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CAMERON

Date: April 2, 2012

To: David Law, McMoRan

From: Jay Jurena, Director of Engineering Cameron Drilling Systems

Copy: Laura Gardner, Project Manager Cameron Drilling Systems

Subject: 13-5/8" 25K EVO BOP Shear Calculation at 25,000 psi MASP

The purpose of this memo is to provide McMoRan with minimum calculated operating shear pressure at MASP for shearing 3-1/2" tubing made of C22 HS material Sy = 160ksi tubing using a Cameron 13-5/8" 25K EVO BOP with DVS Shear Blind Rams.

The following calculation is based on actual shear data collected during API 16A qualification testing using the mentioned tubing and BOP. The actual shear pressures required to shear the tubing at ambient pressure were 1369 psi, 1366 psi and 1371 psi.

Take the highest shear pressure of **1371 psi** and add it to the closing pressure necessary to close the rams at 25,000 psi. The result is the minimum calculated operating pressure necessary to shear and seal at MASP.

The Closing Ratio is 9.16:1 (ref. Operating & Maintenance manual page 44). Closing pressure required to only close rams at MASP is 25,000/9.16 = **2730 psi.**

Add these two pressures to get the minimum closing pressure necessary to shear the tubing at MASP.
<u>1371 psi + 2730 psi = **4,101 psi minimum**</u>

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ENGINEERING REPORT
Cameron Drilling and Production Systems

SUBJECT 13-5/8" 25k BOP
DVS Shear / Seal Test

DATE Jan 15, 2012

Objective: The objective of the test was to determine the ability of the 13-5/8" 25k BOP DVS Rams to successfully shear customer supplied tubing and then pass both low and high pressure tests. This procedure was based on the requirements set forth in API 16A, 3rd Edition.

Conclusion: The DVS Rams were able to successfully shear the tubing three (3) times and passed both low and high pressure tests after the shear.

Date / Site / Witnesses: This test was performed on September 26, 2011 at the Cameron Technology Development Center in Houston, TX. Witnesses to the test included Damon Sedita of GL Noble Denton in addition to Steve Shimonek, Scott Carpenter and Mike Graham of Cameron.

Material / Description: The DVS Rams used for this test were P/N 2345790-01-01 Rev 01, S/N 112147052 for the upper and P/N 2345791-01-01 Rev 01, S/N 112147053 for the lower. The body used was a 13-5/8" 25k Single BOP, P/N 2345315-01

Procedure: The test procedure used for this test was X-336370-09, Rev. 02. Although API 16A, 3rd Edition does not cover 25k rated equipment, the test procedure was based on the requirements set forth in the API document for lower rated equipment. A synopsis of procedure X-336370-09 is shown below:

(1) After the BOP is assembled with the DVS rams, open and close the BOP two times using 1,500 psi hydraulic pressure.

(2) After the second "open" cycle, once again close the BOP with 1,500 psi.

(3) Apply 1,500 psi lock pressure.

(4) After the BOP is locked, vent all pressures to zero.

(5) Apply a minimum of 200 psi (300 psi maximum) wellbore pressure and hold for a minimum of 10 minutes. The allowable pressure decline rate is 6 psi / minute.

(6) Increase the wellbore pressure to 25,000 psi and hold for a minimum of 10 minutes. The allowable pressure decline rate is 30 psi / minute.

(7) Reduce the wellbore pressure to zero.

(8) Apply 1,500 psi close pressure and then apply 1,500 psi unlock pressure.

(9) Bleed the unlock pressure and then the close pressure to zero.

(10) Apply 1,500 psi open pressure.

(11) Once the rams are fully open, bleed all pressure to zero.

SUBJECT 13-5/8" 25k BOP
DVS Shear / Seal Test

DATE Jan 15, 2012

(12) Suspend a section of 3-1/2" C22 HS (160ksi yield strength) tubing into the BOP (with a minimum of 24" of pipe above the rams.)

(13) Apply 3,000 psi closing pressure to the rams to shear the tubing. Monitor and record the amount of pressure required to shear the tubing.

(14) Once the tubing has been sheared, maintain 3,000 psi Close pressure.

(15) Lock the BOP using 1,500 psi.

(16) Reduce the closing pressure and then the lock pressure to zero.

(17) Apply a minimum of 200 psi (300 psi maximum) wellbore pressure and hold for a minimum of 10 minutes. The allowable pressure decline rate is 6 psi / minute.

(18) Increase the wellbore pressure to 25,000 psi and hold for a minimum of 10 minutes. The allowable pressure decline rate is 30 psi / minute.

(19) Reduce the wellbore pressure to zero.

(20) Apply 1,500 psi close pressure and then apply 1,500 psi unlock pressure.

(21) Bleed the unlock pressure and then the close pressure to zero.

(22) Apply 1,500 psi open pressure.

(23) Once the rams are fully open, bleed all pressure to zero.

(24) Remove the lower section of the sheared tubing from the BOP.

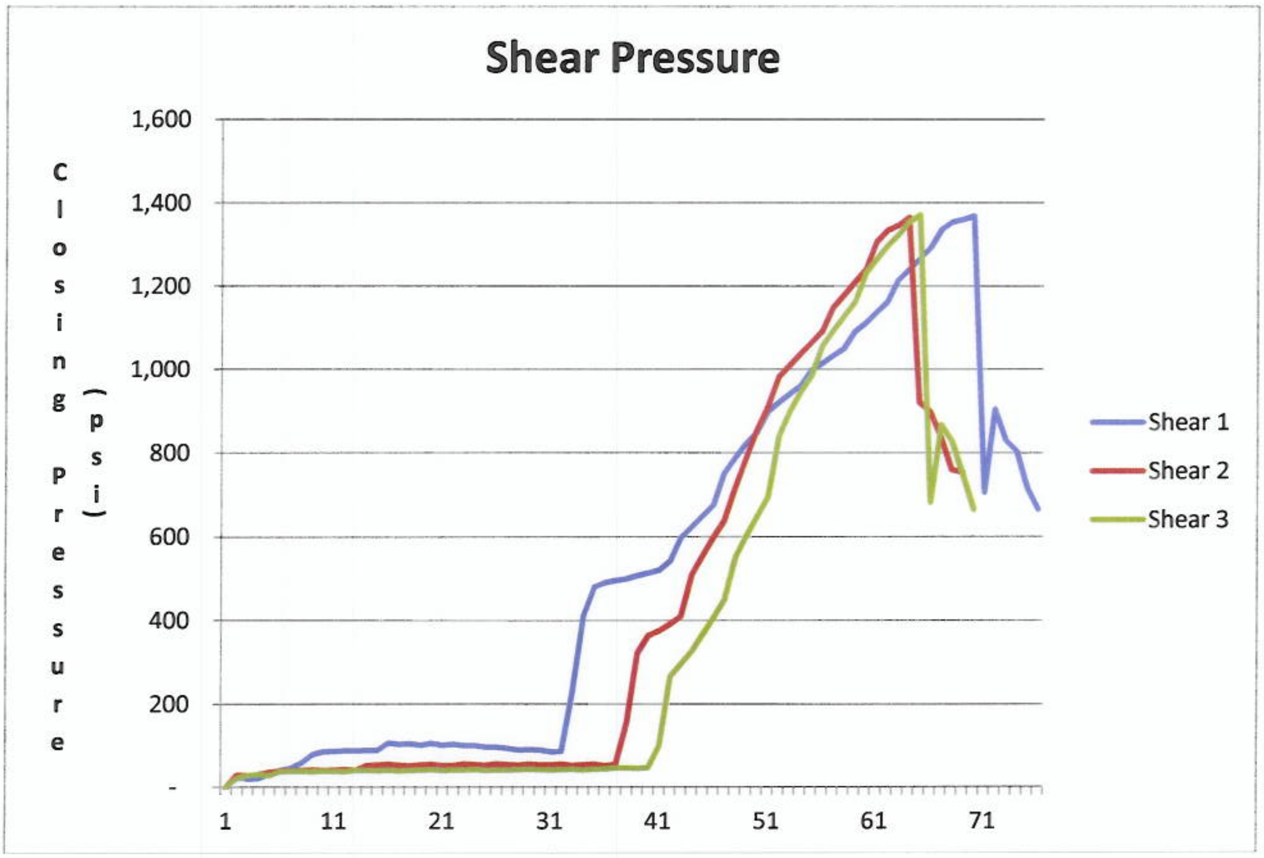
(25) Repeat the above steps to shear two (2) additional sections of tubing.

(26) After testing, remove the DVS rams and inspect and document any wear or damage.

Results: Three successful shear tests were performed. Listed below are the close or shear pressures required to shear the tubing:
1st Shear – 1,369 psi
2nd Shear – 1,366 psi
3rd Shear – 1,371 psi.
The average pressure required to shear the tubing was 1,368 psi and the maximum was 1,371 psi. After each shear, the BOP successfully passed both a low pressure (approx. 200 psi) and a high pressure (25,000 psi) pressure test. No visible leakage was detected during any pressure hold periods.

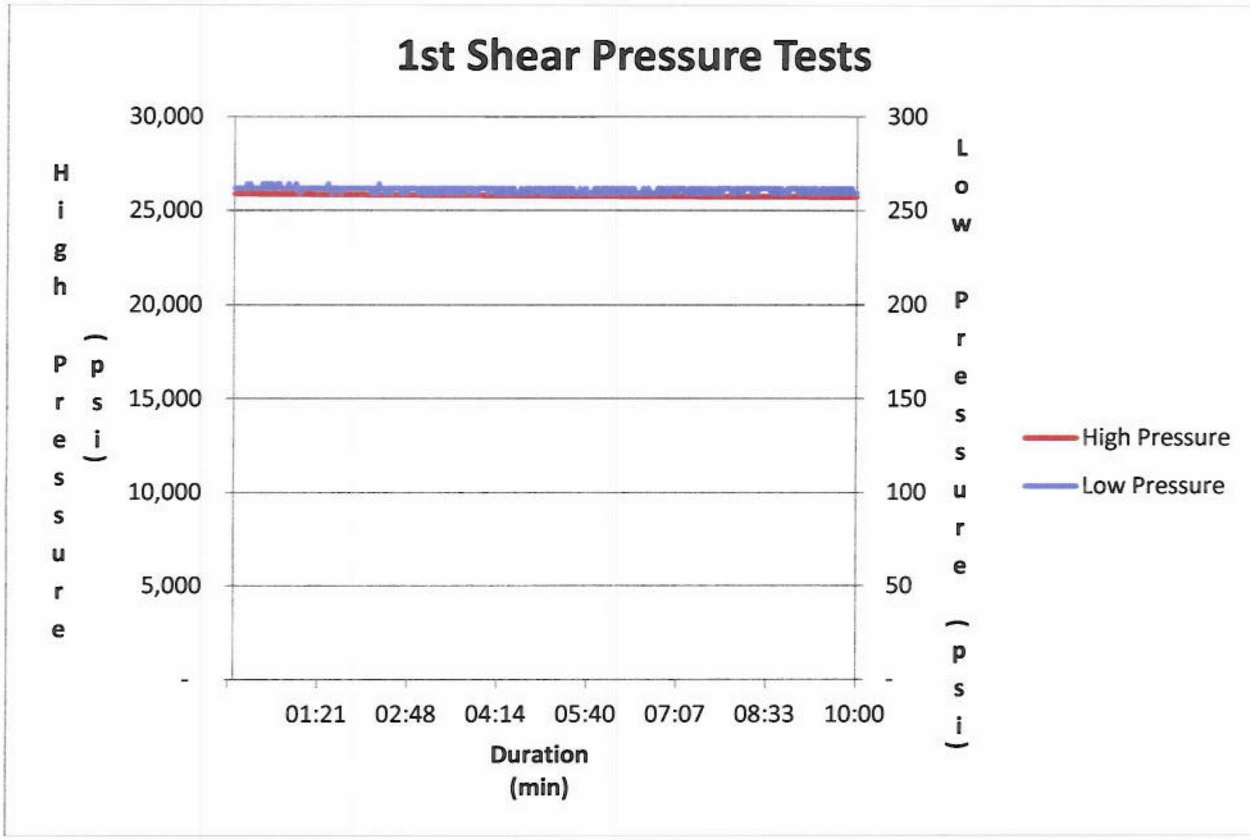
Graphs of the shear pressures and pressure tests are shown in Appendix 1; photographs are shown in Appendix 2; inspection results are given in Appendix 3.

Appendix 1
Pressure Charts



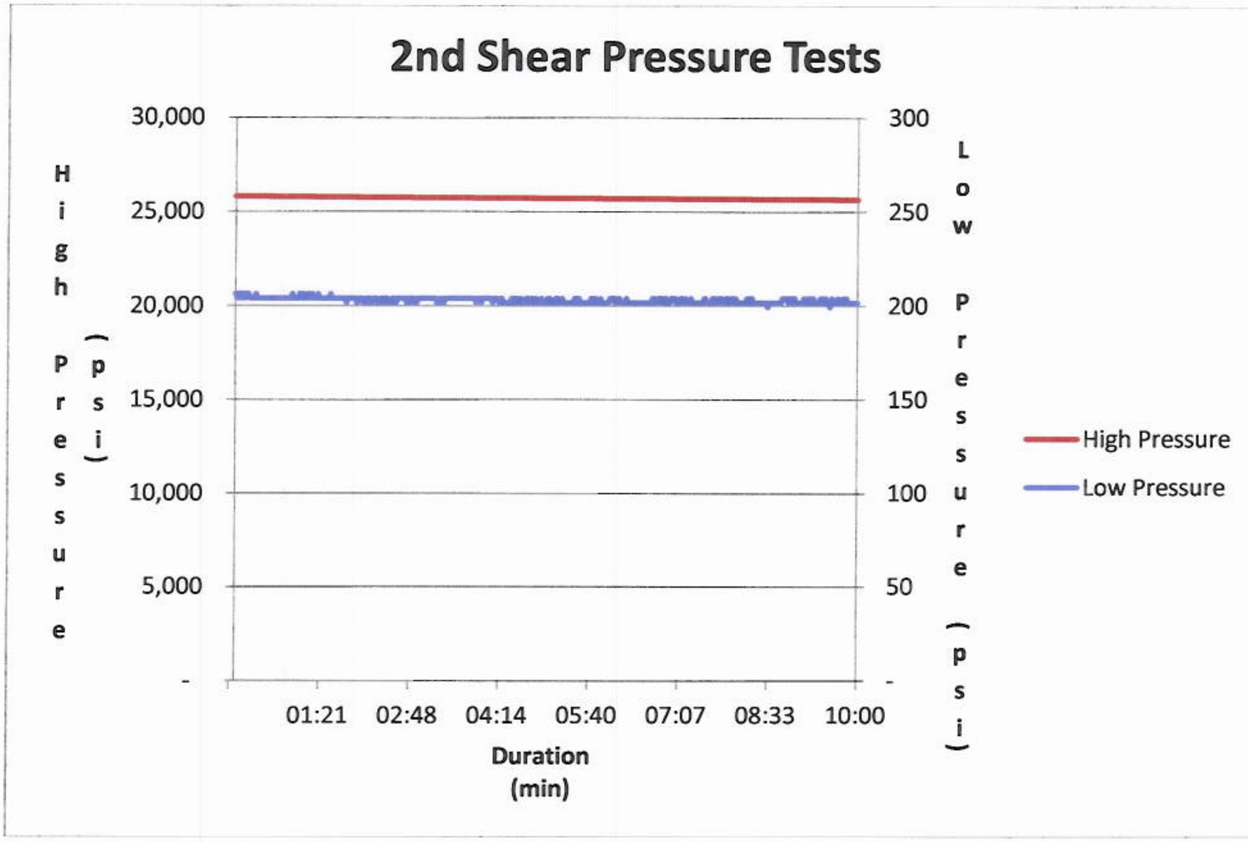
SUBJECT 13-5/8" 25k BOP
DVS Shear / Seal Test

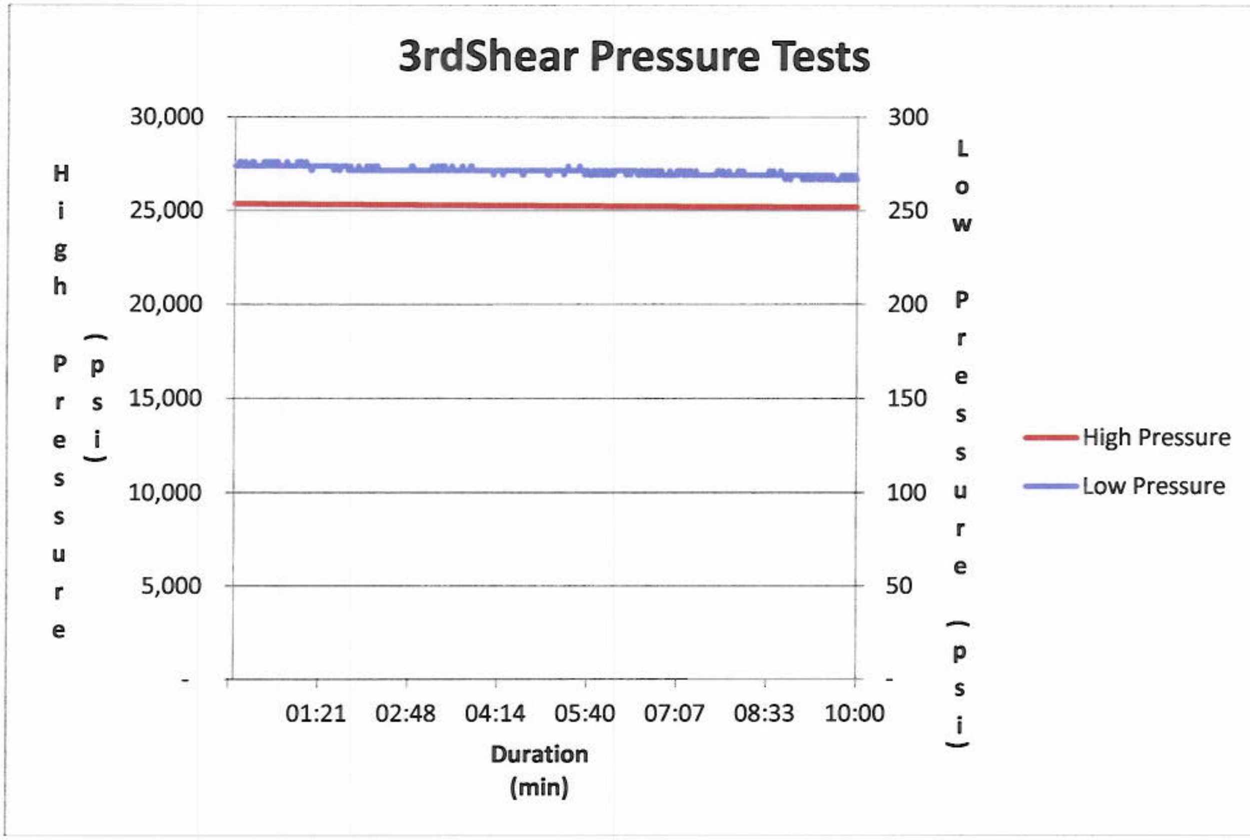
DATE Jan 15, 2012



SUBJECT 13-5/8" 25k BOP
DVS Shear / Seal Test

DATE Jan 15, 2012




3rdShear Pressure Tests
High Pressure (psi)
30,000
25,000
20,000
15,000
10,000
5,000
-
Low Pressure (psi)
300
250
200
150
100
50
-
01:21
02:48
04:14
05:40
07:07
08:33
10:00
Duration (min)
High Pressure
Low Pressure

Appendix 2
Photographs

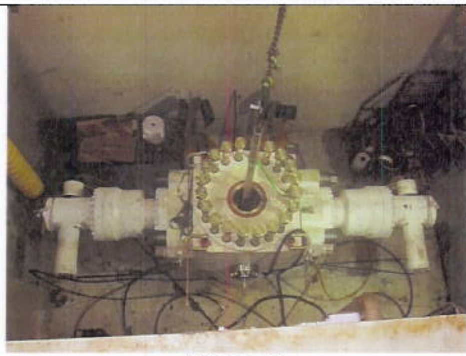


Figure 1
Test Setup

Figure 2
Customer Supplied Tubing

Figure 3
Upper DVS – Before test

Figure 4
Upper DVS – Before test

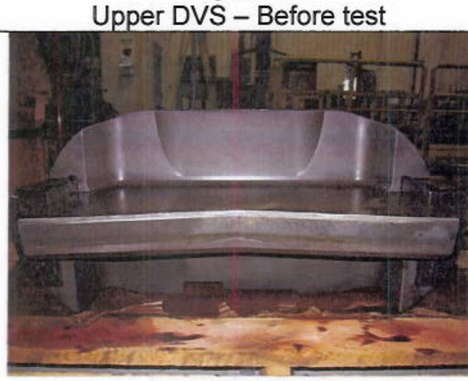


Figure 5
Lower DVS – Before test

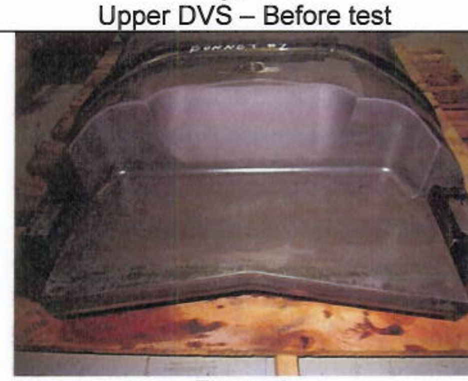


Figure 6
Lower DVS – Before test

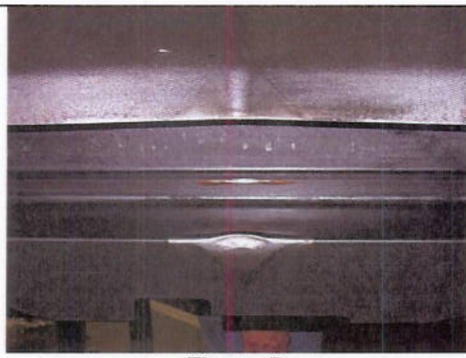


Figure 7
Upper DVS – After test

Figure 8
Upper DVS – After test

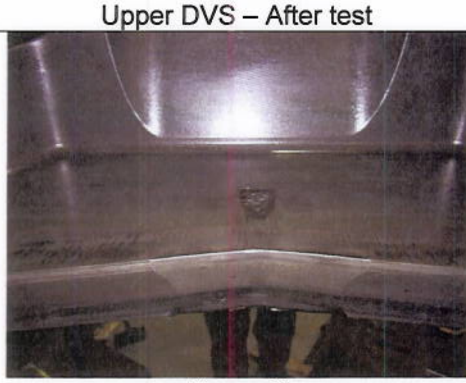


Figure 9
Lower DVS – After test

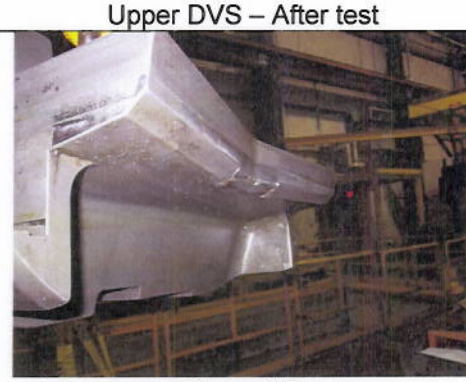


Figure 10
Lower DVS – After test

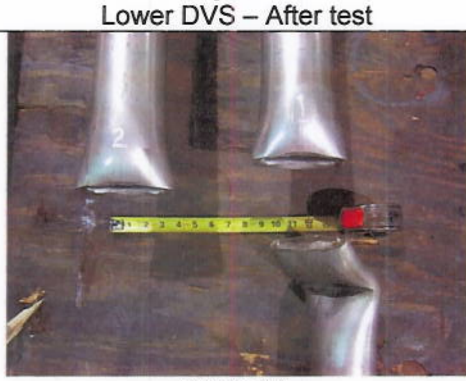


Figure 11
Sheared Tubing

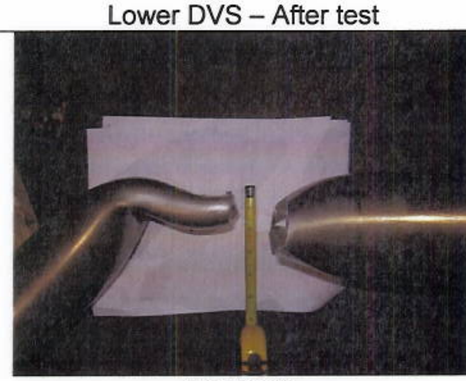


Figure 12

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ENGINEERING REPORT
Cameron Drilling and Production Systems

SUBJECT 13-5/8" 25k BOP
DVS Shear / Seal Test

DATE Jan 15, 2012

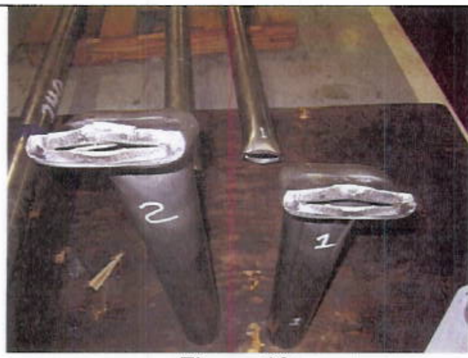

Figure 13

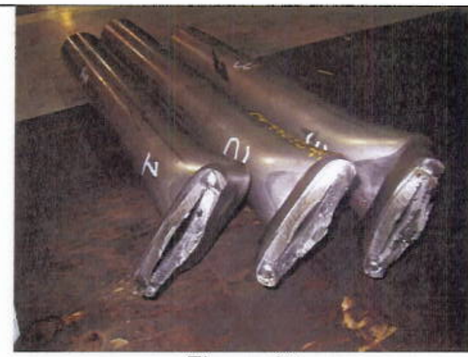
Figure 14

Figure 15

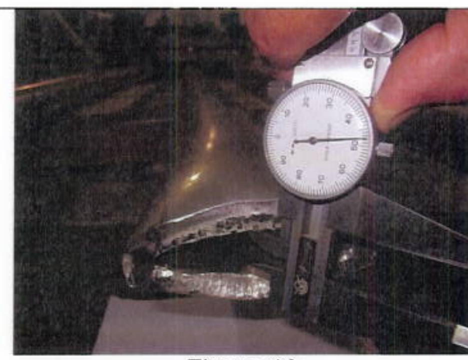
Figure 16

Figure 17

Figure 18

Appendix 3
Inspection Information

SUBJECT 13-5/8" 25k BOP
DVS Shear / Seal Test

DATE Jan 15, 2012

P.O. BOX 924469
HOUSTON, TX 77292
PHONE: (713) 290-8490

P&B TESTING INC

6645 W. TIDWELL
HOUSTON,TX 77092
FAX: (713) 290-8627

Report Date: 09/29/11
Report No: 200376.2
Rev.: A
Cust Acct: CAM2279

To: CAM SUBSEA SYS- RESEARCH CENTER
CAMERON
ATTN: ACCOUNTS PAYABLE
PO BOX 3101
HOUSTON, TX 77253-3101

PO#: 4503081641 ITEM 00003
Material: UPPER DVS RAM P/N 2345790-01
ID/Heat: S/N 112147052 QTY 1
Job Info:

Magnetic Particle Examination Report

Specification: ASTM E-709
Acceptance Criteria: API 6A PSL-3
Equipment: MAGNE-TECH 3509B-10 S/N 103008 CAL DUE DATE: 03/26/12
Area Inspected: 100% ACCESSIBLE SURFACES, INCLUDING WETTED & SEALING SURFACES.
Inspection Method: DC, CONTINUOUS, WET FLUORESCENT

Technique

Direct:				Amps:	
Coils:	X	Turns:	5	Amps:	2600
Central Conductor:		Diameter:		Amps:	
Yoke:		Yoke Spacing:		Lifting Force:	
Bath Concentration:	.25	Particle Type:	MAGNAFLUX 14A	Suspension:	ISOPAR M
U.V. Light:	1,000 + DLM S/N 203211A - DUE DATE: 02/23/12				

Comments/ Test Notes

PARTS DEMAGED TO LESS THAN 3 GAUSS.

COILS PERFORMED IN TWO DIRECTIONS.
REJECT DUE TO LINEAR INDICATIONS GREATER THAN 3/16" AS MARKED.

No. Pcs. Tested: 1 No. Pcs. Accepted: 0 No. Pcs. Recordable: 0 No. Pcs. Rejected: 1

Operator: Dustin Vice SNT Level: II

Signed: Dustin Vice
DUSTIN VICE

GLND 65 09/29/11

CAMERON

ENGINEERING REPORT
Cameron Drilling and Production Systems

SUBJECT 13-5/8" 25k BOP
DVS Shear / Seal Test

DATE Jan 15, 2012

P.O. BOX 924469
HOUSTON, TX 77292
PHONE: (713) 290-8490

P&B TESTING INC

6645 W. TIDWELL
HOUSTON,TX 77092
FAX: (713) 290-8627

Report Date: 09/29/11
Report No: 200376.3
Rev.: A
Cust Acct: CAM2279

To: CAM SUBSEA SYS- RESEARCH CENTER
CAMERON
ATTN: ACCOUNTS PAYABLE
PO BOX 3101
HOUSTON, TX 77253-3101

PO#: 4503081641 ITEM 00004
Material: LOWER DVS RAM P/N 2345791-01
ID/Heat S/N 112147053 QTY 1
Job Info:

Magnetic Particle Examination Report

Specification: ASTM E-709
Acceptance Criteria: API 6A PSL-3
Equipment: MAGNE-TECH 3509B-10 S/N 103008 CAL DUE DATE: 03/26/12
Area Inspected: 100% ACCESSIBLE SURFACES, INCLUDING WETTED & SEALING SURFACES
Inspection Method: DC, CONTINUOUS, WET FLUORESCENT

Technique

Direct				Amps:	
Coils:	X	Turns:	5	Amps:	2600
Central Conductor:		Diameter:		Amps:	
Yoke:		Yoke Spacing:		Lifting Force:	
Bath Concentration:	.26	Particle Type:	MAGNAFLUX 14A	Suspension:	ISOPAR M
U.V. Light:	1,000 + DLM S/N 203211A - DUE DATE: 02/23/12				

Comments/ Test Notes

NO RELEVANT INDICATIONS OBSERVED
PARTS DEMAGED TO LESS THAN 3 GAUSS.

COILS PERFORMED IN TWO DIRECTIONS.
REJECT DUE TO LINEAR INDICATIONS GREATER THAN 3/16" AS MARKED.

No. Pcs. Tested: 1 No. Pcs. Accepted: 0 No. Pcs. Recordable: 0 No. Pcs. Rejected: 1

Operator: Dustin Vice SNT Level: II

Signed: [signature]
DUSTIN VICE

GLND 55 09/29/11

13-5/8" 25K BOP
DVS SHEAR / SEAL TEST

THIS TEST IS PART OF THE OVERALL PERFORMANCE VERIFICATION TEST PROCEDURE FOR 13-5/8" 25K EVO BLOWOUT PREVENTER (BOP) WITH 5,000 PSI RATED BONNETS, IN ACCORDANCE WITH API 16A 3rd Ed/ISO 13533.

THE OVERALL PERFORMANCE VERIFICATION TEST IS DOCUMENTED IN X-336370-01.

Test Pressures and Hold Periods:

The test pressures are given as minimums and should not be exceeded by more than 5% of the given minimum pressure. A pressure test will be considered satisfactory, provided that the pressure decline rate is within the manufacturer's specified range of 0.2% per minute. The pressure decline rate can be caused by changes in temperature, setting of elastomer seals, or compression of trapped air in the equipment being tested. Hold periods are given as minimums per API 16A, 3rd Ed.

NOTE: A chart recorder or data acquisition system **shall** be used on all pressure tests.

SAFETY NOTE: Redundant pressure monitoring devices shall be used on all pressure lines. For example, a pressure gauge should be used on all lines that are monitored by pressure transducers.

Definitions:

Leakage -- Visible passage of the pressurized fluid from the inside to the outside of the pressure containment volume of the equipment being tested.

Stabilized -- When the initial pressure decline rate decreases to within the manufacturer's specified range of 0.2% per minute, not to go below minimum pressure.

Acceptance Criteria:

NO VISIBLE LEAKAGE IS ALLOWED DURING ANY PRESSURE TESTS.

Procedure:

(1) Fully assemble the 13-5/8" 25k BOP with DVS rams in place.

(2) Make up the 13-5/8" test flange (P/N 599516-09-23) to the bottom of the BOP. Ensure the pressure plug (P/N 599516-09-24) is installed in the bottom flange.

(3) Pressure transducers capable of recording 5,000 psi shall be used on both the BOP open and close circuits. A pressure transducer capable of reading 25,000 psi shall be used on the wellbore pressure circuit.

(4) Open and close the BOP three times using 1,500 psi.

(5) Ensure that the BOP is in the closed position and lock the BOP using 1,500 psi.

NOTE: Ensure that the lock functions properly by allowing enough time for the back pressure in the unlock system to fully bleed to zero.

(6) Reduce the closing pressure to zero psi.

(7) Reduce the lock pressure to zero psi.

(8) Apply a minimum of 200 psi to 300 psi wellbore test pressure.

(9) After wellbore pressure has stabilized (at a minimum of 200 psi), hold for a minimum of ten minutes. The allowable pressure decline rate for this test is 6 psi per minute.

(10) Increase the wellbore pressure to 25,000 psi.

(11) After wellbore pressure has stabilized (at a minimum of 25,000 psi), hold pressure for a minimum of ten minutes. The allowable pressure decline rate for this test is 30 psi per minute.

(12) Reduce the wellbore pressure to zero psi.

(13) Apply 1,500 psi close pressure and then apply 1,500 unlock pressure.

(14) Bleed the unlock pressure and then the close pressure to zero psi.

(15) Apply 1,500 psi open pressure.

(16) Once the rams are fully open, bleed all pressures.

(17) Suspend a section of 3-1/2" C22 HS (160 ksi yield strength) drill pipe into the bore of the BOP. There should be a minimum of 24" of pipe above and below the shear rams. For

cases where there is not 24" of clearance below the shear rams, allow 1" to 2" of clearance between the pipe and bottom of the BOP bore.

(18) Apply 3,000 psi closing pressure to the close port of the BOP in order to facilitate the shearing of the drill pipe.

Note: It is acceptable to slowly increase the closing pressure until the 3,000 psi maximum is reached during the shearing process. Ensure that the pressure required to shear the pipe is recorded.

WARNING – This is a Shearing Test of drill pipe. The BOP must be isolated from personnel during the Shearing Operation.

(19) Lock the BOP using 1,500 psi.

(20) Reduce closing pressure to zero psi.

(21) Reduce locking pressure to zero psi.

(22) Apply a minimum of 200 psi to 300 psi maximum wellbore test pressure.

(23) After wellbore pressure has stabilized (at a minimum of 200 psi), hold for a minimum of ten minutes. The allowable pressure decline rate for this test is 6 psi per minute.

(24) Increase the wellbore pressure to 25,000 psi.

(25) After wellbore pressure has stabilized (at a minimum of 25,000 psi), hold pressure for a minimum of ten minutes. The allowable pressure decline rate for this test is 30 psi per minute.

(26) Reduce the wellbore pressure to zero psi.

(27) Apply 3,000 psi close pressure and then apply 1,500 unlock pressure.

(28) Bleed the unlock pressure and then the close pressure to zero psi.

(29) Apply a maximum of 3,000 psi open pressure.

(30) Once the rams are fully open, bleed all pressures.

(31) Remove the lower section of the sheared pipe form the BOP.

(32) Inspect and document any wear on the ram or BOP.

(33) Repeat steps 17 through 32 for two additional samples of drill pipe. Ram packers may be replaced as necessary.

---------- **END OF DOCUMENT** ----------

WELL EXAMINATION AND CERTIFICATION
Verification that Blind Shear Rams will Shear Pipe in the Hole

Well Name	South Marsh Island Block 230 Davy Jones #1 Well OCS-G-26013 #1 ST01
Drilling Rig Name	Rowan EXL III
Program Description	Verify that the blind shear rams will shear the planned pipe in the wellbore
Program Revision Number / Date	MMR-U210-026 Rev B / 9 March 2014
Well Examiner	David B. Lewis

The Rowan EXL III is equipped with a 13-5/8" 25K BOP with DVS Blind Shear Rams. C22-HS 3-1/2" 0.430" wall 160 ksi tubing and 2-7/8" 0.362" wall V-150 work string are expected to be across the BOPs during the temporary plug and abandonment activities.

The DVS Rams successfully sheared and sealed (no visible leaks as per API 16A) the C22-HS 3-1/2" 0.430" wall 160 ksi tubing three times. The tests were conducted on 26 September 2011 at Cameron's Technology Center in Houston, Texas.

The 13-5/8" 25K BOP is capable of shearing and sealing the planned 3-1/2" 0.430" wall 160 ksi tubing and the 2-7/8" 0.362" wall V-150 work string.

Requirements CFR 250.1705 (c)	**Documents Reviewed**	**Deemed Appropriate**
Verification that Blind-shear Rams will Shear Pipe in the Hole	• Item 11 DJ1 TA 25K BOP EVO MASP Calculations 0221.pdf – 21 February 2014 • ER 4228.pdf – 15 January 2012 • ER 4228 Abstract.pdf – 9 December 2011 • 13-25K BOP Shear Calculation at 25K MASP.pdf – 2 April 2012	Yes

Signed: David B. Lewis
Date: 9 March 2014

QUALIFICATIONS OF DAVID B. LEWIS

General	David has thirty years of domestic and international experience in oil & gas exploration and production. He has an engineering and an operational background in drilling, completions, offshore structures and experience in deepwater, big bore (mono bore) and high pressure-high temperature wells. He is a Registered Professional Engineer in the State of Texas, a member of ASCE, SPE, and serves on numerous API and ISO committees.
Education	MS degree in Civil Engineering - Structures / Engineering Mechanics – 1980 - University of Missouri-Rolla BS degree in Civil Engineering - Structures / Engineering Mechanics – 1978 - University of Missouri-Rolla Post-graduate doctoral work in finite element methods, continuum mechanics, vibrations, and structural dynamics.
Employment	2001 – Present: President and CEO - Blade Energy Partners 2000 – 2001: Section Manager – Well Construction Technology - ExxonMobil 1997 – 2000: Section Manager – Drilling Technology - Mobil Technology Company 1992 – 1997: Senior Drilling Engineering Advisor - Mobil Drilling 1988 – 1992: Senior Drilling Engineer - Mobil Drilling 1981 – 1988: Senior Structural Engineer - Mobil Technology Company
Affiliations	Registered Professional Engineer – Texas #59664 API – American Petroleum Institute • API Executive Board Member of Committee 5 – Tubular Goods • Chairman API RP 5-EX Resource Group on Solid Expandable Development • Chairman API Resource Group on Tubular Properties Software Development • Technical Member of API 5CT - Specifications for Casing and Tubing • Technical Member of API TR 5C3 - Bulletin on Formulas and Calculations for Casing, Tubing, Drill Pipe, and Line Pipe Properties • API Executive Board Member of Committee 16 - Drilling Well Control Equipment • Chairman 16Q - Recommended Practice for Design, Selection, Operation and Maintenance of Marine Drilling Riser Systems • Chairman 16R - Specification for Marine Drilling Riser Couplings • Technical Member of API RP 6HP (PER 15K) - Greater than 15 ksi Equipment • Technical Member API RP 96 – Deepwater Design Considerations ISO – International Standardization Organization • Technical Member WG2A and WG2B for ISO TR 10400 - Petroleum and natural gas industries — Equations and calculations for the properties of casing, tubing, drill pipe and line pipe used as casing or tubing Authored or co-authored 25 technical publications in the upstream oil and gas industry.