontal positioning, etc.

Tubing Setting Compatibility and Force Analysis

Packer Size	S2™ Crossover Tool	S2™ Hydro-Set Adapter	Hydraulic Setting Tool		Setting Pressure (psi)						Setting Force (lb)			
	Size	Kit Size■	Size■	Model	P_1	P_2	P_3	Max	Absolute Max		Min.	Max.	Absolute Max.	
									Standard	H_2S			Standard	H_2S
45-25	20-25	20SCA-30	20	B-1	900	1,200	1,500	2,000			26,000	35,000		
50-26	20-26			B-1	1,500	2,000	2,500	3,000			43,000	52,000		
			40 *	HT		1,900	2,400	2,900						
55-26	40-26			B-1		2,000	2,500	3,500			49,000	69,000		
				HT	1,600	2,200	2,800	3,800						
66-32	80-32			B-1	1,500	2,000	2,500	3,500						
70-32			70	SC	1,900	2,500	3,100	4,200	5,500	4,500	50,000	68,000	88,000	72,000
76-32														
70-40	80-40													
76-40														
96-40	190-40		86		1,300	1,800	2,200	3,500				78,000	123,000	100,000
96-47	190-47													
107-60	210-60		107				3,100		4,000	-	110,900	125,000	143,000	-
117-60	220-60						2,200				78,500			

■When using setting tools other than those listed, P_1, P_2, and P_3 should be the pressures required to yield 60%, 80%, and 100% of the minimum setting force required. Other than the compression recommended in step 1 in the "operating procedures" section, pressure alone should be used to set the new SC-1 Packer. Do not exceed absolute maximum setting force for the packer.

* 55A2-26: use size 20 B-1 hydraulic setting tool and follow the size 40 B-1 detting pressure specifications or use size 40 "HT" hydraulic setting tool as specified. Maximum setting pressure should be sufficient to properly set the packer. However, absolute maximum may be applied if required without damage to setting tool or packer.

1 Introduction

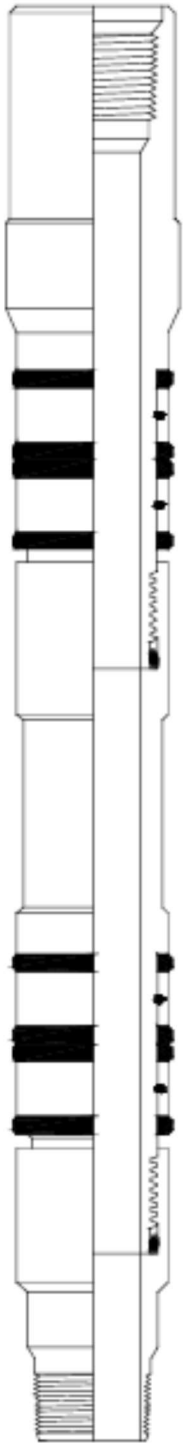
The S-22 locator seal assembly is used to provide an efficient leak-proof seal between the SC packer and the production string. This assembly is used in standard completions where the tubing is landed with weight on the packer and/or where the tubing is allowed to float. When the locator seal assembly is installed in sand control frac completion, the Model A seal assembly spacer tube and seal nipples are used to straddle the frac sleeve.

2 Description

The S-22 locator seal assembly has a locating shoulder which locates on the top sub of the SC packer providing positive locating for the tubing. The mandrel has two sets of packing units on its outside diameter (OD) to give the added sealing protection of an extra seal unit. The locator seal assembly comes in different sizes for performance ratings and/or ID requirements. It can be fitted with either chevron packing units or with bonded seal packing units.

Recommended Usage

For complete information regarding completion practice, particular Seal recommendations for varying well conditions, and pressure and temperature limitations, refer to the basic Tech Unit 5692.

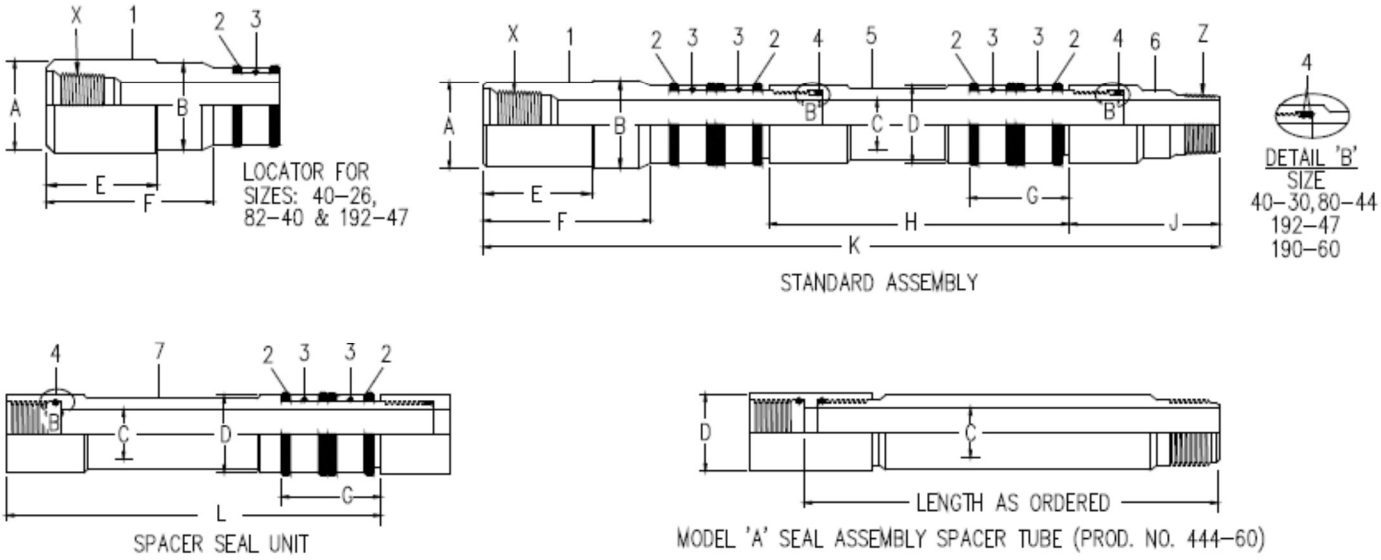


Drawing 655-148-1

8 Assembly and Dimensional Information

S-22™ Locator Seal Assembly (Standard)

Figure 1: Assembly and Dimensional Data Drawing 655-148-1



S-22™ Locator Seal Assembly (Standard)

Dimensional Data, Sizes 20-25, 40-26, 40-30, 80-32, 81-32 and 80-40

Refer to Drawing 655-148-1.

Dimension	Size						
	20-25	40-26	40-30	80-32	81-32	80-40	80-40XP
A	3.125	3.062	3.062	3.465	3.062	4.218	3.230
B	3.125	2.875	3.187	3.465	3.465	4.218	4.218
C	1.875	1.968	1.968	2.406	2.000	3.000	3.000
D	2.490	2.678	2.990	3.239	3.239	3.989	3.989
E	—	5.500	5.000	—	3.500	—	3.500
F	12.000	9.630	9.500	12.630	12.630	9.870	9.870
G	2.562	2.437	2.562	2.500	2.500	2.656	2.656
H*	10.630	9.880	9.130	12.880	12.880	9.440	9.440
J	6.000	6.500	6.500	8.000	8.000	6.500	6.500
K	37.310	30.500	29.750	38.130	38.130	30.380	30.380
L*	21.810	21.180	20.500	23.750	23.750	22.250	22.250
X	2-3/8-in. OD EU	2-3/8-in. OD EU	2-3/8-in. OD EU	2-7/8-in. OD EU	2-3/8-in. OD EU	3-1/2-in. OD EU	3-1/2-in. OD EU
Z	2-3/8-in. HYD FJ	2-3/8-in. OD NU	2-3/8-in. OD NU	2-7/8-in. OD NU	2-3/8-in. OD EU	3-1/2-in. OD NU	3-1/2-in. OD NU
Drift	1.656	1.901	1.901	2.348	1.901	2.867	2.867

*Dimensional Data represents the net increase of the product when an additional Lower Seal Unit or Spacer Seal Unit is added.

(Figure 9) Baker Model SC-1 Production Packer and S-22 Locator Seal Assembly is the type of gravel pack packer as installed on The MC20 Platform Well Completions

Schlumberger

QUANTUM

Gravel-pack packer

APPLICATIONS
- Stand-alone screen applications
- Production or drillstem testing
- Single and multizone completions
- Vertical, highly deviated, and horizontal wellbores

BENEFITS
- Large-bore design maximizes production
- Improved performance parameters increase reliability and reduce risk

FEATURES
- Sealbore retrievable packer
- Hydraulic setting with various QUANTUM* service tools
- Element selection that includes hydrogenated nitrile butadiene rubber (HNBR), Viton®, and Aflas®
- Torque-through feature that allows rotation
- Conformance to NACE standard MR0175

The QUANTUM gravel-pack packer is specifically designed to increase reliability and improve all aspects of sand control operations. The rugged QUANTUM packer is the core component of the QUANTUM gravel-pack completion system, which is specifically designed for single-trip production gravel packing in vertical, deviated, and horizontal wells.

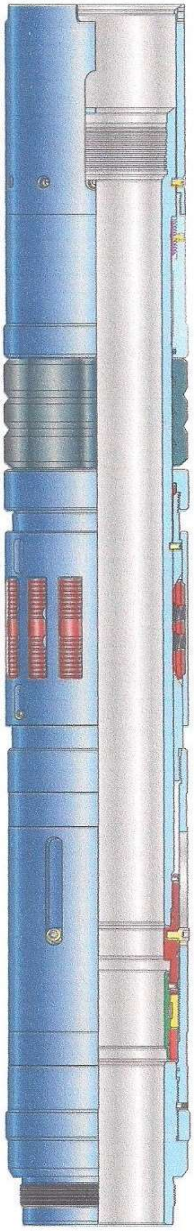
Main features
- Hydraulic-set
- Retrievable
- For use in gravel-pack completions and sand management

Configurations and operation
The QUANTUM packer is available in standard and large-bore configurations, allowing seal assembly IDs to match production tubing IDs. The large-bore design allows for multiple completions in which the lower production tubing must pass through an upper packer assembly without damaging the sealbores. All operations are completed with pressure and vertical movement and do not require rotation.

Retrieval and milling
QUANTUM packers are designed to be retrieved with straight pull or to be milled if necessary. These packers can be set on wireline and retrieved using an internal retrieving tool. They feature one-piece self-energizing packing elements and one-piece bidirectional slips that reduce the risk of loss during retrieval or milling. The slips are located below the packing element for maximum protection from debris fouling.

Meeting standards
The QUANTUM packer's flow-wetted components are manufactured from materials that comply with NACE standard MR0175 for sulfide stress cracking-resistant metallic materials.

The QUANTUM packer can be set by a variety of QUANTUM services tools, including the Type 3, the cased hole gravel- and frac-pack tools, and various wireline-setting tools.



QUANTUM gravel-pack packer.

(Figure 10) SLB Quamtum Gravel Pack Production Packer as installed on MC20 Platform Well Completions

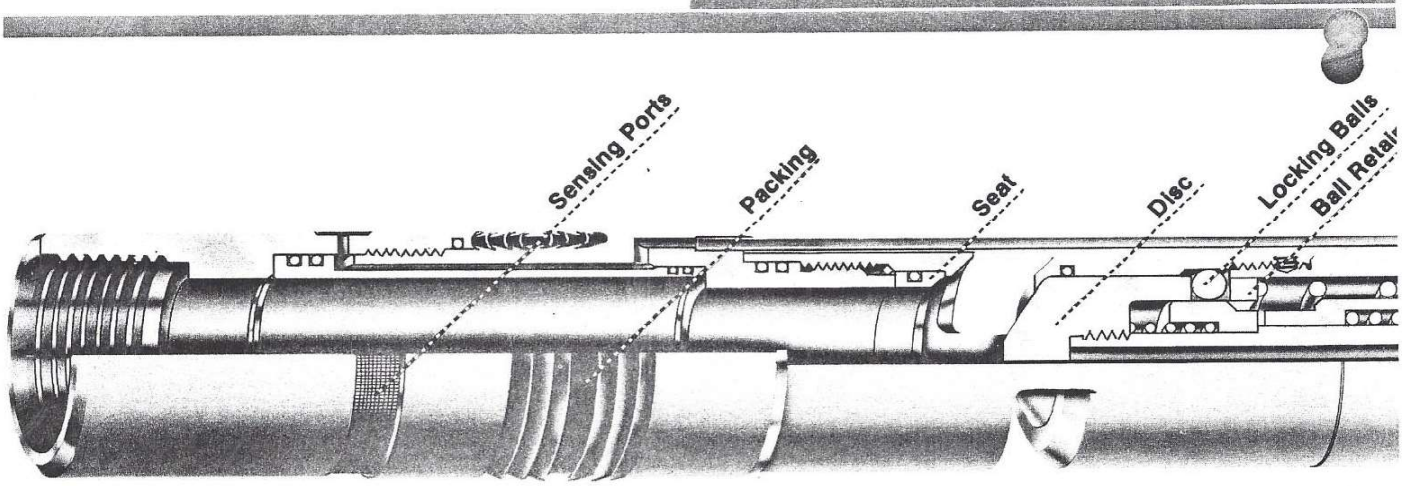
Downhole Completion Tools/Equipment:

SCSSV's – Baker Hughes and SLB provided serial numbers, product numbers, and valve sizes for all the Baker Hughes and SLB Model SCSSV's that were installed on the MC 20 wells. Baker Hughes and SLB verified with their respective engineering departments that the size and type SCSSV's that were installed on the TEC MC-20 platform well completions are designed for a 25-year life. When an originally installed SCSSV was permanently locked out on a MC 20 well (usually due to problems opening & closing the SCSSV) a Macco "PBHX" SSCSV was installed in the completion tubing's "X" nipple (See Figure 1 Present Completion Schematic for details of installation). See Macco SSCSV spec sheet (Figure 4), Baker Hughes SCSSV spec sheet (Figure 5), and SLB SCSSV spec sheet (Figure 6) that are installed on the MC-20 Platform Completions.

If the SSSV's and SSCV's shut in the tubing as designed, it would not create an effective barrier given the production tubing and seals pulled out of the seal bore area in the packers which would leave the tubing by casing annulus as a flow path. This coupled with the catastrophic destruction to the wellheads, tubing spools, valves and tubing itself leave the well with multiple leak paths (failed barriers) to the surface.

MACCO Reliable Downhole Safety

Valve Section



ENGINEERING FEATURES OF THE HPB

- **HPB available up to 15,000 PSI test and 10,000 PSI W.P. (standard valve is 7500 test and 5000 W.P.).**
- **The HPB has the largest seat area available in any wireline sub-surface safety valve.**
- **The HPB has the lowest spread of any surface-controlled sub-surface safety valve.**
- **Remote lines are not required (but can be utilized) with the HPB; hence, large savings are realized in the initial application (Christmas tree, extra spool, etc.).**
- **The HPB controls extreme pressures with very low control line pressure due to very small tubing effect.**
- **HPB is available with a self-equalizing feature.**

The HPB is time tested with proven field use and is the most versatile safety valve in existence. Additional engineering features include:

- Cost-effective Installation—The "HPB" can be installed utilizing an existing landing nipple and lock.

- Superior Materials—Maximum protection against erosion and corrosion is the result of researched component wear, i.e. each component is operationally matched to optimum wear materials,—monel, inconel, heat-treated stainless steel or alloys.

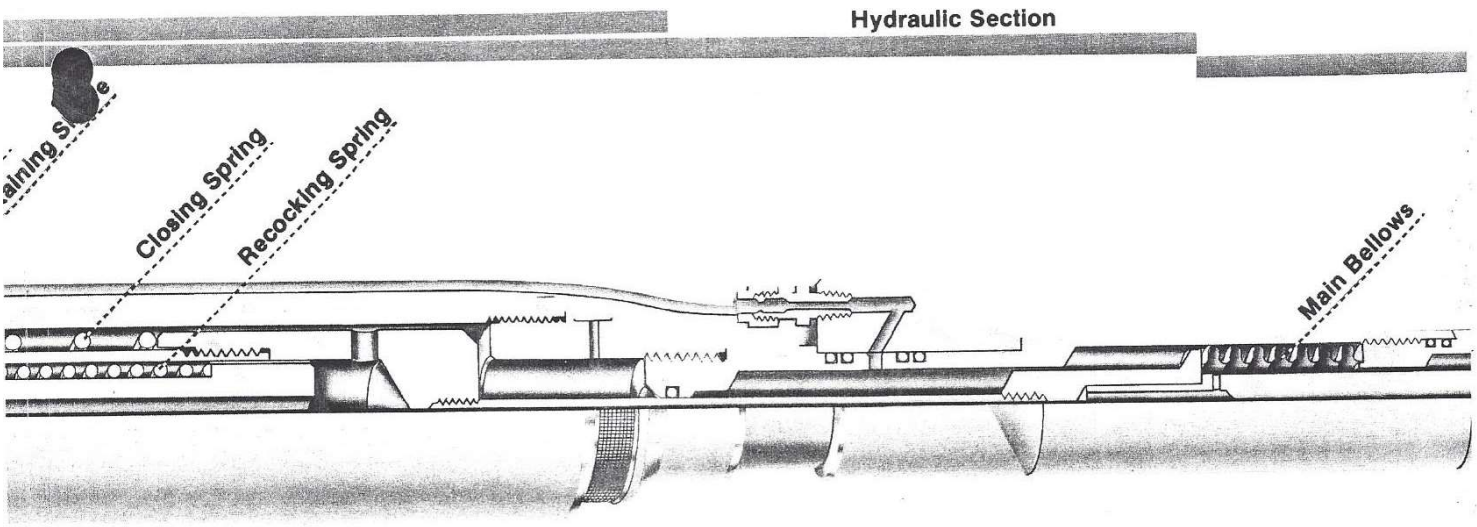
- Component Flow Protection—Engineered to protect vital internal components, the Macco "HPB" is designed with the disc out of the direct flow path; all other components are encased in a protective valve and a positive seal ring and screening system to keep foreign matter out of the sensing section.

- Optimized Flow—The "HPB" offers the largest flow area available in wireline retrievable hydraulic equipment—maximum flow is obtained by optimized internal annular design and minimum pressure loss across the valve.

- Snap Action Positive Closure—Throttling associated with other type safety valves has been eliminated—the snap action principle employed by Macco assures the valve to be fully opened or securely closed. The dual seal mode utilizes a primary metal to metal seal backed by a bonded rubber seal. Half rotated balls and partially opened flappers are eliminated.

- Patented Bellows Protection*
  The patented bellows protection unit limits the differential pressure across either the main or the fluid retaining bellows and prevents bellows damage in case of tubing pressure or dome pressure up to 10,000 psi.

- Depth Setting Flexibility—With the Macco "HPB", the safety valve can be set at the most desirable well depth—shallow or deep. The "HPB's" high pressure capability coupled with the proven dual bellows system, eliminates failures due to pressure or inability to seal dome charge.



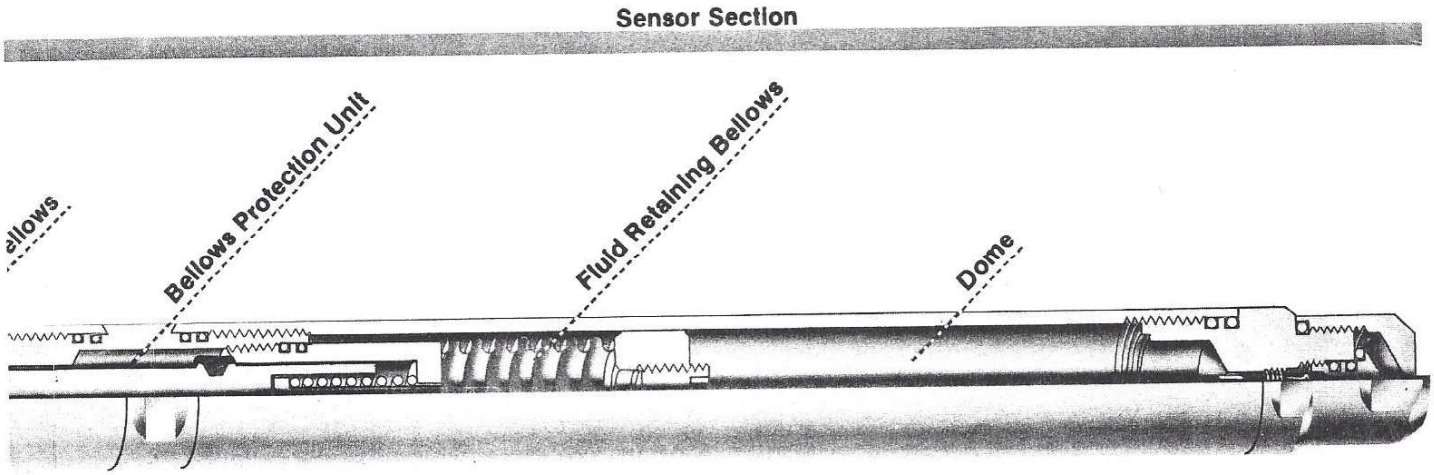
- Erosion Reduction Design—The combined internal design features—optimum flow area, snap action positive closure, component flow protection, and dual seal capability provide the most erosion resistant valve available.
- Ease of Field Test and Reset—Testing is accomplished by a small test sleeve and reset by simply changing the dome charge.
- Enhanced Annular Control—Annular controlled installations are completed without pulling the existing tubing. The "HPB's" low operating pressure spread (125-175 PSI) makes it ideal for casing pressure controlled installations. Additionally, it operates efficiently with gas lift operations.
- "Pressure Proof" Hydraulic Section—The disc and seat operation and Macco's patented bellows protection system eliminates failures due to applying full system pressures to unequalized valves. The dome and bellows are reinforced to pressure ratings in excess of conventional operating limits.
- Optional Self-equalization—This allows the operator to reopen the valve where manual equalization is unfeasible.

DESCRIPTION

Functionally, the "HPB" has three operational sections as depicted in the illustrations.

- The upper part of the "HPB" shows the internal components of the valve section—disc and seat, locking mechanism and operating spring.
- The hydraulic section includes the control pressure sensing ports. Note the protective screen which insures continuous trouble-free sensing. Other components comprising the hydraulic section are; the packing section, the hydraulic pressure routing system and the control pressure cavity located above and around the main bellows.
- The lower section of the "HPB" illustrates the sensor section. Encased in the sensor section is the dome, dome charging port, dual bellows system and the dual bellows protection unit.

Description and Operation



OPERATION

The Hydraulic Section

Hydraulic pressure is supplied to the "HPB" safety valve by a hydraulic control line or annular pressure. The control line is connected to the landing nipple and strapped to the tubing string as it is installed in the well.

The hydraulic pressure is obtained through the screened sensing ports and routed to the cavity above and around the main bellows by the outside mounted pressure line. This hydraulic pressure holds the valve open.

The Sensor Section

The dome is precharged to the desired pressure with nitrogen. The charge pressure compresses the fluid retaining bellows. Utilizing the dual bellows system prevents excessive differential pressures within the system. The compression of one bellows results in the expansion of the opposite bellows. Additional protection is afforded the bellows system by the bellows protection unit.

The Valve Section

The valve section controls the flow of fluids by reacting to pressure changes within the system. When operational pressure falls below that amount required to fully overcome dome charge, an upward movement occurs compressing the closing spring. Locking balls, which in turn are held in place by the ball retaining sleeve, lock the disc in the open position. The disc is physically disassociated from the bellows system, thus no movement of the disc occurs. When control pressure falls sufficiently to allow bellows movement to contact and displace the ball retaining sleeve, the locking balls release. The disc is then thrown onto the seat by the compressed closing spring.

To reopen the valve, sufficient hydraulic control pressure must be applied to overcome the preset dome charge. The tubing pressure across the disc and seat must be equalized. Equalization at this point will allow the reopening spring to move the disc to the full open position. In the full open position, the locking balls will re-engage thus insuring full open full flow performance.

Figure 4 (MACCO "PBHX" SSCSV as installed in production tubing "X" nipple profile)

Model "T(E)-5" Deep Set Tubing Retrievable Flapper Safety Valve Size 2-7/8" w/ Metal to Metal Housing Seals

Product Family Nos. H82480 and H82483

Table of Contents

Description and Purpose

The Models "T(E)-5" Tubing Retrievable Safety Valve is a non-equalizing or self-equalizing flapper-type subsurface tubing mounted safety valve. The self-equalizing version utilizes an Equalizing Flapper Assembly. The "T(E)-5" is rated for 5,000 psi working pressure. This valve is controlled from the surface via a small diameter hydraulic control line connecting the safety valve to the surface Emergency Shut-Down System. Since the valve is of the normally closed type, when the applied control line pressure is removed, the valve returns to the closed position thus shutting in the well. This Valve has a variable Setting Depth capacity.

The "T" Series Tubing Retrievable Safety Valves are compatible with the Baker Flapper Lock Open Permanent Lock Open Tool. This compatibility is standard on all sizes of "T" Series Safety Valves. Should the normal pressure integrity of the valve be lost for any reason, the valve can be permanently locked-open via the appropriate "Flapper Lock Open Tool", Product Family No. H82280. Once locked open the safety valve can either be pulled from the well or a Wireline Retrievable Insert Safety Valve or a Separation Sleeve may be run and landed in the integral landing nipple profile of the "T" Series Safety Valve. The Wireline Insert Safety Valve uses the existing control line. The control chamber is opened to the tubing for this purpose. To open the control chamber to the tubing a Control Line Communication Tool utilizes a "puncture-type" device which provides communication to the tubing.

The valve is supplied without Nipple Adapter or Bottom Sub. Such accessories are furnished as per customer requirements.

The Nipple Adapter contains the upper seal bore and a profile for a Wireline Lock Assembly. Seal bore size and profile type to be specified by customer.

The Bottom Sub, has the lower seal bore. Seal bore size to be specified by customer.

Application and Correspondence

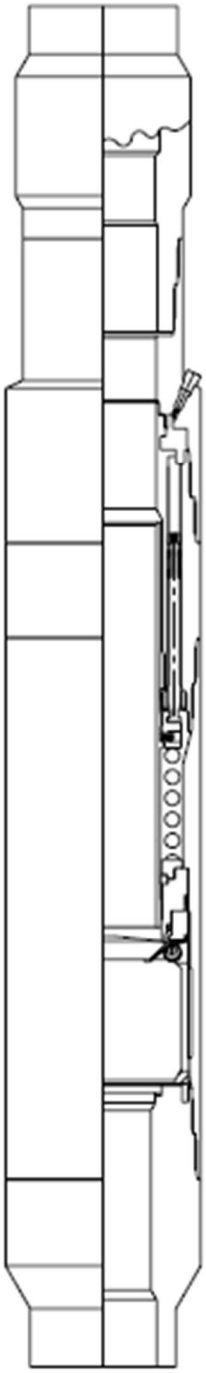
Specification ANSI/API 14A (ISO 10432) sets forth specific guidelines for controlling quality in the design, manufacture, and testing of safety and pollution prevention equipment. The Baker program meets and exceeds these mandatory requirements. When the Baker program is adhered to and the valve has successfully completed the Spec 14A (ISO 10432) Validation Testing process, the valve is referred to as a "Qualified" SCSSV and is eligible to receive the API Monogram. This means that Baker certifies that the valve is a Validation Tested SCSSV acceptable for offshore applications per the US Minerals Management Service.

This SCSSV is designed and manufactured per the Spec 14A (ISO 10432) program. Valves ordered per API Monogram requirements are acceptable for application of the API Monogram if the valve's Validation Test status is current. For monogrammed applications, Spec 14A guidelines must be maintained throughout the life of the valve. For non-monogrammed applications, field testing may differ from the testing requirements for monogrammed applications (detailed in this operating manual).

Inquiries concerning Verification Test status, design, manufacture, testing and reordering of component parts should be addressed to:

Marketing Services
Baker Oil Tools
3000 N. Hemlock Circle
Broken Arrow, Oklahoma 74012
Phone: (918) 455-3000
Fax: (918) 259-2087

Drawing No. 570-957-00



BAKER HUGHES Baker Oil Tools

(Figure 5) Baker Hughes SCSSV as installed on MC20 Platform Well Completions

Schlumberger

TRM-4P and -4HP Series Safety Valves

General service, premium rod piston, metal-seal body joints, flapper valve with working pressures to 10,000 psi [68,950 kPa]

APPLICATION

- Sweet to severely corrosive applications from 40 degF to 300 degF [4 degC to 149 degC]

BENEFITS

- Has downstop that protects the hydraulic piston bore and increases reliability.
- Allows fewer potential leak paths.
- Reduces operating friction and resists corrosive chemicals to provide safe, long-term operation.
- Reduces solids and scale-deposition problems.
- Provides a simple slickline procedure, with or without secondary communication.
- Has high hydraulic system pressure rating (15,000-psi [103,421-kPa] piston seals).

FEATURES

- Static nonelastomeric operating piston seat in full-open position
- Minimum number of seals
- Metal-seal body joints and static operating piston seal in full-closed position
- Rod piston hydraulic seals
- Optimal geometry and clearance between sliding components
- Metal-seal communication and lockout mechanism
- Full metal-to-metal sealing Inconel® flapper mechanism

The Camco* TRM-4P and -4HP tubing-retrievable, surface-controlled, subsurface safety valves are value engineered to provide long-lasting, safe, and reliable operation. These valves feature rod-piston actuation, metal-to-metal seal body joints, a rugged flapper-closure mechanism, and a minimum number of critical seals to ensure maximum reliability.

The TRM-4P and -4HP valves have only two body joints and use the proprietary Cam-P* threads to achieve a reliable, metal-to-metal seal. The premium flapper mechanism in these valves also features full metal-to-metal sealing plus a secondary soft seat, and it meets a leakage-acceptance criterion that is substantially more stringent than API and ISO specifications.

The valve's modular design allows a maximum number of material and design options, including a wide range of nipple profiles, to cost effectively fit specific applications and operating environments. These TRM-series valves are available with working pressure ratings to 10,000 psi [68,950 kPa] and setting depths to 2,500 ft [762 m].

PREMIUM PISTON SYSTEM

The rod piston system uses a reliable spring-energized, filled Teflon sealing element. Operating within the valve's chamber housing, this system consists of a stepped OD, a compliant downstop of a polyetheretherketone polymer, a static, full-closed, metal-to-metal seal and an integral piston centralizer. As the operating piston reaches full open, it seats to form a static seal and protects the dynamic operating piston from produced fluids. The polymer sealing element provides a compliant sealing surface to avoid incomplete sealing caused by particulate matter, and the piston system components are manufactured from wear-resistant materials for maximum durability.

VALVE OPERATION

The TRM-4P and -4HP series safety valves are normally closed. They are opened by applying hydraulic pressure through a control line that extends from the safety valve through the wellhead to the control panel. Hydraulic pressure applied from the surface control panel pushes the rod piston and the flow tube down. This force compresses the power spring, moves the flapper off seat, and continues until the valve is in the open position. When fully open, the flapper and seat system are isolated from production flow to prevent contamination. When the hydraulic control line pressure is released, the power spring lifts the flow tube and the rod piston. This upward movement permits the torsion spring on the hinged flapper to move the flapper into the flow stream, close against the flapper seat, and shut in flow from the well.

TRM-4HP safety valve.

TRM-4P and -4HP Series Safety Valves

LOCKOUT OPERATION

A unique mechanism enables a simple slickline procedure to move a lockout sleeve located above the flow tube downward to part a shear plug, engage the lockout rod, and permanently lock the safety valve open while establishing hydraulic communication to the valve ID. A secondary valve can then be installed in these valves. A second lockout option allows these TRM series safety valves to be locked open without activating secondary hydraulic communication.

Engineering Data for TRM-4P Series Safety Valves

Tubing Size[1] (in [mm])	Valve Type	Max. OD (in [mm])	Nipple Bore (in [mm])	Working Pressure (psi [kPa])	Tensile Strength[2] (lbf [kg])
2.375 [60.3]	TRM-4P	3.625 [92.1]	1.875 [47.6]	5,000 [34,475]	132,213 [59,960.5]
		3.640 [92.5]			108,000 [48,979.6]
		3.688 [93.7]	1.812 [46.0]		127,000 [57,596.4]
2.875 [73.0]		4.609 [117.1]	2.312 [58.7]		184,000 [83,446.7]
3.500 [88.9]		5.176 [131.5]	2.812 [71.4]		261,000 [118,367.3]
4.500 [114.3]		6.923 [175.8]	3.812 [96.8]		413,000 [187,301.6]
5.500 [139.7]		8.226 [208.9]	4.562 [115.9]		466,000 [211,337.9]
		7.798 [198.1]	4.312 [109.5]	7,500 [51,713]	687,000 [311,564.6]
		8.226 [208.9]	4.562 [115.9]	6,000 [41,370]	466,300 [211,473.9]
		8.187 [207.9]		7,500 [51,713]	922,465 [418,351.5]
7.000 [177.8]	TRM-4P-CF	9.234 [234.5]	6.000 [152.4]	5,000 [34,475]	692,750 [314,172.3]
		9.453 [240.1]	5.500 [139.7]		736,000 [333,786.8]
		9.250 [235.0]	5.939 [150.9]		885,000 [401,360.5]
		9.453 [240.1]	6.000 [152.4]	6,750 [46,541]	692,750 [314,172.3]
		9.156 [232.6]	5.675 [149.2]	5,000 [34,475]	778,800 [353,197.3]

Engineering Data for TRM-4HP Series Safety Valves

Tubing Size[1] (in [mm])	Valve Type	Max. OD (in [mm])	Nipple Bore (in [mm])	Working Pressure (psi [kPa])	Tensile Strength[2] (lbf [kg])
2.375 [60.3]	TRM-4HP	4.124 [104.7]	1.812 [46.0]	10,000 [68,950]	133,000 [60,317.5]
2.875 [73.0]		4.801 [121.9]	2.312 [58.7]		222,000 [100,680.3]
		5.166 [131.2]			267,000 [121,088.4]
3.500 [114.3]		5.610 [142.5]	2.812 [71.4]		312,000 [141,496.6]
		5.507 [139.9]			362,000 [164,172.3]
		5.680 [144.3]			263,637 [119,563.3]
		5.568 [141.4]	2.562 [65.1]		395,000 [179,138.3]
4.500 [114.3]		7.923 [201.2]	3.812 [96.8]		495,000 [224,489.8]
		7.515 [190.9]			
5.500 [139.7]		8.125 [206.4]	4.312 [109.5]		804,000 [364,625.9]
		8.686 [220.6]	4.437 [112.7]		835,000 [378,684.8]
		8.962 [227.6]	4.312 [109.5]		804,700 [364,943.3]
7.000 [177.8]		9.000 [228.6]	5.000 [127.0]	8,500 [58,608]	1,029,000 [466,666.7]

[1] The engineering data provided illustrate the scope of this product offering but are not all inclusive. Additional sizes and pressure ratings are available upon request.
In 7-in sizes, the curved flapper is the standard version. A flat-flapper version can be obtained on request to meet specific strength requirements (e.g., 10,000-psi working pressures).
[2] Tensile ratings are given for specific example valves; higher-strength materials affect this value. Tensile ratings shown are exclusive of end connection (EOEC) and at ambient temperature.

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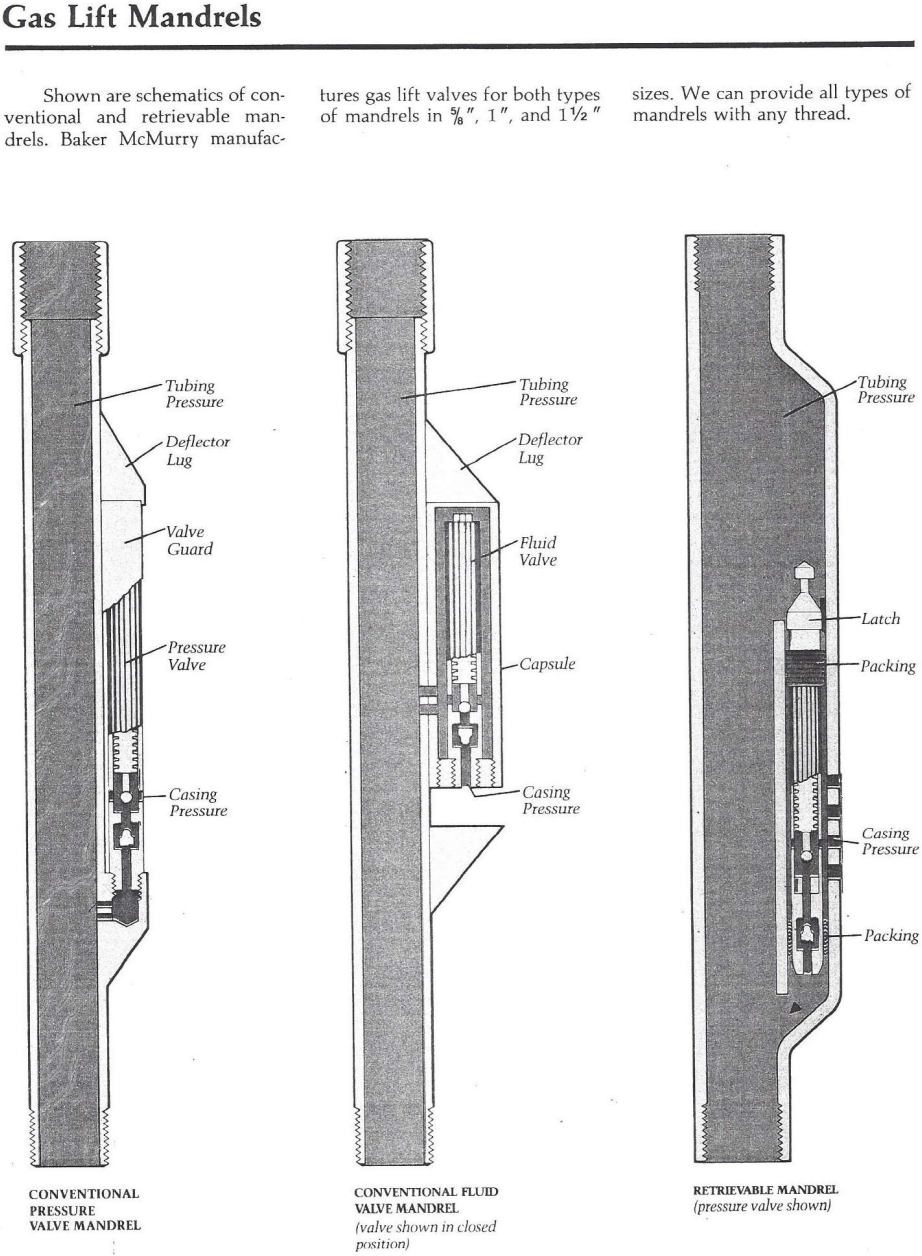
(Figure 6) Baker Hughes SCSSV as installed on MC20 Platform Well Completions

Gas Lift Mandrels (GLM's) – Conventional gas lift pressure valve mandrels were installed in the MC 20 A-4 well completion tubing at 2812', 2842', 3392', 3988', 4305', 4983', & 5383' and were equipped with dummies during the original well completion in 1990. Live gas lift valves were installed in place of the original dummies into all of the originally installed GLM's in 1995. It is a standard completion practice to use live gas lift valves to increase flow of oil up the tubing as reservoirs' natural energy decreases. Live gas lift valves need a pre-set amount of pressure that is pumped down the production casing by production tubing annulus into the one-way gas lift valve to kick off the gas lift valves and help lift the oil up the tubing ID to the surface. It is generally assumed that these type GLM's do not leak hydrocarbons from the production tubing into the production casing annulus, however in this case a GLM could have been damaged and/or broken off during the tubing movement when the platform collapsed and the platform was pulled away from each well. Conventional gas lift pressure valve mandrels/gas lift valve designs are accepted completion tools that have a 25 to 40-year life according to Ron Massicot with Lycon Gas Lift Products.
See conventional Baker McMurry Manufactured Gas lift Mandrels in Figure 7 below.



(Figure 7) McMurry Gas Lift Mandrels as installed on MC20 Platform Well Completions

Production tubing & casing corrosion – There are formulas developed to predict excessive corrosion rates for carbon steel under known downhole conditions. For example, at a downhole temperature of 240°F, a pressure of 1000 psi and 1% mol of CO2, the corrosion rate predicted is around 20 mm/yr. (3/4 in./yr.). All forms of corrosion create corrosion products that have their own consequences, depending on the contaminants present in the subsurface water. A review of the typical MC 20 wells tubing designs (Figure 1, 2, & 3) show that the tubing metallurgy used is API recognized corrosion resistant alloy/carbon steel N-80. Corrosion mitigation typically takes two forms: investment in corrosion-resistant alloys such as the N-80 tubing installed, along with a chemical corrosion inhibition/monitoring program. Without a chemical corrosion inhibition/monitoring program and the fact that subsurface water compositions from particular wells change over time, an prediction of corrosion conditions of the tubulars that were installed in the TOC MC 20 Platform wells was deemed to be unproductive. It is common knowledge that tubulars and other components with leaks, holes or other defects will accelerate deterioration with flowing fluids. **Continued deterioration to component should be expected at MC-20 given the indications of damage to components coupled with known produced water flow.**

References

Baker Hughes" Allen Womble – Baker Sand Control Packers, Broussard LA (337) 654-8253
SLB" Laurabeth Barker – SLB SCSSV and Production Packer Sales Representative, Houston TX (713) 829-1923
Lycon Inc." Ron Massicot- McMurry Gas Lift Mandrel & Gas Lift Valve Distributer, Lafayette LA (337)-658-8812
Well Completion Design" *Jonathan Bellarby" 2009,* page 443.