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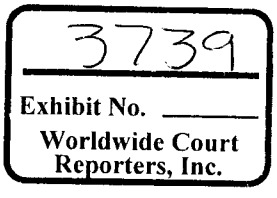
Macondo MC252 #1 Permanent Abandonment Statement of Requirements



Rev	Date	Document Status	Custodian/Owner	Authority
0	7/20/2010	Final–Issued for Use	Bruce Rogers	Pat O'Bryan

Document	Organization ID	Sector ID	Discipline ID	Document Class	Sequence Number	Document Revision
Control Number	2200	T2	DO	SR	4005	0

BP-HZN-2179MDL00412932

AMENDMENT RECORD

Amendment Date	Revision Number	Amender Initials	Amendment

Document Authorization Form

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Special Instructions	MC252

Document Details

Document Number	2200-T2-DO-SR-4005	**Revision**	0
Document Title	Macondo MC252 #1 Permanent Abandonment Statement of Requirements		
Next Review Date	N/A		

Reason for Issue (check as applicable)	**New Document**	**Revised Document**	**Obsolete Document**
	X		

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	Print Name	**Signature**	**Date**
Custodian/Owner	Bruce Rogers		7-21-10
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Authorizer	Pat O'Bryan		7/26/10
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1. Mission Statement

Operations to recover the Deepwater Horizon's Blow Out Preventer (BOP) stack and permanently abandon the Macondo MC252 #1 well shall be designed/planned to minimize risk of impact to health, safety, security and environment (HSSE).

Procedures, materials and equipment shall comply with established industry, federal and international codes and standards. BP's Drilling and Well Operations Policy (DWOP) and Engineering Technical Practices (ETPs) shall be followed when more rigorous than the aforementioned standards.

2. Objectives

Primary objectives of the Macondo MC252 #1 Permanent Abandonment Statement of Requirements (SoR) follow.

1. Identify BP and Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) permanent abandonment requirements.
2. Identify BP's requirements for recovery, preservation and transportation of evidence.

3. MC252 #1 Pore Pressure and Frac Gradient – Post-Drilled

The current Macondo pressure interpretation incorporates revisions to the pre-drill forecast based on: synthesis of Logging While Drilling (LWD) and wireline pressure indicators (pressure transforms based on resistivity, sonic and check-shot, and density); drilling parameters and data (RxC, background and connection gases); direct drilling indicators (kicks, losses); and GeoTap and MDT pressure measurements. Pore pressure is higher than the pre-drill most-likely curve, from 9,000-ft to 17,750-ft TVDKB.

The pre-drill pressure prediction was too low in this interval due to slower than predicted interval velocities, and the apparent need for higher pressure transform model more similar to that used in the analysis of the high pressure, narrow margin offset well "Yumuri" (MC382-1). Reservoir pressures are much lower than predicted. Pre-drill centroid modeling of channel sands draped over the large 4-way Macondo structure placed reservoir pressures 0.1 to 0.3 ppg higher than shale pressure. Actual reservoir pressures imply regional hydraulic connectivity to deeper water, lower overburden/pore pressure environments to the south (similar reservoir pressure to Isabella), or local connectivity up-dip beneath the salt bodies southwest and east of the prospect.

Though wireline density is limited to the reservoir section, calibrated acoustic to density transforms of the Macondo sonic and check-shot imply that overburden is lower than predicted. Lower densities used in the calibrated post-well overburden are consistent with the higher than predicted pore pressure observed at the prospect. The narrower than predicted Pore Pressure/Fracture Gradient (PPFG) window above the reservoir level led to shallower than planned shoes, and use of contingency liners.

Based on a projected shut-in wellhead pressure of about 6,900 psi, estimated depleted pore pressures and frac gradients range from 11.1 and 13.9 ppge, respectively, in the M57-B sand to 10.8 and 14.0 ppge, respectively, in the M56-F sand.

The M56-F sand is particularly vulnerable to lost returns. While drilling MC252 #1, mud losses were experienced in the M56-F sand with a 14.5 ppge equivalent circulating density (ECD).

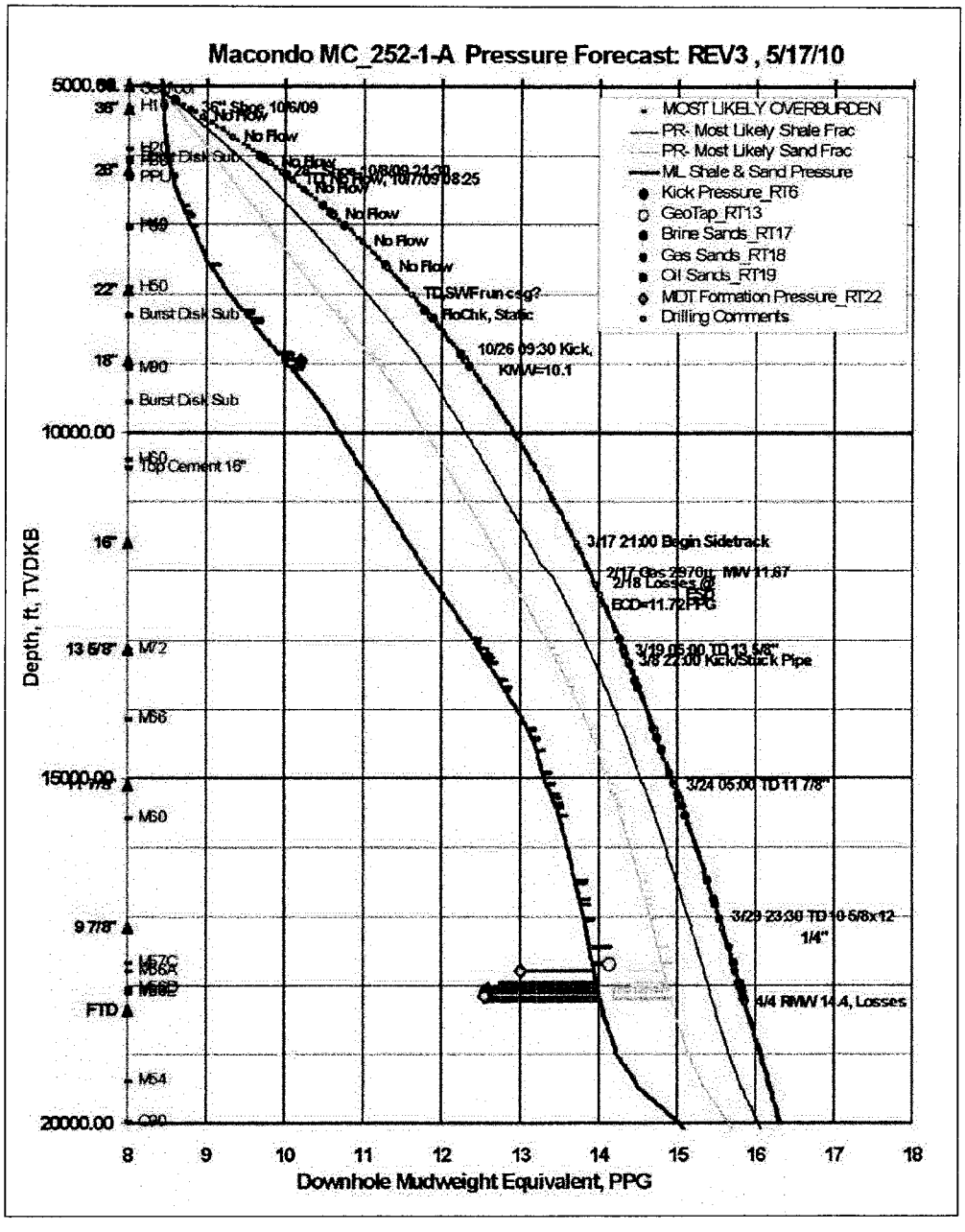

Figure 1: MC252 #1 Post-Drilled Pressure Profile

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Custodian/Owner:	Bruce Rogers	**Issue Date:**	7/20/2010
Retention Code:	ADM3000	**Next Review Date (if applicable):**	N/A
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Well:	Macondo MC252 #1					KB (amsl):		75.00										
Date:	12th April 2010					WD:		4992.00										
Geologist:	Galina Skripnikova / Stuart Lacy					Bit Dia/MW:		8 1/2" / 14.0 ppg										
Test/ Run No.	File No.	Sand	DEPTH (ft) RKB (MD)	TVD (KB)	TVD (SS)	Gauge Type*	Initial Hydrostatic psi	ppge	PRETEST DATA Min FP	FP psi	ppge	Final Hydrostatic psi	ppge	OVB psi	Temp (degF)	Time (min)	Mobility*** and Comments	VC **
1	136	M56	18,120.9	18,110.0	18,035.0	Qtz	13,355.40	14.18	10136.97			13,356.51	14.18	13356.51	230.4		Tight test	
1																		
2	137	M56	18,123.0	18,112.0	18,037.0	Qtz	13,360.11	14.19	11821.39	11840.74	12.57	13,361.74	14.19	1521.00	232.0		Still building 70 md/cp	
1																		
3	138	M56	18,123.9	18,112.9	18,037.9	Qtz	13,364.27	14.19	11800.42	11842.91	12.57	13,365.06	14.19	1522.17	233.2		Starts well, took format on pressure, then keeps building up 62 md/cp	
1																		
4	139	M56	18,126.0	18,115.1	18,040.1	Qtz	13,368.49	14.19	11956.65	11844.68	12.57	13,368.43	14.19	1523.75	233.7		Same as above 28.6 md/cp	
1																		
5	140	M56	18,133.0	18,122.0	18,047.0	Qtz	13,375.98	14.19	11805.59	11847.26	12.57	13,375.70	14.19	1528.42	233.3		Same as above 20.1 md/cp	
1																		
6	141	M56	18,129.9	18,119.0	18,044.0	Qtz	13,374.02	14.19	11755.19	11847.23	12.57	13,373.53	14.19	1526.30	234.6		Not stable, build down then up 22.7 md/cp	
1																		
7	143	M56	18,124.0	18,112.9	18,037.9	Qtz	13,374.21	14.20	11827.00	11850.41	12.58	13,367.74	14.19	1517.33	237.4		Sample 1, 1x2-3/4 chamber, 4xMPRS, 2xSPMC	
1																		
8	144	M56	18,086.0	18,075.0	18,000.0	Qtz	13,339.39	14.19	11823.07	11841.04	12.60	13,338.39	14.19	1497.35	237.6		Good test. Sample 2. 1x2-3/4 chamber, 4xMPRS, 2xSPMC	
1																		
9	145	M56	18,140.0	18,129.0	18,054.0	Qtz	13,375.58	14.19	12602.81	11855.02	12.58	13,375.29	14.19	1520.27	237.5		Started well then continue building with spikes	
1																		
10	146	M56	18,144.9	18,135.0	18,060.0	Qtz	13,380.46	14.19	12626.55			13,380.05	14.19	13380.05	237.2		Build up is much slower than at	
1																		
11	147	M56	18,142.0	18,131.0	18,056.0	Qtz	13,378.37	14.19	12648.33	11855.75	12.57	13,372.08	14.18	1516.33	236.1		Sample 2. 1x2-3/4 chamber, 6x	
1																		
12	148	M56	18,157.0	18,146.1	18,071.1	Qtz	13,371.07	14.17	11839.26	11856.99	12.57	13,378.91	14.18	1521.92	238.4		Good test mobility 146	0.2400
1																		
13	149	M56	18,167.0	18,156.1	18,081.1	Qtz	13,385.80	14.18	11838.82	11859.41	12.56	13,385.99	14.18	1526.58	239.2		Good test mobility 108	0.2406
1																		
14	150	M56	18,180.0	18,169.1	18,094.1	Qtz	13,395.91	14.18	12506.29	11862.51	12.56	13,395.61	14.18	1533.10	240.2		Good test mobility 116	
1																		
15	151	M56	18,130.0	18,119.1	18,044.1	Qtz	13,357.95	14.18	11850.32	11850.50	12.58	13,357.87	14.18	1507.37	240.7		Good test mobility 12	
1																		
16	152	M56	18,082.9	18,071.1	17,996.1	Qtz	13,322.46	14.18	11829.75	11838.16	12.60	13,323.89	14.18	1485.73	240.6		Good test mobility 322	
1																		
17	153	M56	18,069.0	18,058.1	17,983.1	Qtz	13,314.45	14.18	116663.07	11835.01	12.60	13,315.76	14.18	1480.75	240.6		Good test	#REF!
1																		
18	157	M56	18,077.0	18,066.1	17,991.1	Qtz	13,330.80	14.19	11819.40	11839.19	12.60	13,329.80	14.19	1490.61	237.9		Good test mobility 107, used a d	#REF!
1																		
19	158	M56	17,976.0	17,965.7	17,890.7	Qtz	13,251.95	14.19				13,253.00	14.19	13253.00	238.0		Tight	
1																		
20	159	M56	17,977.0	17,966.7	17,891.7	Qtz	13,256.89	14.19				13,256.90	14.19	13256.90	237.0		Tight	
1																		
21	160	M56	17,975.0	17,964.7	17,889.7	Qtz	13,257.17	14.19				13,257.22	14.19	13257.22	236.8		Tight	
1																		
22	162	M56	17,805.0	17,794.1	17,719.1	Qtz	13,139.42	14.20				13,138.58	14.20	13138.58	235.2		Tight	
1																		
23	163	M56	17,806.0	17,795.1	17,720.1	Qtz	13,138.26	14.20				13,137.52	14.20	13137.52	234.5		Tight	
1																		
24	164	M56	17,807.0	17,796.1	17,721.1	Qtz	13,138.40	14.20	12037.77	12038.47	13.01	13,137.62	14.20	1099.15	234.0		Good test, mobility 145	
1																		
25	165	M56	17,703.0	17,692.1	17,617.1	Qtz	13,055.66	14.19				13,055.86	14.19	13055.86			No seal	
1																		
26	166	M56	17,706.0	17,695.1	17,620.1	Qtz	13,061.46	14.20				13,061.46	14.20	13061.46			No seal	
1																		
27	167	M56	17,701.0	17,690.1	17,620.1	Qtz	13,058.81	14.19				13,058.81	14.19	13058.81			No seal	
1																		

GENERAL COMMENTS:

* Quartz Gauge= PSIA, Strain Gauge=PSIG

** Validity Code: V=Valid, T=Tight, SC=Supercharg ***Mobility Ratio=mD/cP (millidarcy per centipoise)

Figure 2: MC252 #1 MDT Pressures

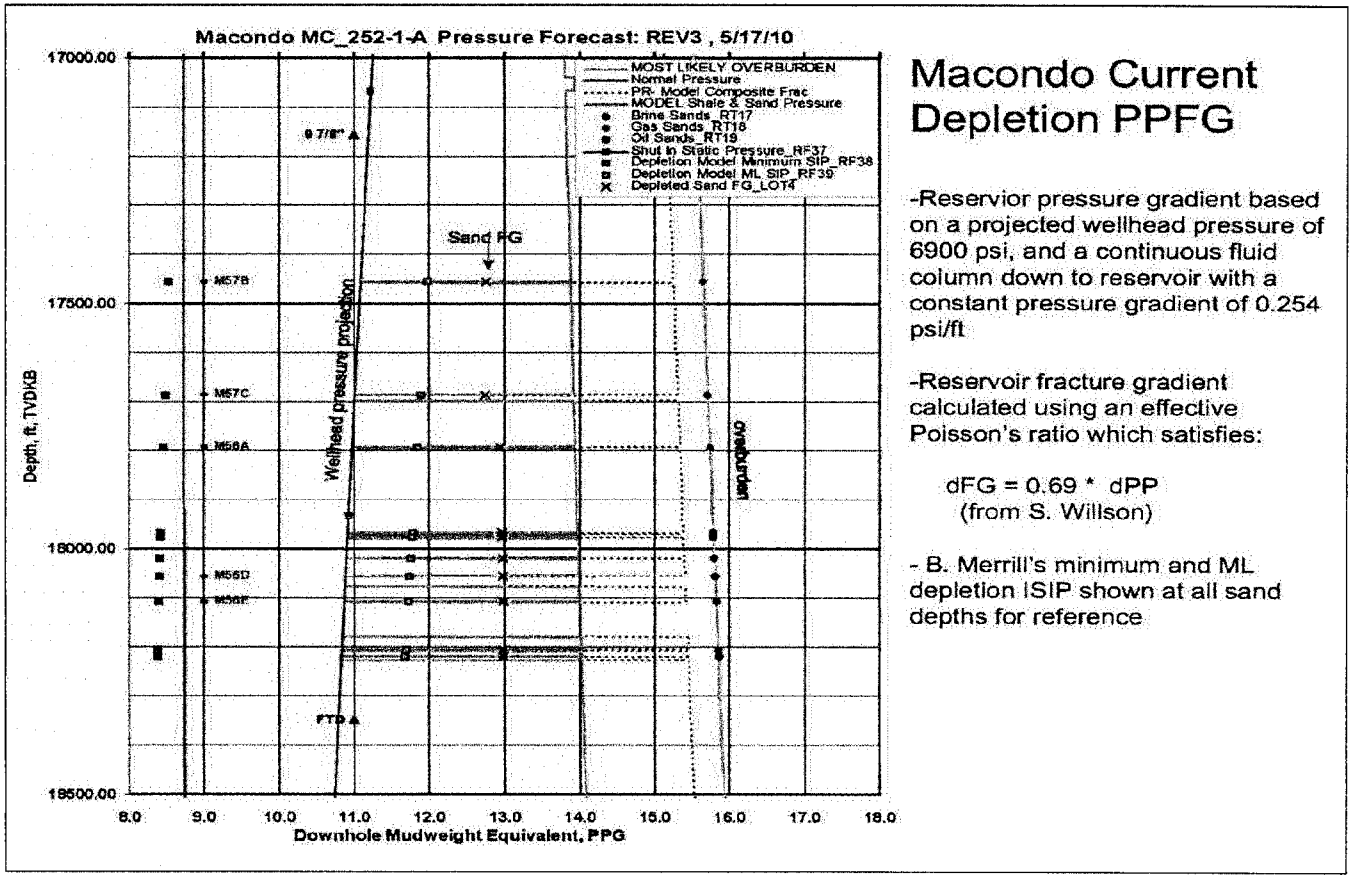

Figure 3: Macondo Current Depletion PPFG

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4. MC252 #1 Static Temperature – Post-Drilled

1.1 Pre-Drill vs. Post-Drill Temperature Comparison

Reservoir temperatures were predicted to be in between 219°F and 248°F, with a most likely case at 235°F. Post-well temperatures, acquired from the MDT tool, gave a broad range between 230 and 242°F. Therefore, the post-well temperature range was similar to the pre-drill temperature prediction.

The black curve is the post-well temperature curve. It takes into account the outer limit of the MDT temperatures as the closest reservoir temperature reading.

The post-well temperature curve is slightly above the most-likely pre-drill curve (~7°F) but is close to the pre-drill temperature prediction.

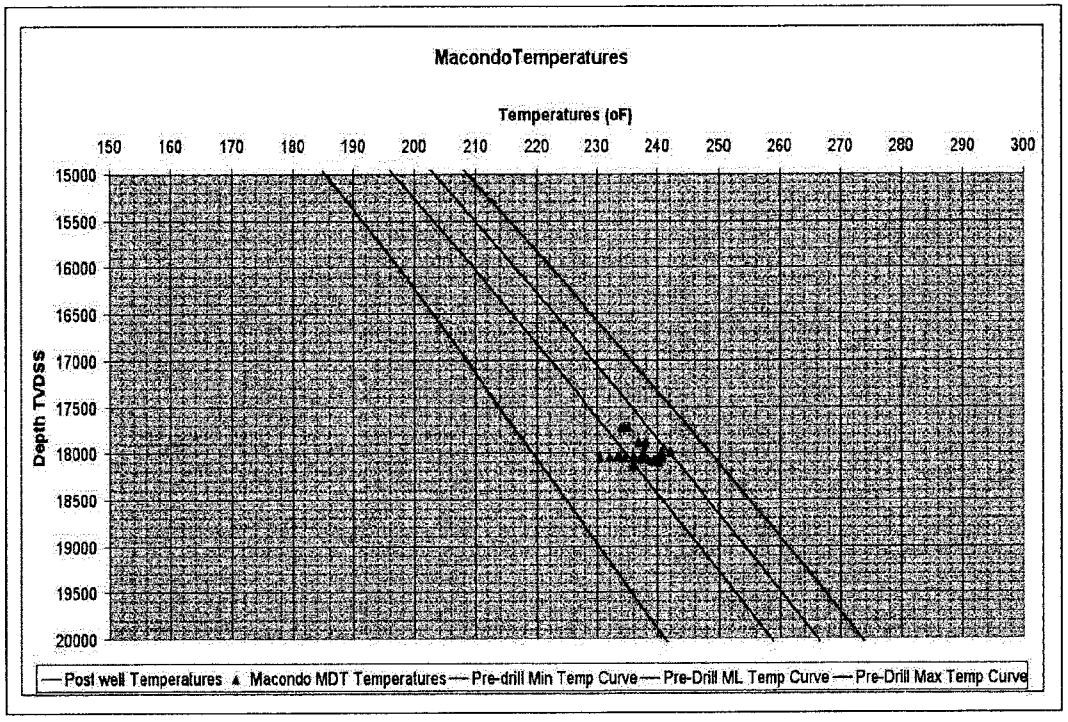

Figure 4: MC252 #1 Static Temperature

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5. MC252 #1 Wellbore Diagram – Current Conditions

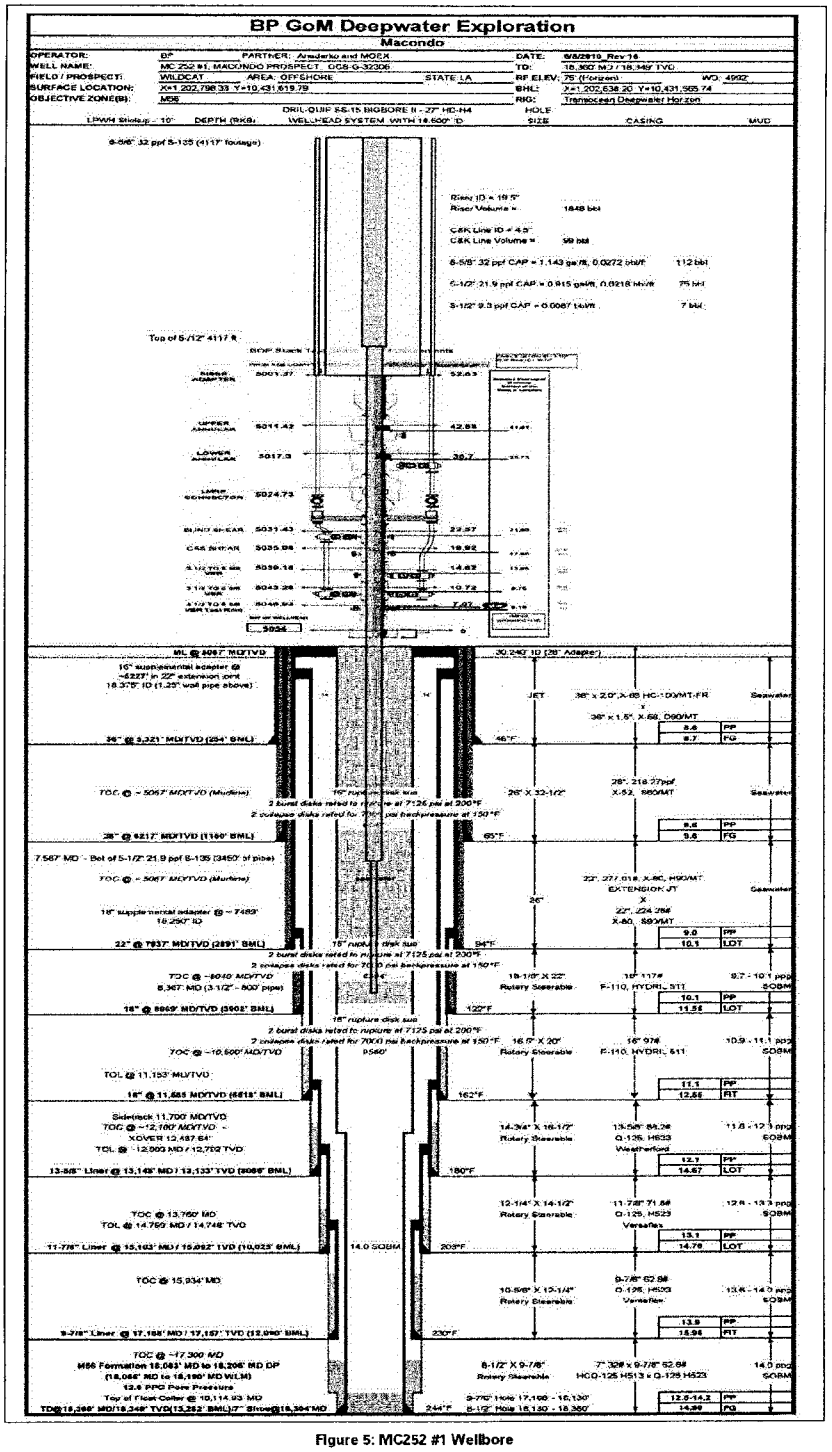

Figure 5: MC252 #1 Wellbore

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6. MC252 #1 Rupture Disks in 16-in Casing

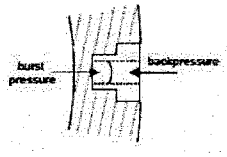
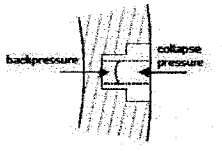
Rupture Disk Sub Worksheet – Statement of Requirements					
Business Unit		Well Charge		Date	
Purchase Number		Item Number		Material Number	
Description	16" Burst & Collapse subs 3 subs plus 1 back-up for a total of 4 subs			Drawing Number	
Casing String Designation *Description of string that will include burst disk sub*	*OD, Weight / Wall, Grade, Connection, Special Drift Requirements* **16" 97.0 (0.575" wall) P-110 Hydril 511**				
	Burst (MIYP) Rating **6,920 psi**		*Collapse Rating* **2,340 psi**		
Burst Disk Description *Typical tolerance is ± 5%* *Rating is at 150°F unless noted otherwise* *Disks should be installed 2 per sub, 180° apart*			*Burst Disks per Sub* **2 at 180°; HES AO6239-3**		
			Burst Pressure (e.g. 5,000 psi ± 5%) **7,500 psi ± 5% at 200°F**		
			Minimum Backpressure **5,250 psi**		
Collapse Disk Description *Typical tolerance is ± 5%* *Rating is at 150°F unless noted otherwise* *Disks should be installed 2 per sub, 180° apart*			*Collapse Disks per Sub* **2 at 180°; new disk item**		
			Collapse Pressure (e.g. 2,000 psi ± 5%) **1,600 psi ± 5% at 150°F**		
			Minimum Backpressure **7,000 psi**		
O-Ring Material *Verify compatibility with mud http://nt.bpweb.bp.com/elastomers/*	*O-Ring Material (e.g. Viton or Buna-N)* **Viton**				
Sub Geometry *Vendor to supply drawing* *All disks shall be installed with thread lock compound*	☐ Pin x Pin ⊗ Pin x Box ☐ Box x Box		*Additional Requirements (e.g. minimum tong area, number of recuts, minimum length requirements)*		
Pressure Test Parameters *Hunting's tester allows for different burst disk and collapse disk test values*	*Test Pressure – Specify the minimum of:* - *Casing test pressure* - *55% of nominal rupture pressure for burst disks* - *90% of minimum backpressure for collapse disks* **6,300 psi**		*Hold Time (e.g. 10 minutes)* **10 minutes**		
Number of Additional Disks *For reworking field returns*	*Total Additional Burst Disks* **2 additional disks**		*Total Additional Collapse Disks* **2 additional disks**		
Special Marking or Identification Requirements					

Figure 6: Rupture Disk Sub Worksheet (SOR)

7. MC252 #1 Wellhead Diagrams – Current Conditions

A Dril-Quip SS-15 BigBore II wellhead system with 27-in HD-H4 connector profile as shown below was installed at MC252 #1. The position of the 9 7/8-in casing hanger and seal assembly is to be confirmed.

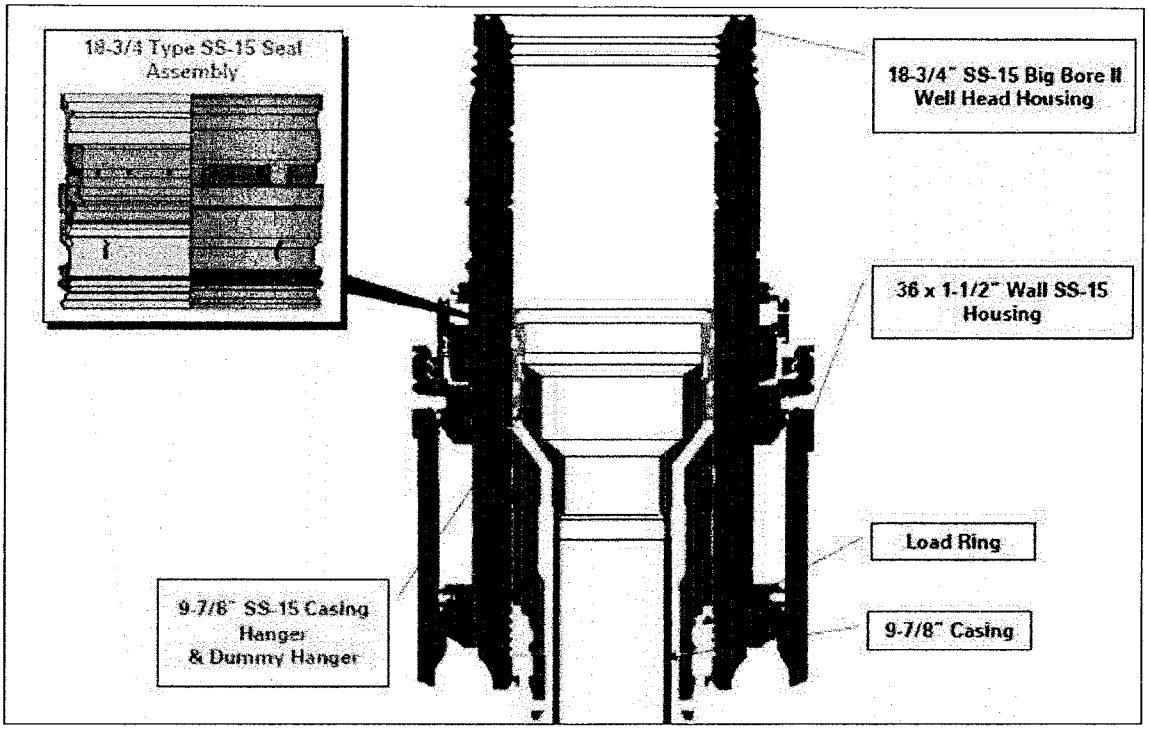


Figure 7: Wellhead Diagram

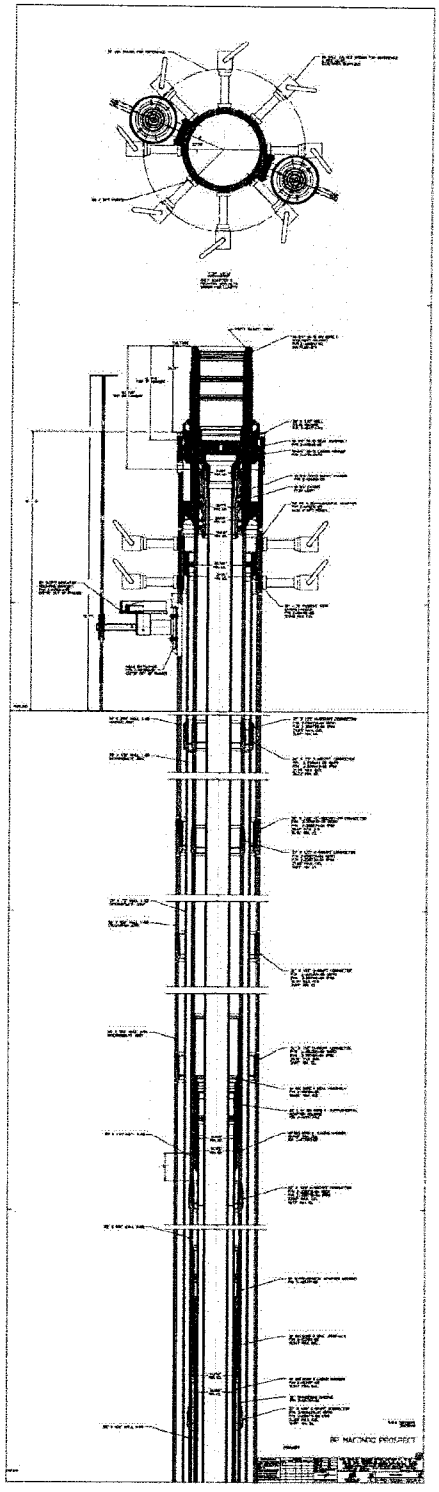


Figure 8: Wellhead Stack-Up Diagram

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8. Deepwater Horizon BOP Stack

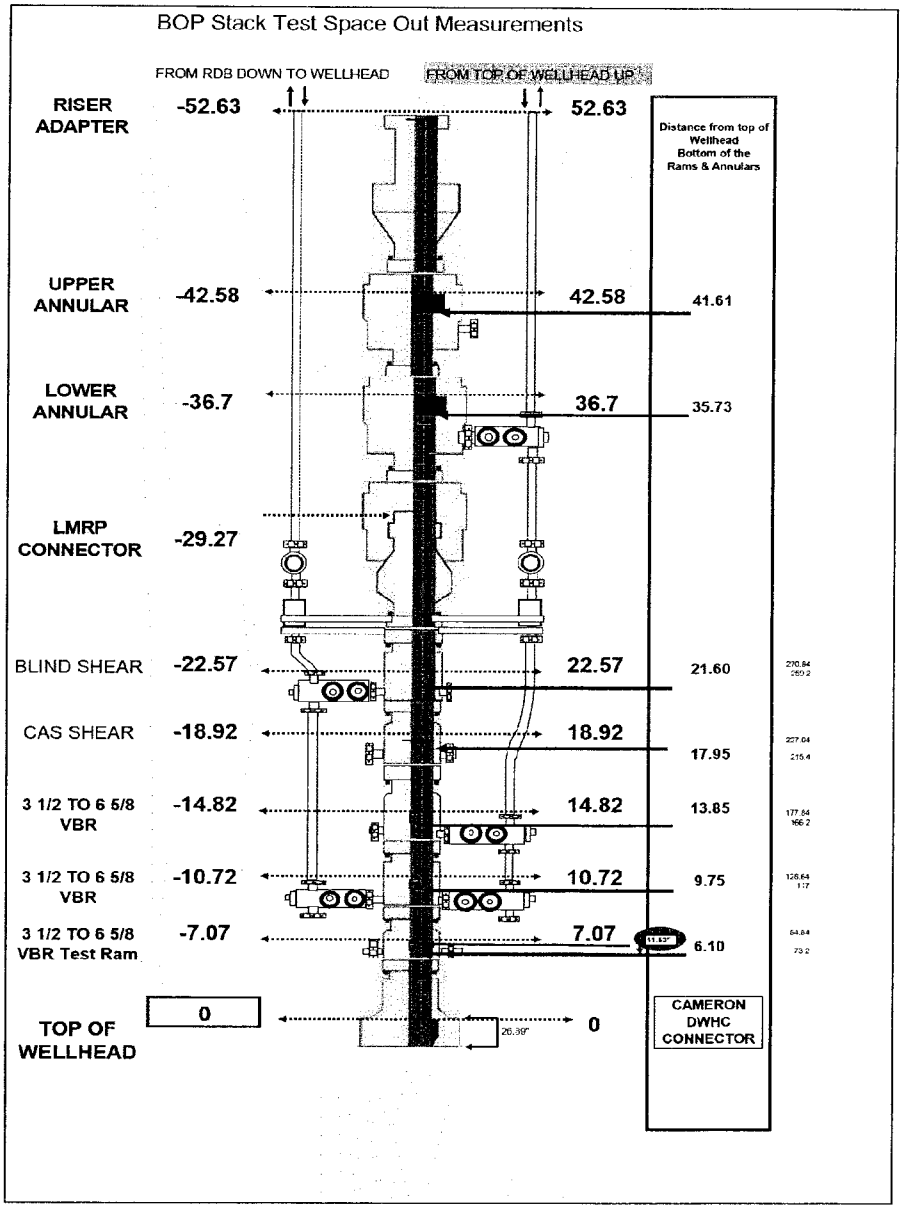

Figure 9: Deepwater Horizon BOP Stack

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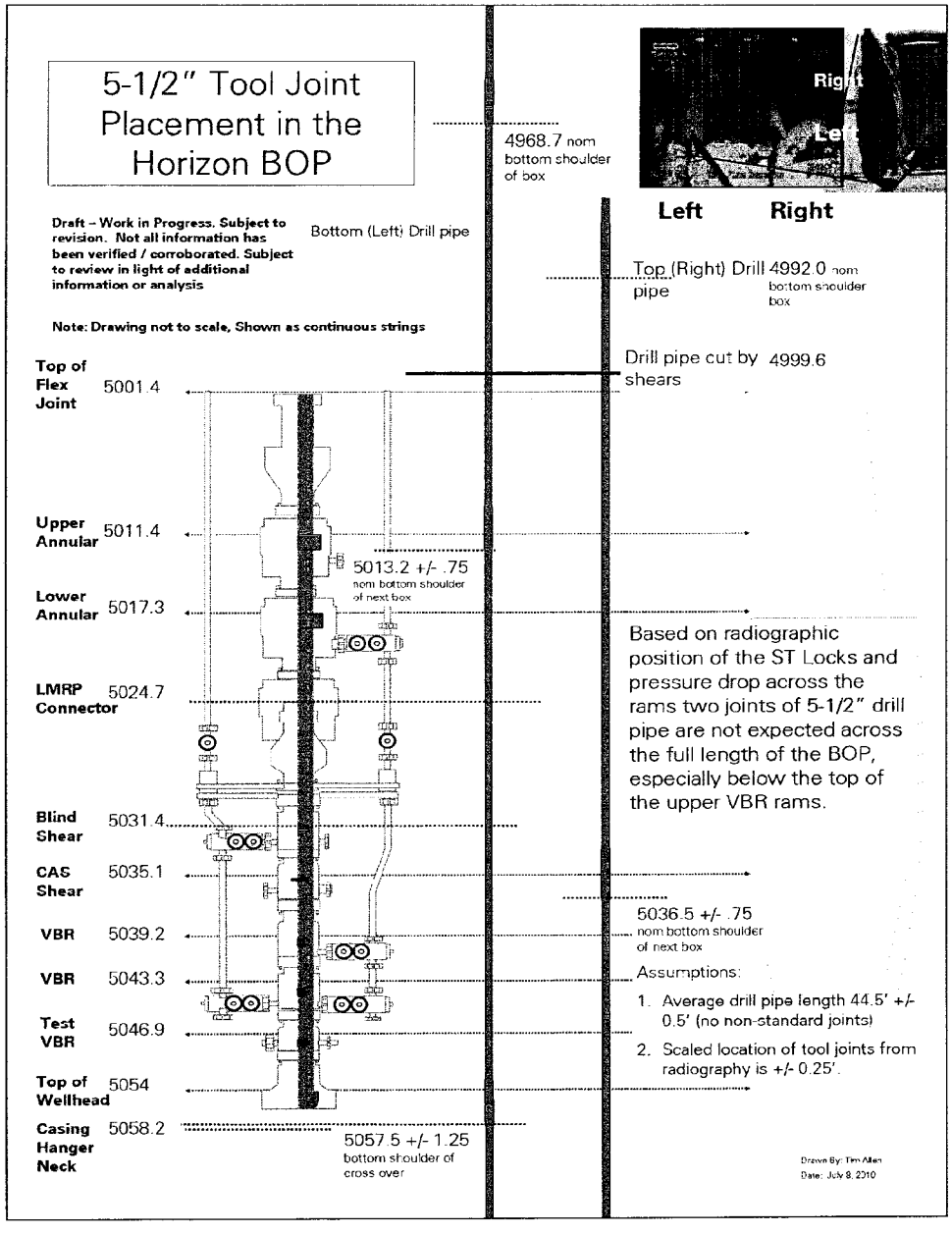

Figure 10: Tool Joint Placement

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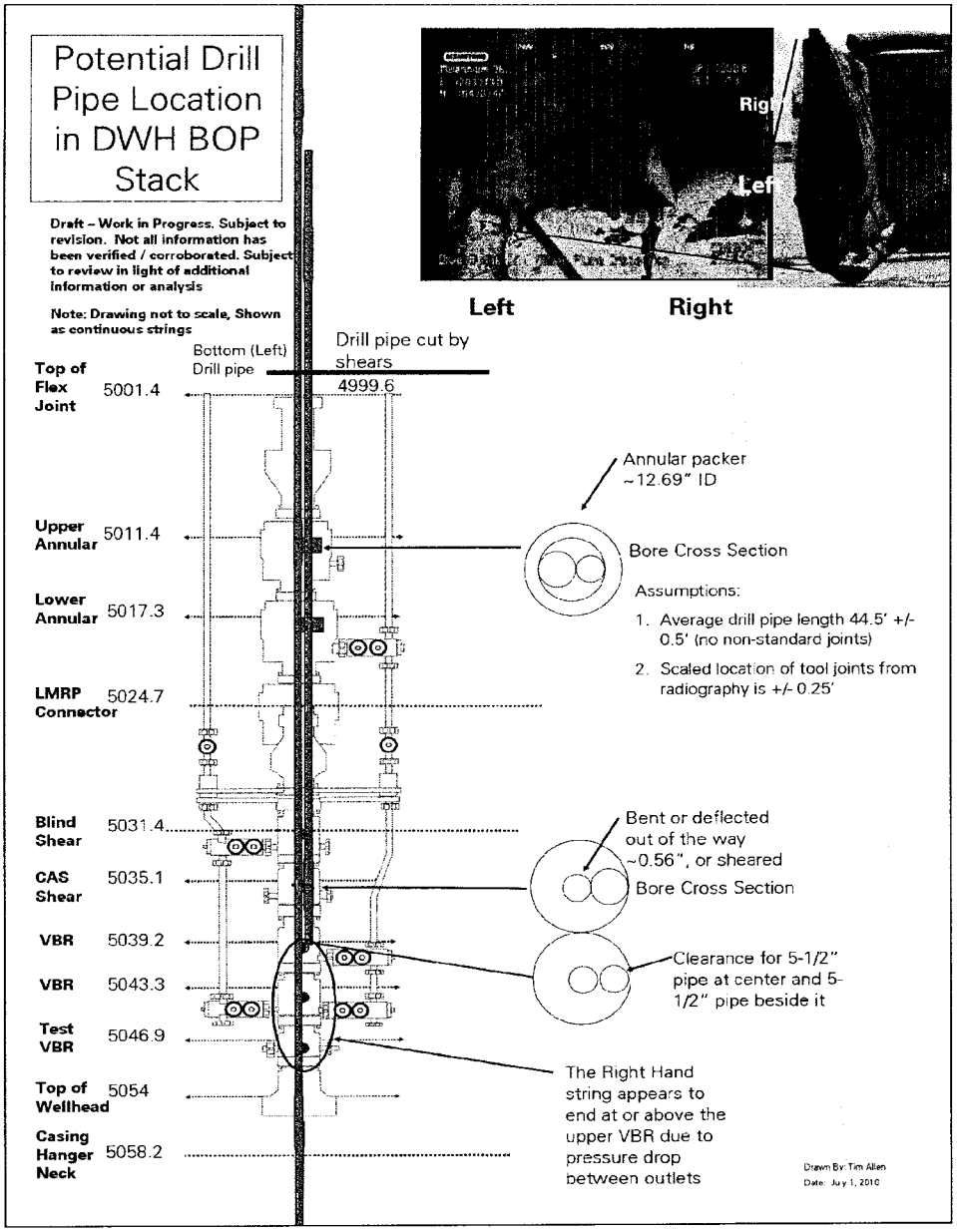

Figure 11: Potential Drill Pipe Location in Deepwater Horizon BOP Stack

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Current status of each BOP component as well as suspected status before any Remotely Operated Vehicle (ROV) intervention follows.

Component	Current Position	Original Position
Upper Annular	Closed – Took fluid and pressured up successfully	Open
Lower Annular	Open – Repeated System Leaks when attempting to close	Unknown
Blind Shear Rams	At least one side closed, other side either closed or jammed open – System did not take fluid but pressured up immediately. Saw fluid leaking from ST Lock tubing which will only see pressure if at least one side of the rams are closed. Confirmed fully closed with ROV radiography survey	At least one side Closed, other side either closed or jammed open.
Casing Shear Rams	Closed – Took fluid and pressured up successfully	Open
Upper Pipe Rams	No intervention has been made. Confirmed partially closed with ROV radiography survey	Unknown
Middle Pipe Rams	Closed – System did not take fluid but pressured up immediately; some indication of movement	Partially Closed
Test Pipe Rams	Closed – Took fluid and pressured up successfully	Open
Choke & Kill Line Valves	All confirmed both visually and physically to be in respective fail safe positions. Q4000 via Yellow POD now in control of Choke & Kill Line Valves	Same as current position
Choke & Kill Lines	Connected to Junk Shot Manifold via 150-ft Flexible Jumpers and Pressure Sensors are acoustically streaming data continuously	Connected to riser
Lower BOP Pressure Sensor	Pressure sensor now acoustically streaming data continuously	n/a

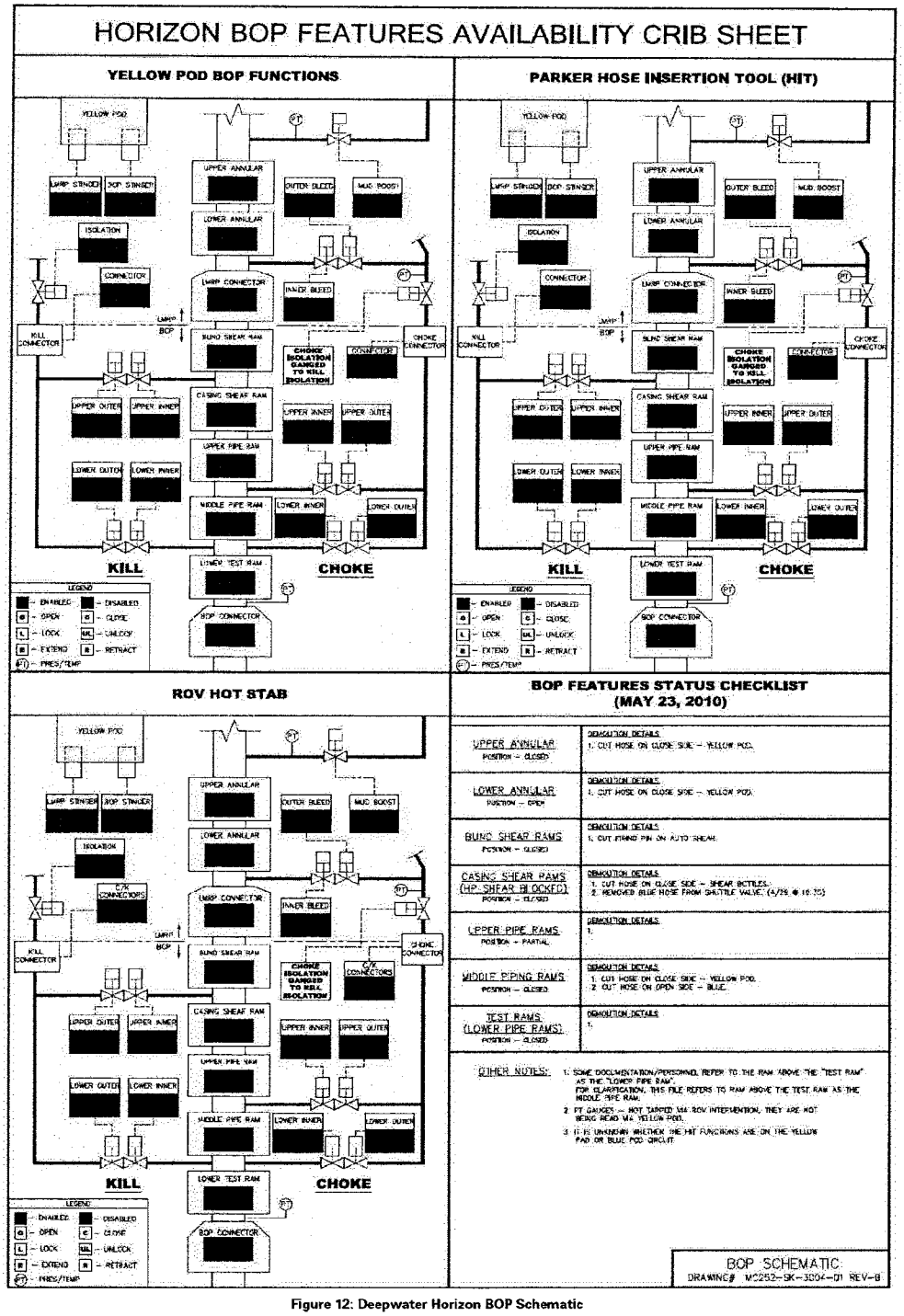

Figure 12: Deepwater Horizon BOP Schematic

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Custodian/Owner:	Bruce Rogers	**Issue Date:**	7/20/2010
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9. Deepwater Horizon BOP Stack Function Capability

REV1			Can Function With:			
Function	Stack Loc	Block Pressure?	Yellow Pod	Blue Pod	HIT	ROV Hot Stab
Upper Annular - Open	LMRP	y	y	n	n	n
Upper Annular - Close	LMRP	y	n	n	y (1.5")	n
Lower Annular - Open	LMRP	y	y	n	n	n
Lower Annular - Close	LMRP	n	n	n	n	n
Blind Shears - Open	BOP	y	y	n	n	n
Blind Shears - Close	BOP	y	y	n	n	y
Casing Shears - Open	BOP	y	y	n	n	n
Casing Shears - Close	BOP	y	y	n	y (1.0")	n
Upper Pipe Rams - Open	BOP	y	y	n	n	n
Upper Pipe Rams - Close	BOP	y	y	n	n	n
Lower Pipe Rams - Open	BOP	y	y	n	n	n
Lower Pipe Rams - Close	BOP	y	n	n	y (1.0")	n
Test Rams - Open	BOP	y	y	n	n	n
Test Rams - Close	BOP	y	y	n	n	y
LMRP Connector Lock	LMRP	y	y	n	n	n
LMRP Connector Unlock	LMRP	y	y	n	n	y
C/K Connectors - Lock	LMRP	y	y	n	n	n
C/K Connectors - Unlock	LMRP	y	y	n	n	y
Isolation Vavles - Open	LMRP	y	y	n	y (0.5")	n
Isolation Valves - Close	LMRP	y	y	n	y (0.5")	n
Pod Stinger - Extend	LMRP	y	y	n	n	y
Pod Stinger - Retract	LMRP	y	y	n	n	y

(Continued on next page)

REV1			Can Function With:			
Function	Stack Loc	Block Pressure?	Yellow Pod	Blue Pod	HIT	ROV Hot Stab
Inner Bleed - Open	LMRP	y	y	n	n	n
Inner Bleed - Close	LMRP	y	y	n	n	n
Outer Bleed - Open	LMRP	y	y	n	n	n
Outer Bleed - Close	LMRP	y	y	n	n	n
Mud Boost - Open	LMRP	y	y	n	n	n
Mud Boost - Close	LMRP	y	y	n	n	n
Lower Inner Choke - Open	BOP	y	y	n	n	n
Lower Inner Choke - Close	BOP	y	y	n	n	n
Lower Outer Choke - Open	BOP	y	y	n	n	n
Lower Outer Choke - Close	BOP	y	y	n	n	n
Upper Inner Choke - Open	BOP	y	y	n	n	n
Upper Inner Choke - Close	BOP	y	y	n	n	n
Upper Outer Choke - Open	BOP	y	y	n	n	n
Upper Outer Choke - Close	BOP	y	y	n	n	n
Lower Inner Kill - Open	BOP	y	y	n	n	n
Lower Inner Kill - Close	BOP	y	y	n	n	n
Lower Outer Kill - Open	BOP	y	y	n	n	n
Lower Outer Kill - Close	BOP	y	y	n	n	n
Upper Inner Kill - Open	BOP	y	y	n	n	n
Upper Inner Kill - Close	BOP	y	y	n	n	n
Upper Outer Kill - Open	BOP	y	y	n	n	n
Upper Outer Kill - Close	BOP	y	y	n	n	n
WH Connector - Lock	BOP	y	y	n	n	n
WH Connector - Unlock	BOP	y	y	n	n	y

Note 1: Pressure can be blocked in all POD-controlled functions by de-energizing solenoid
Note 2: All BOP valves can block in pressure until LMRP is removed and valves vent to atmosphere
Note 3: HIT = Hose Insertion Tool. Hose diameter in parenthesis

BP-HZN-2179MDL00412932

10. Deepwater Horizon BOP Stack – Intervention Activity

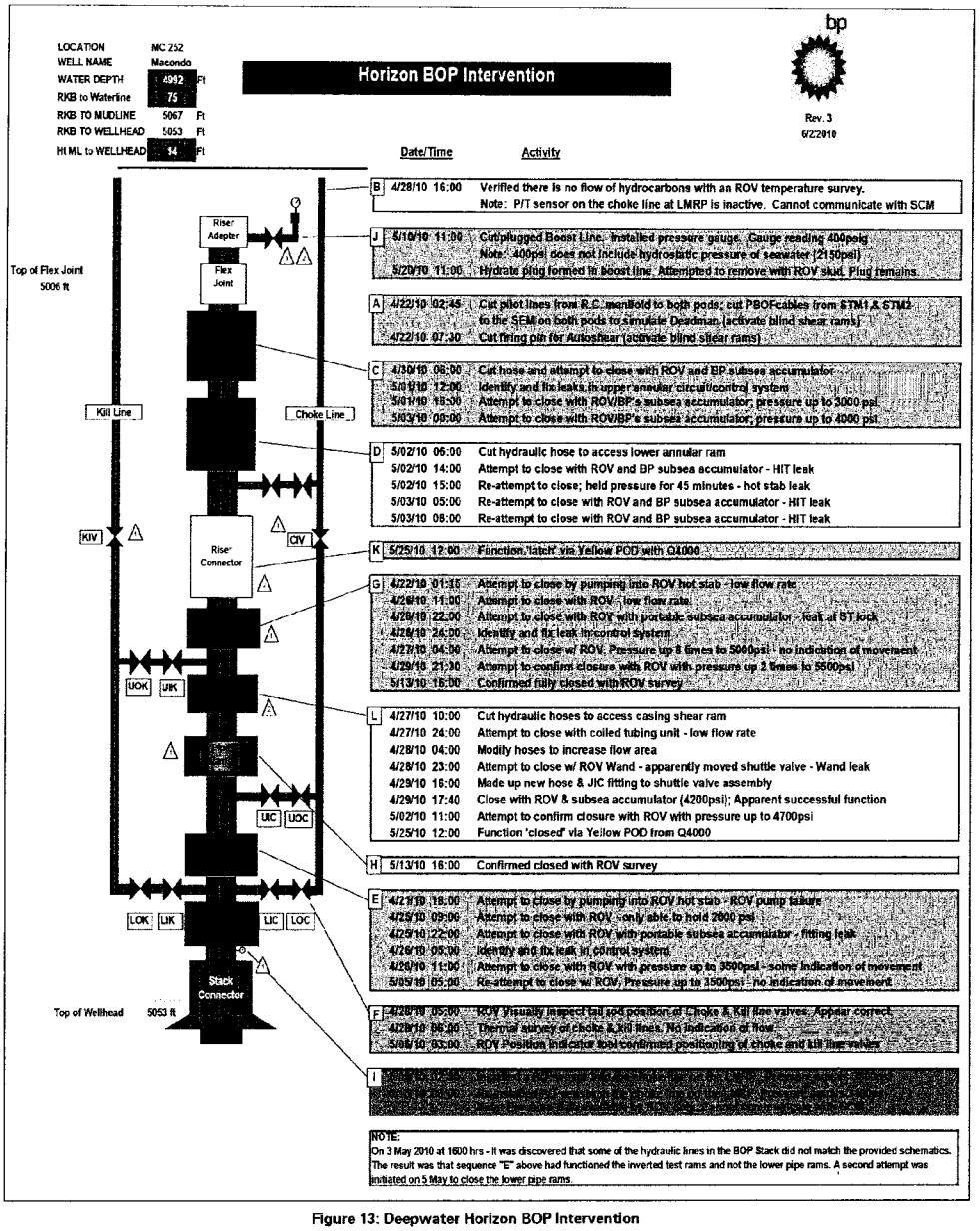

Figure 13: Deepwater Horizon BOP Intervention

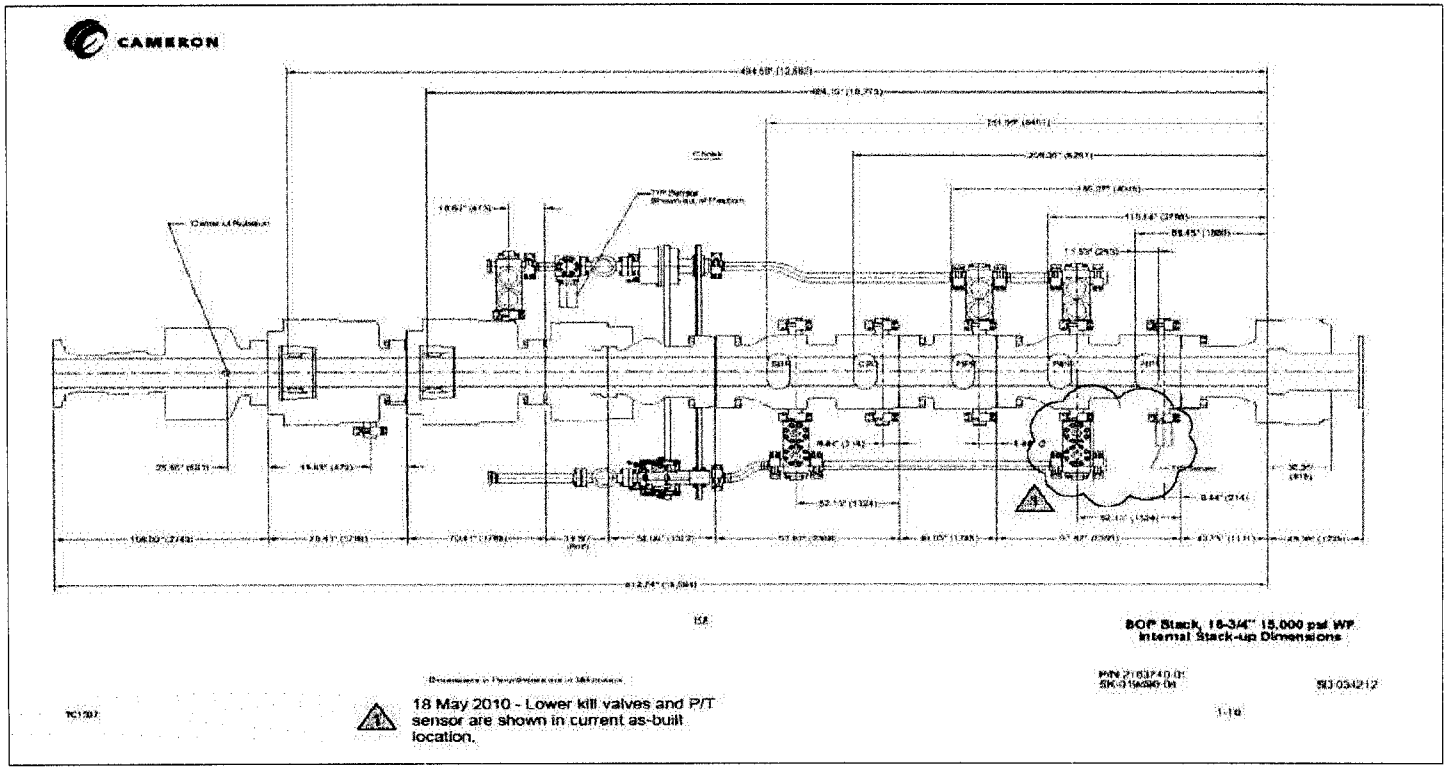

Figure 14: Deepwater Horizon BOP Stack - Stack-Up Dimensions

Title of Document:	Macondo MC252 #1 Permanent Abandonment Statement of Requirements	**Document Number:**	2200-T2-DC-SR-4005
Authority:	Pat O'Bryan	**Revision:**	0
Custodian/Owner:	Bruce Rogers	**Issue Date:**	7/20/2010
Retention Code:	ADM3000	**Next Review Date (if applicable):**	N/A
Security Classification:	BP Confidential	**Page:**	Page 23 of 42
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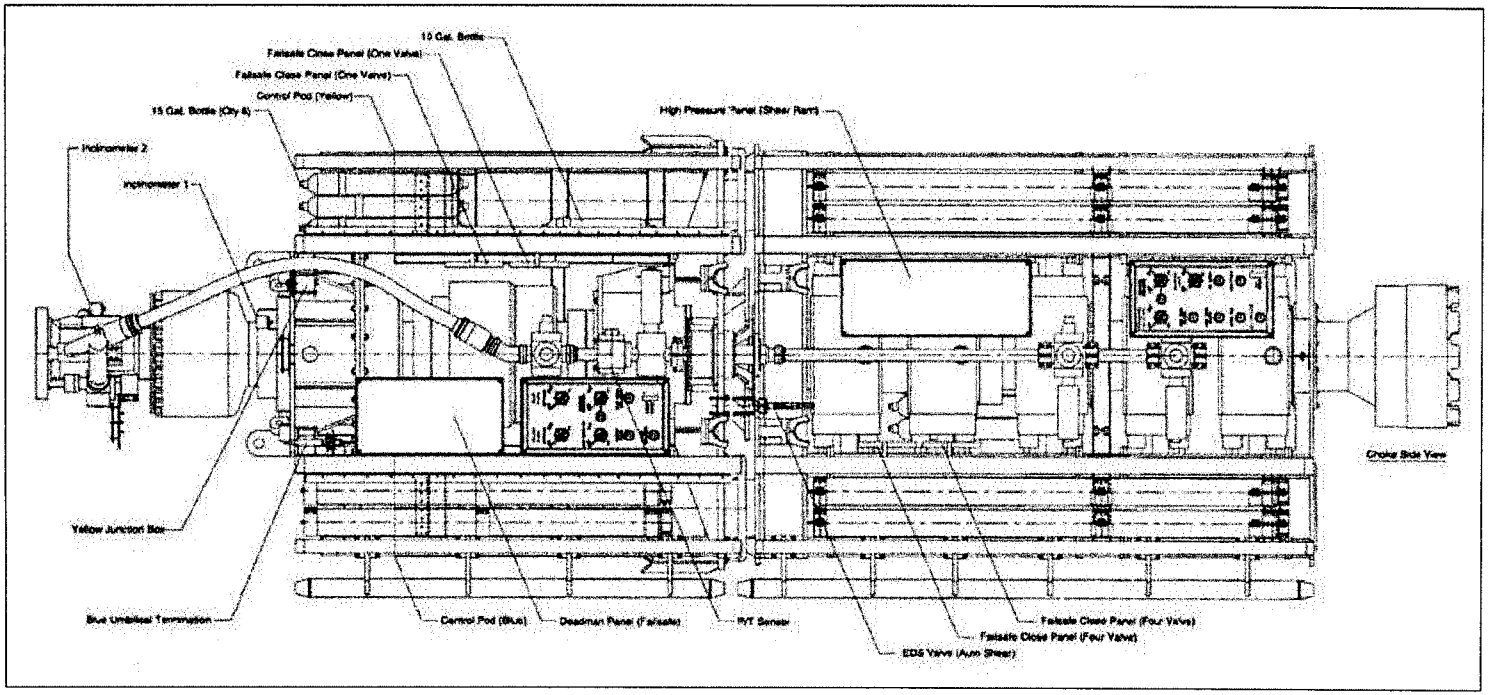

Figure 15: Deepwater Horizon BOP Stack - Choke Side View

Title of Document:	Macondo MC252 #1 Permanent Abandonment Statement of Requirements	**Document Number:**	2200-T2-DC-SR-4006
Authority:	Pat O'Bryan	**Revision:**	0
Custodian/Owner:	Bruce Rogers	**Issue Date:**	7/20/2010
Retention Code:	ADM3000	**Next Review Date (if applicable):**	N/A
Security Classification:	BP Conficential	**Page:**	Page 24 of 42
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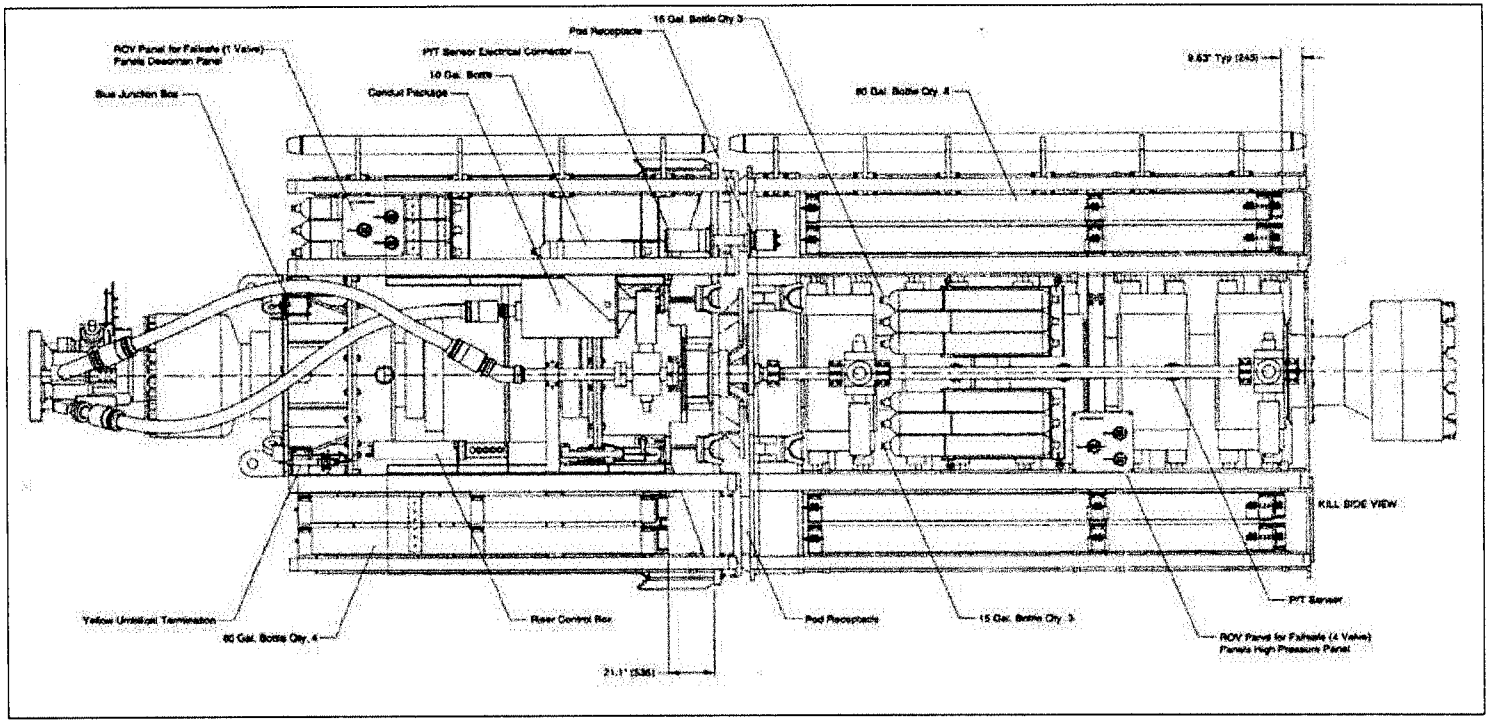

Figure 16: Deepwater Horizon BOP Stack - Kill Side View

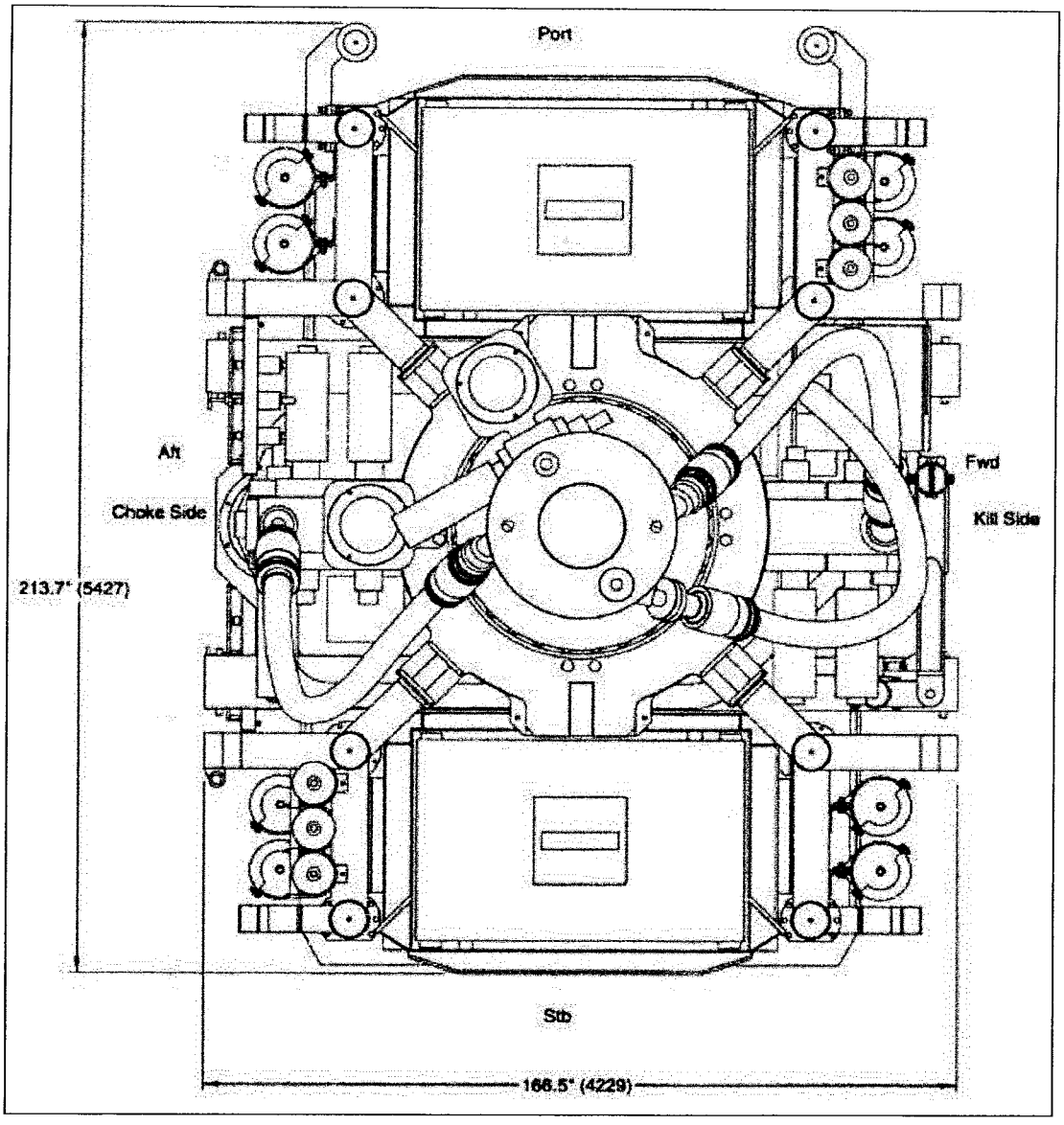

Figure 17: Deepwater Horizon BOP Stack - Top View

Title of Document:	Macondo MC252 #1 Permanent Abandonment Statement of Requirements	**Document Number:**	2200-T2-DO-SR-4005
Authority:	Pat O'Bryan	**Revision:**	0
Custodian/Owner:	Bruce Rogers	**Issue Date:**	7/20/2010
Retention Code:	ADM3000	**Next Review Date (if applicable):**	N/A
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11. Requirements of BP Segment Technical Authority – Well Control

Mark Mazzella, BP Segment Technical Authority – Well Control, has provided the following permanent abandonment requirements.

1. Need to develop acceptance criteria for a successful kill.
   a. Pressure monitoring over a minimum period of time 24 to 48 hours.
   b. Pressure bleed, followed by additional monitoring over a minimum period of time 24 to 48 hours.
   c. Possible multiple bleeds, followed by monitoring.
   d. Establish a maximum acceptable pressure build rate.
   e. Confirm pressure build rate is not increasing after each subsequent bleed.
   f. All pressure bleeds to be done at seabed.
2. Once successful kill criteria are met, it would be acceptable to remove the "Capping Stack" or the Lower Marine Riser Package (LMRP).
3. Once pressure tested, a mechanical or cement plug is required to be set inside the wellbore after successful kill criteria is met to make it acceptable to remove the Horizon BOP stack.
4. If 9 7/8-in production casing is not hanging in the HP housing in the proper profile, mitigation operations will be required before pulling the Horizon BOP stack.

12. Requirements of BP Segment Technical Authority – Zonal Isolation

Daryl Kellingray, BP Segment Technical Authority – Zonal Isolation, has requested that the MC252 #1 Permanent Abandonment Basis of Design (BoD) specify reasons for not perforating and squeezing cement in annuli with exposure to hydrocarbon-bearing zones.

13. Requirements of BP Segment Technical Authority – Instruments and Protective Systems

Kevin Szafron, Segment Technical Authority – Instruments and Protective Systems, has provided the following permanent abandonment requirements.

MC 252 #1 - BOP Recovery Requirements per the BP BOP Investigation Team

The following are the BOP recovery requirements per the BP BOP Investigation Team. BOP recovery will be by others, using procedures by others.

1. Conduct ROV video flybys from all angles of the BOP prior to any initiation of recovery. Flyby should be slow enough so that any video is not blurry.

2. Displace mud out of the BOP.

3. Put a camera inside the BOP bore and video as much of the BOP bore as possible. Ensure that the position of any drill pipe within the bore is captured, the annular/ram elements position and detail are captured, and that any debris is videoed. If there are multiple paths into the bore because of drill pipe, put the camera down each path. Within any given path, rotate the video 360 degree to capture all BOP bore/pipe details over the entire length of the path. Because some of the BOP rams/annulars are closed or partially closed, it is expected that the first entry into the BOP bore will be only to the first closed element. It will be necessary to open the element and potentially remove any drill pipe or debris, to gain access to the next section. As annulars and rams are opened and more of the BOP bore is accessible, progressively video the position of any drill pipe within the bore, the annular/ram elements position and detail, and any debris. Any annulars and rams that are opened should be videoed in the "as found" and opened positions.

4. Take an impression of the end of any drill pipe or drill pipe pieces that are found in the BOP bore, prior to connecting to or moving the drill pipe.

5. Any pieces of drill pipe found in the BOP bore shall be secured and recovered, noting where each was in the BOP.

6. Once all BOP rams and annulars are open, circulate with seawater to clear the wellbore of any mud. Video the entire length of the wellbore, 360 degrees.

7. Recover any other debris or drill pipe that is recoverable, from the wellbore.

8. Preference is to pull the stack in one piece unless recovery logistics require an LMRP disconnect. Recommend recovery of the BOP with a heavy lift vessel to allow recovery in one piece.

9. Double verify that the LMRP connector is locked prior to initiating retrieval.

10. Dump the accumulator hydraulic fluid prior to recovery. Do NOT dump the accumulator precharge (nitrogen).

11. When recovering the BOP to surface, follow the BOP up to surface with an ROV (to video capture any debris falling from the BOP bore).

12. Ensure the stack remains upright after recovery and during any transportation.

Note: These requirements exclude any inspection and testing requirements for the BOP once it reaches surface; this is covered under a separate document.

14. BP Incident Investigation and Litigation Team Requirements

The BP Incident Investigation and Litigation Teams have provided the following requirements for permanent abandonment. Initial point of contact for the Incident Investigation Team is Jim Lucari, Managing Attorney [redacted] Initial point of contact for the Litigation Team is Mike Homeyer, Managing Attorney – Litigation ([redacted].

1.2 Incident Investigation Team

The Incident Investigation Team is to be consulted about the development of the permanent abandonment procedure. The Incident Investigation Team should be informed of the various operations and techniques required to effect the recovery so they have an opportunity to understand what has to be done to recover the BOP stack and how that may impact its condition. The Incident Investigation Team may have specific goals or requirements that need to be accommodated, if at all possible.

1.3 Litigation Team

The Litigation Team to be consulted about the development of the permanent abandonment procedure, as well. The Litigation Team will provide direction regarding issues such as evidence preservation, chain of custody procedures and the personnel necessary to observe the recovery of the BOP stack. It is recommended to utilize the *Riser Kink – Lifting and Post-Recovery Survey Procedure* (Document No. 2200-T2-DO-PR-4119-0) as a prototype for future chain of custody procedures.

1.4 Deepwater Horizon BOP Stack Recovery Requirements

If the wellbore is capable of being re-entered: Run a Cement Bond Log and Casing Inspection Log (Vertilog) over entire casing interval possible.

If the wellhead can be recovered: cut and pull 9 7/8-in hanger and seal assembly (~20 ft below hanger); and cut and pull 18 3/4-in wellhead housing (including seal assembly seal area).

A video record of the inside of the Deepwater Horizon BOP stack is desired, if wellbore conditions permit.

The following is not a must have, but should be evaluated, especially if the flow is determined to be up the casing after the dynamic kill: core float collar; recover auto-fill flapper valves, samples of cement, and wiper plugs (if still there); core down through shoe and into rat hole to obtain cement samples.

Expect to have representatives from Transocean, Cameron, U.S. Coast Guard/Marine Board of Investigation, BP and potentially some additional technical experts onboard the vessel to witness the recovery and any post-recovery inspection. Before getting too far into development of a procedure, the Incident Investigation and Litigation Teams should be

consulted specifically about what, if any, inspection or testing gets done on vessel, before the BOP stack is brought to shore. A few factors, including the timing of the recovery and whether or not any testing is done offshore will influence whether personnel, other than those described above, will need to be present.

Incident Investigation and Litigation Teams will be requested to furnish special protocol, objectives, witnessing requirements, documentation requirements, chain of custody, etc. as early as possible for incorporation into plans and procedures.

Incident Investigation and Litigation Teams should provide input on where and how the BOP is delivered to shore. In part, this will be dictated by ownership and various court orders. Consideration may also be given to facilitating detailed inspection and testing once delivered to shore.

15. BP Drilling and Well Operations Practice Requirements

Permanent abandonment requirements from "Section 26 Zonal Isolation Requirements during Drilling Operations and Well Abandonment" of the *BP Drilling and Operations Practice* (GP10-00) are provided below. Permanent abandonment requirements from the BP Zonal Isolation Engineering Technical Practice (ETP GP10-60) match those provided below.

Section 26.3 Permanent Abandonment

The decision to permanently abandon or temporarily suspend a well shall be approved by the relevant Performance Unit Leader or their delegate and by the regulatory authorities.

Permanent abandonment shall be designed to protect aquifers, ensure isolation between distinct permeable zones and to prevent flow from them to surface or seabed.

- For hydrocarbon bearing permeable zones two permanent barriers are required from surface or seabed

For water bearing permeable zones one permanent barrier required from surface or seabed

Acceptable Barriers

26.3.1 Cement shall be the material acceptable for permanent abandonment.

Selection and Location of Permanent Barriers

26.3.2 Good cement verified to be 30 m TVD (100ft TVD) above a distinct permeable zone shall be considered an acceptable permanent barrier.

To constitute a permanent barrier the annular cement around the plug setting depth should meet annular isolation requirements positioned to provide full lateral coverage of the well. Cement plugs shall be set at a point where formation strength is capable of controlling the pressure from the formations it is isolating.

Barrier Verification

26.3.3 Barriers can be verified by weight testing and/or pressure testing (positive and / or inflow). All primary barriers should be weight tested and pressure tested except:

- In OH where only weight testing is permitted (OH cement plugs cannot be accepted as the only barrier)

- When the plug has been set on a permanent mechanical barrier (when pressure testing is only required).

Weight testing should be up to at least 15K lb (6.8 Tonne). Pressure testing shall be 0.1psi/ft (2.26 KPa/m) above the leak off test (LOT) (or predicted fracture gradient at the shoe) or 500 psi (3.45 MPa) whichever is the greater. The pressure test is acceptable where pressure drop is <10% over 15 mins.

16. Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) Requirements

BOEMRE requirements from the *Code of Federal Regulations Part 250 – Oil and Gas and Sulfur Operations in the Outer Continental Shelf* apply.

§250.1710 **When must I permanently plug all wells on a lease?** You must permanently plug all wells on a lease within 1 year after the lease terminates.

§250.1711 **When will MMS order me to permanently plug a well?** MMS will order you to permanently plug a well if that well:

a. Poses a hazard to safety or the environment; or

b. Is not useful for lease operations and is not capable of oil, gas, or sulfur production in paying quantities.

§250.1712 **What information must I submit before I permanently plug a well or zone?** Before you permanently plug a well or zone, you must submit form MMS-124, Application for Permit to Modify, to the appropriate District Manager and receive approval. A request for approval must contain the following information:

a. The reason you are plugging the well (or zone), for completions with production amounts specified by the Regional Supervisor, along with substantiating information demonstrating its lack of capacity for further profitable production of oil, gas or sulfur;

b. Recent well test data and pressure data, if available;

c. Maximum possible surface pressure and how it was determined;

d. Type and weight of well-control fluid you will use;

e. A description of the work; and

f. A current and proposed well schematic and description that includes:

(1) Well depth;

(2) All perforated intervals that have not been plugged;

(3) Casing and tubing depths and details;

(4) Subsurface equipment;

(5) Estimated tops of cement (and the basis of the estimate) in each casing annulus;

(6) Plug locations;

(7) Plug types;

(8) Plug lengths;

(9) Properties of mud and cement to be used;

(10) Perforating and casing cutting plans;

(11) Plug testing plans;

(12) Casing removal (including information on explosives, if used);

(13) Proposed casing removal depth; and

(14) Your plans to protect archaeological and sensitive biological features, including anchor damage during plugging operations, a brief assessment of the environmental impacts of the plugging operations, and the procedures and mitigation measures you will take to minimize such impacts.

§250.1713 **Must I notify MMS before I begin well plugging operations?** You must notify the appropriate District Manager at least 48 hours before beginning operations to permanently plug a well.

§250.1714 **What must I accomplish with well plugs?** You must notify ensure that all well plugs:

a. Provide downhole isolation of hydrocarbon and sulfur zones; and

b. Protect freshwater aquifers; and

c. Prevent migration of formation fluids within the wellbore or to the seafloor.

§250.1715 **How must I permanently plug a well?**

a. You must permanently plug wells according to the table in this section. The District Manager may require additional well plugs as necessary.

PERMANENT WELL PLUGGING REQUIREMENTS

If you have-	Then you must use-
(1) Zones in open hole	Cement plug(s) set from at least 100 feet below the bottom to 100 feet above the top of oil, gas and fresh-water zones to isolate fluids in the strata.
(2) Open hole below casing	(i) A cement plug, set by displacement method, at least 100 feet above and below deepest casing shoe; (ii) A cement retainer with effective back-pressure control set 50 to 100 feet above the casing shoe, and a cement plug that extends at least 100 feet below the casing shoe and at least 50 feet above the retainer; or (iii) A bridge plug set 50 feet to 100 feet above the shoe with 50 feet of cement on top of the bridge plug, for expected or known lost circulation conditions.
(3) A perforated zone that is currently open and not previously squeezed or isolated	(i) A method to squeeze cement to all perforations; (ii) A cement plug set by the displacement method, at least 100 feet above to 100 feet below the perforated interval, or down to a casing plug, whichever is less; or (iii) If the perforated zones are isolated from the hole below, you may use any of the plugs specified in paragraphs (a) (3) (iii) (A) through (E) of this section instead of those specified in paragraphs (a) (3) (i) and (a) (3) (ii) of this section.

	(A) A cement retainer with effective back-pressure control set 50 to100 feet above the top of the perforated interval, and a cement plug that extends at least 100 feet below the bottom of the perforated interval with at least 50 feet of cement above the retainer; (B) A bridge plug set 50 to 100 feet above the top of the perforated interval and at least 50 feet of cement on top of the bridge plug; (C) A cement plug at least 200 feet in length, set by the displacement method, with the bottom of the plug no more than 100 feet above the perforated interval; (D) A through-tubing basket plug set no more than 100 feet above the perforated interval with at least 50 feet of cement on top of the basket plug; or (E) A tubing plug set no more than 100 feet above the perforated interval topped with a sufficient volume of cement so as to extend at least 100 feet above the uppermost packer in the wellbore and at least 300 feet of cement in the casing annulus immediately above the packer.
(4) A casing stub where the stub end is within the casing	(i) A cement plug at least 100 feet above and below the stub end; (ii) A cement retainer or bridge plug set at least 50 to 100 feet above the stub end with at least 50 feet of cement on top of the retainer or bridge plug; or (iii) A cement plug at least 200 feet long with the bottom of the plug set no more than 100 feet above the stub end.
(5) A casing stub where the stub end is below the casing	A plug as specified in paragraph (a) (1) or (a) (2) of this section, as applicable.
(6) An annular space that communicates with open hole and extends to the mud line.	A cement plug at least 200 feet long set in the annular space. For a well completed above the ocean surface, you must pressure test each casing annulus to verify isolation.
(7) A subsea well with unsealed annulus	A cutter to sever the casing, and you must set a stub plug as specified in paragraphs (a) (4) and (a) (5) of this section.
(8) A well with casing	A cement surface plug at least 150 feet long set in the smallest casing that extends to the mud line with the top of the plug no more than 150 feet below the mud line.
(9) Fluid left in the hole	A fluid in the intervals between the plugs that is dense enough to exert a hydrostatic pressure that is greater than the formation pressures in the intervals.
(10) Permafrost areas	(i) A fluid to be left in the hole that has a freezing point below the temperature of the permafrost, and a treatment to inhibit corrosion; and (ii) Cement plugs designed to set before freezing and have a low heat of hydration.

b. You must test the first plug below the surface plug and all plugs in lost circulation areas that are in open hole. The plug must pass one of the following tests to verify plug integrity:

(1) A pipe weight of at least 15,000 pounds on the plug; or
(2) A pump pressure of at least 1,000 pounds per square inch. Ensure that the pressure does not drop more than 10 percent in 15 minutes. The District Manager may require you to test other plug(s).

§250.1716 **To what depth must I remove wellheads and casings?**

a. Unless the District Manager approves an alternate depth under paragraph (b) of this section, you must remove all wellheads and casings to at least 15 feet below the mud line.

b. The District Manager may approve an alternate removal depth if:

(1) The wellhead or casing would not become an obstruction to other users of the seafloor or area, and geotechnical and other information you provide demonstrate that erosional processes capable of exposing the obstructions are not expected; or
(2) You determine, and MMS concurs, that you must use divers, and the seafloor sediment stability poses safety concerns; or
(3) The water depth is greater than 800 meters (2,624 feet).

§250.1717 **After I permanently plug a well, what information must I submit?**

Within 30 days after you permanently plug a well, you must submit form MMS-124, Application for Permit to Modify (subsequent report), to the appropriate District Manager, and include the following information:

a. Information included in §250.1712 with a final well schematic;

b. Description of the plugging work;

c. Nature and quantities of material used in the plugs; and

d. If you cut and pulled any casing string, the following information:

(1) A description of the methods used (including information on explosives, if used);
(2) Size and amount of casing removed; and
(3) Casing removal depth.

BOEMRE Notice to Lessee (NTL) 2010-N05, effective 6/8/10, specified the following additional permanent abandonment requirements.

General Certification of Compliance with Existing Regulations and National Safety Alert

Recommendation 1 of section III.A of the Safety Measures Report directed the Department of the Interior, in conjunction with the Department of Homeland Security, to verify operator compliance with existing regulations and the joint Minerals Management Service (MMS) – United States Coast Guard (USCG) Safety Alert (SA), Deepwater Horizon Explosion and Fire Resulting in Multiple Fatalities and Release of Oil, issued on April 30, 2010. This NTL informs lessees and operators that all operators are required to submit a general certification that they are knowledgeable of all operating regulations at 30 CFR 250 – Oil and Gas and Sulphur Operations in the OCS – and that they are conducting their operations in compliance with those regulations. Operators must review their operations to ensure that they are performed in a safe and workmanlike manner as required by §250.107(a)(1). In addition, each operator must certify that they have conducted the following specific reviews of their operations:

1. Examine all well control system equipment (both surface and subsea) currently being used to ensure that it has been properly maintained and is capable of shutting in the well during emergency operations. Ensure that Blowout Preventers (BOPs) are able to perform their designated functions. Ensure that the ROV hot-stabs are function-tested and are capable of actuating the BOP.
2. Review all rig drilling, casing, cementing, well abandonment (temporary and permanent), completion, and workover practices to ensure that well control is not compromised at any point while the BOP is installed on the wellhead.
3. Review all emergency shutdown and dynamic positioning procedures that interface with emergency well control operations.
4. Ensure that all personnel involved in well operations are properly trained and capable of performing their tasks under both normal drilling and emergency well control operations.

Review of BOEMRE Notices to Lessees (NTLs) 2010-G04 effective 6/1/10, 2010-N04 effective 5/30/10, 2010-N05 effective 6/8/10 and 2010-N06 effective 6/18/10, did not yield additional permanent abandonment requirements.

BOEMRE's David Troquet has requested to recover production casing as deep as possible for cementing purposes.

17. United States Coast Guard Requirements

The United States Coast Guard's primary requirement for the permanent abandonment of MC252 #1 is to minimize invasion of equipment to be recovered as evidence. Evidence that may be recovered includes: (1) the Deepwater Horizon's BOP stack; (2) 5 1/2-in and 3 1/2-in drill pipe (fish); (3) wellhead equipment; (4) 16-in intermediate casing and upper rupture disks; and (5) 7-in x 9 7/8-in production casing.

18. U.S. Department of Energy Requirements

Requirements from the U.S. Department of Energy are forthcoming and will be addressed in the Macondo MC252 #1 Permanent Abandonment Basis of Design (BoD).

19. Requirements for Permanent Abandonment Basis of Design

A summary of requirements to be addressed in the Macondo MC252 #1 Permanent Abandonment Basis of Design (BoD) follows.

1. Plans to recover 5 1/2-in and 3 1/2-in drill pipe (fish) from the Deepwater Horizon's Blowout Preventer (BOP) stack and production casing which minimize risk of fish falling downhole. These plans to include preserving and transporting the fish as instructed by the BP Incident Investigation and Litigation Teams.
2. Plans to recover the "capping stack" from the top of the Deepwater Horizon's BOP stack. These plans will ensure the "capping stack" is readily available if the MC252 #1 well starts flowing during BOP stack recovery operations.
3. Plans to recover the Deepwater Horizon's BOP stack from the MC252 #1 wellhead as well as preserving and transporting the BOP stack as instructed by BP Incident Investigation and Litigation Teams. Prior to recovery of the Deepwater Horizon's BOP stack, Transocean and Cameron to verify current operational status of the stack components.
4. Plans to isolate hydrocarbon-bearing zones with cement and mechanical plugs, considering indefinite life of abandonment. These plans to address each possible type of flow (annular, cased hole or both) that may be encountered. Run cement evaluation logs as necessary to confirm location of cement.
5. As instructed by BP Incident Investigation and Litigation Teams, plans to recover, preserve and transport the following: (1) Dril-Quip BigBore II subsea wellhead; (2) 9 7/8-in production casing hanger and seal assembly; (3) casing above the mudline attached to the wellhead; (4) 16-in intermediate casing and upper rupture disks; and (5) 7-in X 9 7/8-in production casing.
6. Recommendation of rigs/vessels to recover above equipment, install new BOP equipment, re-enter and permanently abandon MC252 #1.
7. Plans to record digital video, pressure test and report required information.
8. Reasons for not fulfilling requirements in previous sections of this Statement of Requirements (SoR).