

Workshop on Emergency Response for Offshore Hydrocarbon Installations

Presented by: Colin Moir
Athens 25th June 2019

*Enhancing EU Directive compliance utilising LR Secondary Well Control
Verification service: 'Well – Secured'*

Experts in Well design, Well project delivery and Well safety



Working together
for a safer world



- 💡 A unique service solution created by LR Wells team over last 4 yrs to enhance overall Operator / Drilling Contractor evaluation of individual Well HSE project exposure demonstrating planned responses to Emergency Well Control risks scenarios maintain ALARP.
- 💡 Providing evaluation service to mitigate and reduce escalation of Emergency response scenarios including Well Control & Blowout Control Plans. Currently used to support HSE Permit to Drill submissions in UKCS.
- 💡 Currently used by several UKCS Operators, Drilling Contractors (could be Regulators) to demonstrate a consistent methodology adopted for all Well project assessments involving non Production Installations (NPI).
- 💡 Fully secure Identity manager protocols with permissions and Verification sign off including review comments / suggestions and 100% auditable.
- 💡 Configurable question templates tailored to suit specific Operations, local / regional requirements and ranked for Technical and Safety criticality.



- 💡 Initial requirement to create template to apply Region, Standards, Well type, NPI data gathering questions.
- 💡 Question sets within templates can be tailored to support and can be ranked according to Technical merit, and or Safety criticality.
- 💡 Secure Identity manager protocols with access permissions and Verification sign off complete with review comments, sign off and 100% auditability.
- 💡 Assigned individual(s) from Operator / Drilling contractor populate appropriate templates with project specific data to inform all parties on the proposed Well plan including RoMH.
- 💡 LR then perform technical ranking Well review as an independent or combined with Operator to best technical selection for the Well project.
- 💡 Specific SWCE team workshop perform a detailed risk assessment to Configure/Optimise BOP defining redundancy for all phases of the well.

Lloyd's Register applies its expert knowledge and independence to help clients across the Energy Industry design, construct and operate their capital intensive assets and businesses to their highest levels of safety and performance.

Our world class expertise allows us to resolve and share solutions to the most complex situations, providing the confidence demanded by engineering principles, government regulations and industry codes and standards.

We draw on a long heritage of fresh, innovative thinking in response to new technologies and challenges. The one consistent element is our commitment to independence, integrity and always doing the right thing.

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- 💡 **Enhanced engagement and communication between Operator / Drilling contractor and regulator supporting compliance and Operational excellence.**
- 💡 **Can be configured for all Well preparation areas including Report On Major Hazards (RoMH), Notification of Well Operations (NOWO) including Well Control plan and if required Blowout Control Plan.**
- 💡 **Consistent methodology and approach to Well planning / NPI interfaces where database will allow stake holders historical evidence of assessment process and demonstrate 'Continuous improvement'.**
- 💡 **100% auditability.**
- 💡 **System flexibility will allow easy update to templates for any compliance / regulation changes.**
- 💡 **Effective solution to enhance Well safety and stake holder expectations.**

Well-Secured

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Hello Colin Moir

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Projects

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	Phase	Project Number	Project Title	Due Date	Well Location	Well Type	Standard	Created	Status	Unit System
Edit View Delete	Well Verification	PRJ 1110008749	MSS-1 API STD 53 Compliance Review for UMC 211/21a-16 W4 & W4S1	6/12/2019	UKCS	Normally Pressured	API S53 + TAQA Global	5/22/2019	Open	Imperial
Edit View Delete	Well Verification	LR Project PRJ11067406	ARMADA Platform: Hawkins Well	5/7/2019	UKCS	Normally Pressured	Chrysaor + API S53 + LR Global	2/19/2019	Open	Imperial
Edit View Delete	Well Verification	LR Project PRJ11067411	ARMADA: Seymour Horst Well	3/13/2019	UKCS	Normally Pressured	Chrysaor + API S53 + LR Global	2/18/2019	Open	Imperial
Edit View Delete	Concept	PRJ EXAMPLE	KINGSWELLS DEVELOPMENT	12/4/2018	Namibia Atlantic	Deepwater Normally Pressured	ISO 16530-1	12/5/2018	Open	Imperial
Edit View Delete	Concept	ENG 009	Test Project PDO	8/9/2017	Onshore OMAN	Managed Pressure Drilling	PDO Global Standard	7/24/2017	Open	Imperial

Project

Status	Completed	Unit System	Imperial
Phase	Well Verification	Water Depth	294 feet
Project Number	O17CHR058A	Max Mud Weight	13.0 lb
Project Title	CHRYSAOR MARIA PROJECT	Well Depth TVD	13,000 feet
Due Date	1/19/2018	Max Expected Wellhead Pressure	4,400 psi
Well Location	Central North Sea	Max Expected Hydrostatic Pressure	150 psi
Well Type	Overpressured NOT HPHT		
Standard	Chrysaor + API S53 + LR Global		
Well Data Template	Chrysaor Maria Project 2017 - copy		

Concepts	Title	Status	Rig Type	Selected Rig	Selected Vendor
View	Moored Semi-Sub Concept	Approved	Moored Semi - Sub	Blackford Dolphin	DOLPHIN Drilling
View	HDHE Jack Rig	Approved	HDHE Jack up	Rowan Gorilla VII	ROWAN Drilling

Selected Concept HDHE Jack Rig

Selected Concept Justification HDJU (RG VII) was selected as being best overall option for Maria sub sea wells and future Platform based drilling projects which require a jack up. Refer to preliminary rig selection assessment..

Attachments
[Summary Technical Assessment 06-09.pptx](#)
[Draft 1 Interim Maria Rig ITT Assesment.docx](#)
[Well-Secured Technical Evaluation Comments 30th Aug Rev 0.docx](#)

Concept

Status	Approved	Approved	1/12/2018																				
Comments	Following extensive Technical review work and commercial checks Rowan Gorilla VII is only unit available for Maria well.		Approved By Colin Moir																				
Title	HDHE Jack Rig																						
Rig Type	HDHE Jack up																						
Description	Optional Rig type for Maria workovers.																						
Attachments																							
Vendors	<table border="1"> <tr><td>Vendor</td></tr> <tr><td>NOBLE Drilling</td></tr> <tr><td>PARAGON Offshore</td></tr> <tr><td>ROWAN Drilling</td></tr> </table>			Vendor	NOBLE Drilling	PARAGON Offshore	ROWAN Drilling																
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View	ROWAN Drilling	Rowan Norway	Rejected	1025 / 1405																			
Selected Rig	Rowan Gorilla VII																						
Selected Rig Justification	Best Technical rig for Maria project. See attached files to support the long process of evaluation.																						

Rig Data - ROWAN Drilling - Score 1135 / 1405

Status **Approved**

Approved 1/12/2018

Comments Although certain areas of Technical submission were Technically poor subsequent clarifications has identified Rowan are performing upgrades to BOP Shear Ram and Control systems. LR surveyors are involved in this scope. The Rig skidding capabilities and XT handling are sufficient for the Maria well and future platform campaigns. C Moir / Ed McFadden.

Approved By Colin Moir

Title Rowan Gorilla VII

Shearing Matrix

[View Tubular Shearing Matrix](#)

Evidence reviewed and verified

Fail[All Technical Comments](#)

BOP Technical Data

API-2A-4R

[View BOP Technical Data](#)

Evidence reviewed and verified

Pass[All Technical Comments](#)**0** Complete BOP Technical Data Sheet ⓘ

From the Vendor:

Evidence reviewed and verified

Pass[All Technical Comments](#)

Shearing Matrix

Unit System Imperial

Water Depth 7,326 feet

Max Expected Mud Weight 12.5 lb

Max Expected Wellhead Pressure 6,200 psi

Max Expected Hydrostatic Pressure 3,270 psi

Max Casing Shear Pressure 5,000 psi Direct 5,000.0 psi Part of EDS / AMF Cameron Control system with ROV & Acoustic back up

Max Blind Shear Pressure 4,000.0 psi Direct 4,000 psi Upper BSR (CDVS) Direct Tandem Booster 4K and Lower BSR (Refer CSR3 & 4)(DVS) is 5K WP

Tubulars

Item	Description	Details	Size	Grade	Weight	% Elon	Tensile	CSR1	CSR2	BSR1	BSR2	CSR3	CSR4
1	Casing 1	TSH523 DPLS Connection	16"	TN110HS (High Collapse + Sour Serv)	96ppf	16	125,000	3,979	4,269	5,000	5,000	5,000	5,000
2	Casing 2	TSH523 DPLS Connection	13.625"	TN125SS (Sour Service)	88.2ppf	14	135,000	4,231	4,521	5,000	5,000	5,000	5,000
3	Casing 3	TSH W513 DPLS Connection	11.750"	TN110HS (HC + SS)	65ppf	16	125,000	2,745	3,034	3,540	3,911	5,000	5,000
4	Casing 4	TSH W513 Connection	9.625"	L80	53.5ppf	15	80,000	1,949	2,239	2,514	2,885	5,000	5,000
5	Casing 5	TSH Blue-DPLS-SC Connection	7"	TN110HS (HC + SS)	32ppf	14	125,000	1,359	1,649	1,753	2,124	3,506	4,248
6	Primary Drill Pipe 1	Grant Prideco XT57 Connection Av TJ make up length = 29"	5.875"	S135	26.3ppf	23	139,000	1,101	1,390	1,420	1,791	2,839	4,324
7	Landing String 1	6.875" FH Connection Av TJ Make up = 27"	6.625"	V150	50.46ppf	21	150,000	2,550	2,840	5,000	5,000	5,000	5,000

Rig Data - Rowan Gorilla VII ON CONTRACT - Score 500 / 500

Status **Approved**

Approved 5/21/2019

Comments Full assessment has been performed on the Rig and historical evidence is in place for MARIA & MABEL wells. SIMOP work undertaken and responsible parties in place to ensure actions completed prior to spudding Top holes on ARMADA slots.

Approved By Colin Moir

Title GORILLA VII @ ARMADA PLATFORM

Shearing Matrix

[View Tubular Shearing Matrix](#)

Evidence reviewed and verified

Pass

All Technical Comments

Colin Moir 3/22/2019 11:22 AM

Theoretical shear values provided arrived at through manual calculation and use of wall thickness theory calculation contained within latest Cameron EB702 Engineering Bulletin Rev F which gives a slightly conservative figure compared to using provided constant tables. No problem and generally as expected for this model of Blind Shear Ram. No Casing Shear fitted. More concern comes from planned drill pipe connection dimensions where the actual calculated tube wall thickness is found almost twice the distance away from TJ connection due to tapered internal heavy wall and external upset. This has been considered during hang off dimensional checks.

Colin Moir 3/18/2019 8:47 AM

Be aware that Casing strings theoretical shear calculations are all above 90% system capacity. The Rowan Gorilla VII utilises a 10K psi rated Annular and MEWP is worst case 4700psi so there is a Well control device capable of sealing on Casing. The casing has a decent collapse rating and the Annular type is pressure balanced to avoid any unnecessary collapse loading on pipe.

Shearing Matrix

Unit System Imperial

Water Depth 295 feet

Max Expected Mud Weight 13.5 lb

Max Expected Wellhead Pressure 4,700 psi

Max Expected Hydrostatic Pressure 0 psi

Max Casing Shear Pressure 0 psi

Direct

0.0 psi

NOT FITTED TO GORILLA VII BOP.

Max Blind Shear Pressure 3,000.0 psi

Direct

3,000 psi

ROWAN TO RE-CONFIRM CONTROL SYSTEM STATUS?

Tubulars	Item	Description	Details	Size	Grade	Weight	% Elong	Tensile	CSR1	CSR2	BSR1	BSR2	CSR3	CSR4
	1	Intel Drill Pipe 1	Primary Top Hole DP c/w 0.361" Wall	5.875"	S135	23.40 lb/ft	0	130,000	0	0	1,181	1,530	0	0
	2	Intel Drill Pipe 2	Secondary DP c/w 0.362" Wall	5.00"	S135	19.5 lb/ft	0	135,000	0	0	997	1,345	0	0
	3	Intel Drill Pipe 3	Lower Hole sections DP c/w 0.330" Wall	4.00"	S135	14 lb/ft	0	135,000	0	0	719	1,068	0	0
	4	Casing 1	Typically Non Shearable c/w TSH Blue DPLS Connections	13.375"	L80	72 lb/ft	14	80,000	0	0	3,358	3,707	0	0
	5	Casing 2	Located below Csg Hgr to allow for DHSSV clearance c/w TSH Blue DPLS Special	10.750"	P 110	67.5 lb/ft	15	110,000	0	0	2,826	3,174	0	0
	6	Casing 3	Primary Production casing string c/w TSH Blue DPLS	9.625"	L80	53.5 lb/ft	15	80,000	0	0	2,925	3,274	0	0
	7	Liner 1	Primary Liner string c/w TSH Blue DPLS	7"	P110	32 lb/ft	15	110,000	0	0	1,753	2,102	0	0
	8	Liner 2	High Strength Liner to bridge over flow wetted areas c/w TSH Blue DPLS	7"	VM25S125	32 lb/ft	14	125,000	0	0	1,992	2,341	0	0
	9	Tubing 1	Located at Top of Completion design with TN Blue DPL connections Chrome pipe	5.5"	TN110Cr	23 lb/ft	13	110,000	0	0	1,247	1,596	0	0
	10	Tubing 2	Primary completion string c/w JFE Bear Connections Chrome pipe	4.5"	HP2-13Cr110	15.2 lb/ft	13	110,000	0	0	829	1,178	0	0

Justification Comment Checked and approved.

BOP Configuration - Score Score 122 / 152

Status **Approved**

Approved 5/21/2019

Comments Although not ideal the use of 2 pipe sizes to drill the well does affect redundancy but not for primary pipe size to be used in challenging ECD sections parts of the well. Use of fixed 5 7/8" ram packer in MPR will work well and worst case UPR can be used to continue any Well control situations. As we are using a Jack up the probability to require use of BSR is extremely low. Note: Changes to the software are in progress allowing addition of a N/A selection button.

Approved By Colin Moir

Title ARMADA: Seymour Horst Well

Description Configuration as attached file.
Bottom to Top:
Circulation Line (15K valves c/e 15k - 5k X over to 5k Co flexip hose
LPR 3 1/2" - 7 5/8" Variable
Circulation Line (15K valves c/e 15k - 5k X over to 5k Co flexip hose
MPR 5 7/8" Fixed
Circulation Line (15K valves c/e 15k - 5k X over to 5k Co flexip hose
UPR 3 1/2" - 7 5/8" Variable
BSR c/w CDVS type with Tandem Operator
18 3/4" 10k Rated Hydril 'GX' Annular

Attachments [R049-130-08-R07 GENERAL STACKUP ARR-SHEET1 ARMADA.pdf](#)
[ARMADA_COMBINED RG 7 JACK_UP BOP_Set_up_Rev_A_20_Mar_2019.pdf](#)

Item	Question	Intel Drill Pipe 1	Intel Drill Pipe 2	Intel Drill Pipe 3	Casing 1	Casing 2	Casing 3	Liner 1	Liner 2	Tubing 1	Tubing 2
1	Can annular be closed on nominated Tubular string without Operator pressure causing collapse potential	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Confirm that selected primary hang off ram can support worst case planned hang off loads? All DP sizes to be checked.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Confirm if there is an outlet below the Lower pipe rams? Note: Is use of this line under Well control conditions is fully defined, understood and inline with API S53 standards? ⓘ	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes



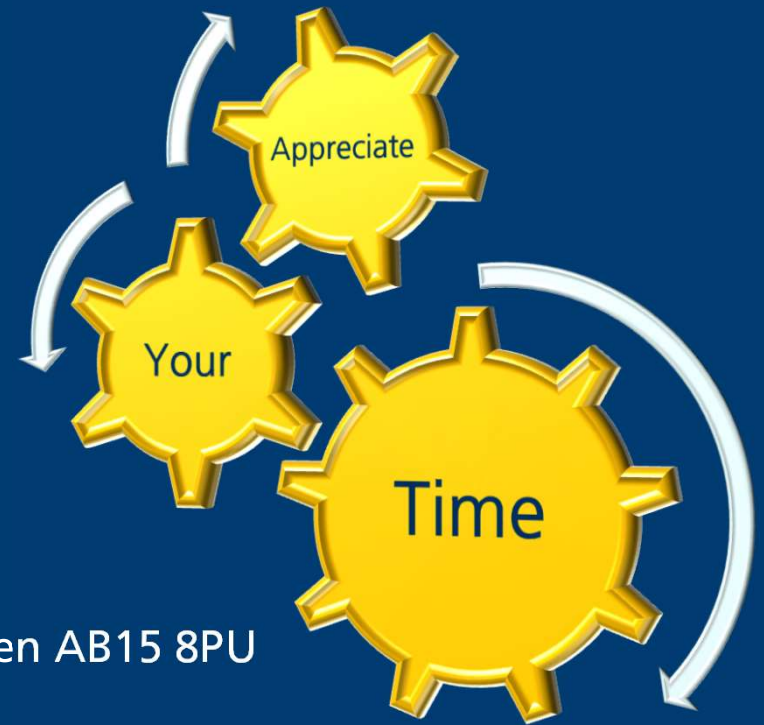
Well-Secured™

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