Assessment of Process Safety for Transocean Deepwater MODUs

Well Control
Blowout Preventers Testing and Maintenance Training

REVIEW REPORT

Prepared for:

Transocean-TODDI HSE Committee
September 2015
### Table of Contents

1. INSTRUCTIONS .................................................................................................................... 7
   1.1 Scope of Work .................................................................................................................. 7

2. INTRODUCTION ................................................................................................................... 8
   2.1 Safety Critical & Barrier Terminology ............................................................................... 9

A. REVIEW OF HSE SAFETY CASE .......................................................................................... 12
   1a. Internal Documents Reviewed .....................................................................................12
   1b. 3rd Party Documents Reviewed ..................................................................................12
   1c. Interviews ....................................................................................................................14
   1d. On-Site Assessments ..................................................................................................14

2. The Assessments, Evaluation and Conclusions ................................................................14
   2a. Assessments / Evaluations ..........................................................................................14
      (i) Summary of Policy and/or Procedure ............................................................................14
         Management Commitment to (Process) Safety .............................................................14
         Safety Management System .......................................................................................... 14
         MODU Characteristics that Make the MODU Safe .........................................................15
         Hazard Identification, Bow-Ties and the Register of Permitted Operations ....................15
         Emergency Response System ......................................................................................15
         Performance Monitoring ...............................................................................................15
      (ii) Industry Standard Compliance ..................................................................................15
      (iii) Confirmation of Compliance or Identification of Non-compliance. .........................16
   2b. Conclusions .................................................................................................................16

B. REVIEW OF AUDIT AND COMPLIANCE POLICIES AND REQUIREMENTS .......... 19
   1. The Review Process .........................................................................................................19
      1a. Internal Documents Reviewed .....................................................................................19
      1b. 3rd Party Information Reviewed ..................................................................................19
      1c. Interviews ....................................................................................................................19
      1d. On-site Assessments ...................................................................................................19
   2. The Assessments, Evaluation and Conclusions ...............................................................20
      Safety Case Auditing ......................................................................................................20
      2a. Assessments / Evaluations ..........................................................................................20
         (i) Summary of Policy and/ or Procedure ........................................................................21
Management System Audits..........................................................................................21
Self Verification/Division Verification Audits..................................................................21
Hardware Audits.............................................................................................................22
(ii) Industry Standard Compliance: External Audits.........................................................22
ISM Code (Audit of the Safety Management System).......................................................22
Class Society Surveys, Flag State Surveys (depending on Registry).................................23
BSEE & USCG Regulatory Inspections.............................................................................24
SEMS Audit for BSEE Compliance as Required by Operator .............................................24
Process Safety Drill Audits (USCG and BSEE)................................................................24
Training Audits: BSEE and USCG ..................................................................................25
OPITO Audit and Certification..........................................................................................25
IADC WellCAP® Audit and Certification .......................................................................26
Customer Audits or Third party (Rig Condition Assessments)..........................................26
(iii) Confirmation of Compliance or Identification of Non-Compliance..............................26

1. Independent Auditor Comment on Well Control Equipment List for the National Response Resource Inventory Database (USCG)..............................................................26
2. Independent Auditor Observation on Designation of Equipment as “Safety Critical”..27

Specific Procedures........................................................................................................29
2b. Conclusions..............................................................................................................29

C. REVIEW OF MAINTENANCE PROCESSES, REQUIREMENTS AND TRACKING; WELL-CONTROL EQUIPMENT, PARTICULARLY WITH RESPECT TO THE BOP SYSTEM .................29

1. The Review Process ......................................................................................................29
1a. Internal Documents Reviewed ....................................................................................30
1b. 3rd Party Information Reviewed ..................................................................................30
1c. Interviews ...................................................................................................................32
1d. On-Site Assessments ..................................................................................................32
2. The Assessments, Evaluation and Conclusions ............................................................29
2a. Assessments / Evaluations ..........................................................................................32

(i) Summary of Policy and/or Procedure .........................................................................32
Performance Requirements of the Blowout Preventer (BOP) ............................................32
Specific Comments on Maintenance Scope Related to BOPs: ........................................34

(ii) Industry Standard Compliance, If Any .................................................................34

Regulatory and Industry Standards for BOPs ..............................................................34

(iii) Confirmation of Compliance or Identification of Non-compliance ......................36

2b. Conclusions..............................................................................................................36

D. REVIEW OF TRAINING AND COMPETENCY ASSESSMENT OF RIG WORKERS INVOLVED IN PROCESS SAFETY ACTIVITIES .................................................37

1. The Review Process Used: ......................................................................................37

1a. Internal Documents Reviewed ..............................................................................37

1b. 3rd Party Documents Reviewed .............................................................................38

1c. Interviews ..............................................................................................................39

1d. On-site Assessment ..............................................................................................39

2. The Assessments, Evaluation and Conclusions ......................................................39

2a. Assessments / Evaluations ..................................................................................39

   (i) Summary of policy and/or procedure ................................................................39

   Safety Case Training ...............................................................................................39

   Overall Training ....................................................................................................39

   Industrial Training Requirements (related to Well Control) .....................................40

   Competence ..........................................................................................................41

   On-the-Job Training ...............................................................................................41

   Well Control Competency Assessment Plan ..........................................................41

   Driller Competency Assessment Program ..............................................................42

   Dynamic Positioning Competency Assessment Program .........................................42

   Subsea Supervisor Competency Assessment Program .............................................42

   (ii) Industry standard compliance, if any .................................................................42

   (iii) Confirmation of Compliance or Identification of Non-compliance ....................44

2b. Conclusions..............................................................................................................44

E. FINAL CONCLUSIONS ............................................................................................46

F. REFERENCES .............................................................................................................48

APPENDIX A : MAP OF TRANSOCEAN’S PROTECTIONS: PROCESS SAFETY ..........51
APPENDIX B: OBSERVATIONS ON WELL CONTROL SCHOOL: .......................................................54
APPENDIX C: OBSERVATIONS ON MAHRA: ........................................................................55
APPENDIX D: OBSERVATIONS ON INTERVIEWS ON DEEPWATER HORIZON: .................56
APPENDIX E: SCOPE OF WORK: ..........................................................................................57
APPENDIX F: METHODOLOGY AND SCOPE: ......................................................................60
NOMENCLATURE ..................................................................................................................62

Figure 1 Extracted from Reference: Guidelines for the Management of Safety Critical Elements
March 2007, Energy Institute, London......................................................................................10

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section is a listing of
screenshots of company systems or descriptions of internal policies and procedures in
use by Transocean.
1. INSTRUCTIONS

On January 3, 2013, Transocean reached an agreement with the U.S. Department of Justice (DOJ) to resolve certain outstanding civil and potential criminal charges arising from the Macondo well incident.

As part of the Consent Decree, Transocean agreed to take specified actions relating to operations in U.S. waters, including, among other things, the design and implementation of, and compliance with, additional systems and procedures; blowout preventer certification and reports; measures to strengthen Well Control competencies, drilling monitoring, recordkeeping, incident reporting, risk management and oil spill training, exercises and response planning; communication with operators; alarm systems; transparency and responsibility for matters relating to the Consent Decree; and technology innovation, with a first emphasis on more efficient, reliable blowout preventers.

The Consent Decree also provides for the appointment of (i) an independent auditor to review, audit and report on Transocean’s compliance with the injunctive provisions of the Consent Decree and (ii) an independent process safety consultant to review, report on and assist with respect to the process safety aspects of the Decree, including operational risk identification and risk management."

This Review is undertaken in compliance with this provision (ii) above.

The selection of Offshore Risk & Technology Consulting Inc. was approved by the DOJ, the U.S. Environmental Protection Agency (EPA), U.S. Bureau of Safety and Environmental Enforcement (BSEE), U.S. Coast Guard (USCG) and the U.S. Department of Interior (DOI) in May 2014.

The document in Appendix E dictated the Scope of Work to be undertaken and which is reported on herein.

1.1 SCOPE OF WORK

The Scope of Work is specific in its requirements for examination of specific areas of process safety with an agreed sampling of Mobile Offshore Drilling Units (MODUs) operating on the U.S. Continental Shelf:

- Review of the Transocean HSE Safety Cases (documenting all process safety activities undertaken in the Transocean system on a specific MODU);
- Review and evaluation of the audit and compliance policies and requirements;
- Review and evaluation of the maintenance processes, requirements and tracking of Well Control equipment in particular Blowout Preventers (BOPs);
- A Review of training and competency assessments for rig workers involved in process safety activities.

Any material deficiencies are defined as a “major non-compliance,” which is a deviation from requirements that (1) Results in the impairment or degradation of a Major Hazard Barrier without mitigation; (2) poses a serious threat to safety of personnel, the vessel or the environment; or 3) indicates the lack of effective systemic implementation of a requirement.
2. INTRODUCTION

The Process Safety Review stipulated as a result of the Consent Decree involved examining the documented (written) system of safety, including documented training and competency, used to minimize the probability of a future major Well Control accident event as a result of failure of the safety system. The Review of written documentation was supplemented with examination of Management System Audits (MSA), external audits, real time review of Transocean databases (FOCUS, RMS II, GMS, and HSE Toolbox), review of training material and courses and interviews with managers, subject matter experts, and with rig-based personnel to confirm that the intended documented safety system was a reality for the field crews/teams.

Process Safety refers to prevention of major accident events which include blowouts, collision, stability events etc. all issues that might involve loss of multiple lives possibly with loss of the MODU and other severe consequences. Occupational safety events, though often tragic are not considered in this term process safety. “Process safety” is a term reserved for rare events with high consequential losses.

Transocean has developed Safety Cases for each of their Mobile Offshore Drilling Units (MODUs) working in the U.S. which are documents that summarize the Rig-Specific dovetailing with the company’s plan of defense for Process Safety. Although not a regulatory requirement or even an industry standard in the U.S. waters, some regulators (e.g., UK, Australia, Denmark), and some major oil companies require a drilling contractor to compile a summary document outlining the system of process safety for a specific MODU with enough description to make a “case for safety” where all the information is summarized in one document known as a Safety Case or a Health Safety & Environment (HSE) Case. The base industry standard document for MODUs worldwide is the International Association of Drilling Contractors (IADC) HSE Case Template. In this Review the Safety Case documents for each of four sample Deepwater MODUs was reviewed in detail, followed up by study and evaluation of the underlying documents. Several other Safety Cases were reviewed in part. An essential part of the Safety Case is the Major Accident Hazards Risk Analysis (MAHRA) undertaken by key members of the crew. A MAHRA workshop was attended and audited for the Deepwater Nautilus (DWN) and Observations reported in Appendix C. The Safety Cases are being upgraded from the initial ones post 2010 and some of these are expected to be finalized before the end of the year.

The Safety Case is a demonstration that the operator has identified all major safety and environmental hazards, estimated the associated risks, and shown how all of these risks are managed to achieve a stringent target level of safety, including a demonstration of how the safety management system in place ensures that the controls are applied effectively. The Safety Case is a stand-alone document based on a set of several subsidiary documents, undertaken to present a coherent argument demonstrating that the risks are managed to be as low as reasonably practicable (ALARP).

The SEMS Rule based on 13 elements of the API RP 75, although similar, delves into Hazard Analysis, but the safety case concentrates on Major Accident Hazards in more detail and the risk assessment through the Bowtie process is much more intense, particularly as carried out in Transocean, and involves crew participation. A critical shortcoming in SEMS is the ALARP process as part of a risk reduction effort, a strategy for the identification of Safety Critical Elements and the development of performance standards; it does, however, deal more with occupational health and safety issues.

The Governing Principles document (HQS-CMS-GOV issue 01 10.06.2014) is the highest level document in the Company and notes:
All Company installations maintain a current Safety Case reviewed and updated according to Company Requirements.

Personnel performing tasks that have the potential to affect safety and environmentally critical barriers are trained to identify barrier degradation and impairment.

Personnel understand they have the obligation to stop any activity, without fear of repercussion, when a real or perceived unsafe or unexpected condition or act is observed.

Hazards are risk assessed, qualitatively and/or quantitatively, using Company approved processes to determine the associated risks based on potential consequences and the likelihood of occurrence.

When major hazards are identified, they are evaluated to identify suitable safety and environmentally critical barriers using Company approved risk assessment and risk management processes.

Some further details on the Review Process and how it was carried out are described in Appendix F.

2.1 SAFETY CRITICAL & BARRIER TERMINOLOGY

The term “Safety Critical” is used throughout this Report and is in general use in the industry. As such an explanation of the meaning may be useful. Safety-Critical Elements was a term coined for the offshore industry after the Piper Alpha accident in the North Sea.

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section details Transocean’s internal methodology for determining criticality along with the types of major hazard barriers Transocean uses in the safety cases for its rig. This section also details how equipment criticality is identified in Transocean’s internal systems.
Figure 2 shows a typical complete list linking Major Hazards, to Safety Critical Elements and Sub-Elements.

There are other systems such as the Ballast System, Structure, and Cranes that are also safety critical but not related to issues covered in this Review. The systems can be categorized as those that can cause Major Accidents, those that can detect potential Major Accidents (e.g., Fire & Gas detection system), and those systems that can mitigate Major Accidents (e.g., emergency shut down, firefighting, public address, escape routes, temporary refuge, emergency generator etc.). Other systems tagged as safety critical are the escape and rescue systems.

The following systems are considered generally as related to drilling and Well Control not all of which are the subject of the Review:

- BOP Stack (Subsea);
- Marine Riser System;
- Choke and Kill System;

Offshore Risk & Technology Inc.
Dr. M. Sharples

23.b (CD) PSC Report 10.1.2015 (redacted)
- Diverter System;
- Mud / Gas Separator Primary System e.g., Poor Boy Degasser;
- Drilling Instrumentation System;
- Station-keeping System, including Navigation Systems, Dynamic Positioning System (DP) including Power Management and Thruster/Propulsion;
- Mud System and Mud Processing Area Ventilation;
- Cement System; and
- Ex Equipment.

It is also an implied requirement that such safety critical equipment will have a “Performance Standard” associated with it. A Performance Standard states the purpose of the sub-system or item of equipment, and provides information in terms of functionality (what is it required to do?), availability (for what proportion of the time will it be capable of performing?), reliability (how likely is it to perform on demand?), survivability (does it have a role post event?), and interactions (do other systems require to be functional for it to operate?). The terms should be such that they are measurable and auditable. The management system supporting needs to be capable of identifying the assurance activities of maintenance, inspection and testing and that these are being carried out by competent people, maintaining a record of the activities, findings and corrective actions.

In Transocean:

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section further details Transocean’s internal methodology for determining criticality.
A. REVIEW OF HSE SAFETY CASE

The Safety Case is a living document and, in the Transocean system, has Custodians and Owners that read, endorse and sign their commitment (in electronic form) to maintain the document during their tenure.

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section introduces the use of a Company standard major accident hazard risk assessment process (Bowtie) that is used as the basis for completing rig-specific major accident hazard risk assessments. In addition, the development of major hazard barriers (controls) is introduced. Reference is made to Appendix C.

1. The Review Process

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section describes the methodology taken by the report author to review a sample of Transocean’s rig-specific Safety Cases. The methodology includes a comparison to the industry standard (the IADC HSE Case Guidelines) plus a review of relevant Company Management System and rig-specific documents. In addition, Transocean’s internal Safety Case training is reviewed.

1a. Internal Documents Reviewed

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section lists the specific internal documents reviewed as part of the wider process to assess Transocean’s Safety Cases.

1b. 3rd Party Documents Reviewed

Industry Guidelines
1. IADC MODU-HSE-Case-Guidelines Ver 3.5; “Health, Safety and Environmental Case: Guidelines for Mobile Offshore Drilling Units” (Safety Case).

Regulatory Documents
4. 33 CFR §146.205, Requirements For Foreign Flag MODUs.
7. 33 CFR Subchapter N.
10. IMO MODU Code (Foreign Flag Vessels).
1c. Interviews

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section details the people interviewed as part of the review of Transocean’s Safety Cases. This includes a summary of the subject matter and additional commentary by the report author.

1d. On-Site Assessments

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section describes a review of the Bridging Document arrangements in place between Transocean and a sample of customers. The review considers the specific relation to Safety and Environmental Management Systems (SEMS).

2. THE ASSESSMENTS, EVALUATION AND CONCLUSIONS

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section clarifies the position of the report author with respect to comments made in the following sections.

2a. Assessments / Evaluations

(i) Summary of Policy and/or Procedure

The Review examined each section/subject encompassed by the Safety Case. Each is commented on briefly below in relation to the Review topics:

**Management Commitment to (Process) Safety**

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section comments on the Transocean governance process for the Safety Case and the rig-specific major accident hazard risk assessment that is documented therein. This includes a summary of the roles for senior Transocean management, rig management / supervision and other internal resources.

**Safety Management System**

**SECTION REDACTED**
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section comments on Transocean’s arrangements for conformance to the various external requirements and guidance for Safety and Environmental Management Systems (SEMS). This includes a brief description of the HSE leadership and governance roles within the Company. Also, this section describes the arrangements for a Designated Person as required by the International Safety Management (ISM) Code.

Placards, Whistleblower Opportunities, and the Chief Compliance Officer

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section comments on Transocean’s arrangements for providing a means of communicating legal and ethical compliance issues to senior management.

MODU Characteristics that Make the MODU Safe

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section comments on Transocean’s arrangements for providing a means of communicating legal and ethical compliance issues to senior management.

Hazard Identification, Bow-Ties and the Register of Permitted Operations

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section comments on Part 3 – Vessel Description from a sample of Safety Cases. Commentary is made on a number of topics related to the safety of rigs including: Class Notation, certification, processes for emergency shutdown, etc.

Emergency Response System

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section comments on Transocean’s processes for major accident hazard identification and risk assessment as documented in a sample of Safety Cases.

Performance Monitoring

(ii) Industry Standard Compliance
There is no requirement for regulatory or industry compliance with the Safety Case and it is not a standard practice to provide Safety Cases for MODUs in the US Regulatory regime. The IADC has developed and updated its IADC HSE (Safety) Case Template for the use of its members in foreign locations where the regulator does require it. This Template was used as a basis to develop the Transocean deepwater MODU Safety Cases that were examined. This Guidance has been voluntarily adopted by Transocean. DNV who is very familiar with North Sea safety cases provided assistance in facilitating the compilation of the Safety Cases for Transocean. Because of the voluminous information/procedures with the complex systems on deepwater drilling rigs, Transocean is undertaking a major revision/improvement to the safety cases to ensure they are more “readable” and understandable for the crew: this will be a great step forward.

The underlying documents, which the Safety Case summarizes, are complaint with industry standards as outlined in Sections B, C, and D of this Report.

The appropriate industry standard for a Bridging Document to bridge the safety management systems of Transocean with its Customers and with its Contractors is the API Bulletin 97 Well Construction Interface Document Guidelines, First Edition, which is not yet a regulatory requirement but there is a requirement for compliance for a bridging document in the BSEE SEMS requirements of which API Bulletin 97 presents a minimum industry standard.

(iii) Confirmation of Compliance or Identification of Non-compliance.

The Safety Cases all followed diligently the IADC HSE Case Template, which is the appropriate template.

Numerous documents that back up the summary of the SMS in the Safety Cases were read, and Reviewed.

Because the Safety Case is not an industry or regulatory standard in North America the policy of Transocean to provide one which is compliant with the IADC HSE (Safety) case, does demonstrate a best practice beyond the minimum requirements.

2b. Conclusions

The major item concluded from the Review of information is that Transocean has adopted the best practice tool of the Safety Case to communicate process safety: the Safety Case is a summary confirming that a process safety system is in place and that the Company has a process safety focus that exceeds the current regulatory and industry requirements:

- Policies and procedures are, and an organization is, in place to lead the company in preventing major accident events;
- There is an SMS in place to ensure that the facility and its operations are safe, which is currently acceptable to the regulatory requirements of SEMS.
The Safety Case has demonstrated that the potential for major accidental events have been identified, and appropriate controls put in place;

Safety critical operational procedures needed during periods of emergency have been established, and drills are conducted to ensure affected personnel and equipment function as necessary with the least possible exposure to risk;

Safety critical equipment has been identified to prioritize testing, repair, replacement which includes a management system and a procurement procedure for expediting safety critical equipment when needed; and

A Permit-to-Work system is clearly in effect, and specific attention and adequate time appears to be given to hand-over of work at shift changes.

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section provides specific comments concerning future development of the Safety Cases and related training.

The purpose of the Safety Case is to identify any barriers that would prevent a major accident event. The Bowtie diagrams were studied meticulously and confirm that the issues that arose from the Macondo event that related to barriers under the control of the drilling contractor had been addressed in the Bowtie diagrams as well as all other risks for which barriers were developed. The list of equipment in hazardous areas has checks that were verified to be made by the maintenance personnel, the auditors, the Class Society, and the Flag State inspections.

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section provides a specific comment concerning Transocean’s preventive maintenance and inspection program.

The Safety Cases cover the events that appear to be able to be anticipated and are considered for the Review subjects as being satisfactory. Writing the Safety Cases alone will not prevent major accident events: if read, discussed and the barriers implemented they should reduce the probability of events occurring and if they occur it reduces the probability of the higher consequences. Continuing to instruct the crew as to use of the document and reviewing the Bowties with them will help the knowledge on board. Insisting on diligent inspections by the Class Society and Flag State inspectors to ensure the certificates in place are deserved, enhances the process safety.

The Safety Case methodology makes assumptions that the barriers identified can be relied upon to be in place. Additional items important in preventing major accident events relate to communications, knowledge and ability to conceptualize when there is a lack of complete understanding by personnel who are in a position to realize the dangers, as most crew members may only have a portion of the information. The industry has not addressed some of
the less tangible issues such as ensuring that personnel from different backgrounds (ethnic, experience, education) all understand the issues when discussions take place. As part of the Review the Lloyd’s culture survey was reviewed, and concluded that the safety culture on board the MODUs examined was good, with observations. Further understanding of safety culture by the industry will provide improvements going forward. Transocean has taken a step forward in examining safety culture and this is an important best practice step forward.

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section provides a specific comment concerning Transocean’s major accident hazard risk assessment process.
B. REVIEW OF AUDIT AND COMPLIANCE POLICIES AND REQUIREMENTS

Audit and Compliance policies involve Company (Transocean) requirements, third party audits, and regulatory audits.

1. THE REVIEW PROCESS

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section describes the internal systems and process in place for document and close out of action items resulting in a variety of audits, inspections, visits and surveys that take place on Transocean rigs.

1a. Internal Documents Reviewed

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section is a list of internal documents relating to audits or surveys that took place onboard Transocean rigs. In addition, this section lists internal policies, procedures and systems reviewed.

1b. 3rd Party Information Reviewed

1. OPITO Audit Report (April/May 2014).
2. OPITO Certification of Transocean Competency Assessment Management System 06/2013 & one valid until 6/2017.
3. IADC WellCAP® Audit.

1c. Interviews

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section details the people interviewed as part of the review of Transocean’s audit and compliance policies and procedures. This includes a summary of the subject matter and additional commentary by the report author.

1d. On-site Assessments

SECTION REDACTED
This section describes a review of the internal system for document and closeout of action items resulting from variety of audits, inspections, visits and surveys that take place on Transocean rigs.

### 2. THE ASSESSMENTS, EVALUATION AND CONCLUSIONS

**SECTION REDACTED**

This section describes a review of company policies and procedures relating to audit and compliance onboard Transocean Rigs. The section also describes the types of internal and external audits reviewed.

**Safety Case Auditing**

**SECTION REDACTED**

This section describes the process for development and subsequent revisions of the safety cases, which include major hazard barriers. This section also details that the audit process focuses on barrier management as it is defined in the safety case for a particular rig.

### 2a. Assessments / Evaluations

The Review directed its focus to the various Audits related to the BOP and control systems, and the marine integrity reviews to the extent of ensuring no major non-conformances in the area of the dynamic positioning (DP) system that supports the control of well activities.
Additionally, the 2014 Annual Report states:

“Regarding Audits, nine rig specific audits were conducted by Transocean’s Corporate HSE Audit and Compliance group on five rigs operating in the Waters of the United States. Five of these were ISPS audits, and there were two each MSA and ISM audits (Note: ISPS, MSA and ISM audits are defined in Appendix 15.a.1-Audit). No major non-conformances/material deficiencies were found and therefore no follow-up on material deficiencies was required.”

and

“Four rig specific audits were conducted by Transocean’s Corporate HSE Audit and Compliance group on three rigs operating in the Waters of the United States. These included two ISM audits, and one MSA and ISPS audit. No major non-conformances/material deficiencies were found and therefore no follow-up on material deficiencies was required.”

and

“Three ISPS audits and five MSA audits, for a total of eight audits, were conducted by Transocean’s Corporate HSE Audit and Compliance group on five rigs operating in the Waters of the United States. No major non-conformances/ material deficiencies were found in these audits and therefore no follow-up on material deficiencies was required.”

(i) Summary of Policy and/or Procedure

Management System Audits

The MSA encompasses a comprehensive audit of the Company Management System, the Safety and Environmental System, and the Operational Procedures including the Emergency Management, Maintenance, and Well Control systems.
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section summarizes the internal requirement and process for self-verification audits and provides a sample of questions in use.

Hardware Audits

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section summarizes the internal requirement and process for equipment hardware audits for the well control equipment.

(ii) Industry Standard Compliance: External Audits

Audits by Class, Flag State including ISM Code Audits, and USCG are standard industry audits without which the appropriate Certificates are withdrawn for major non-conformances that are not dealt with in a timely manner.

Audits by BSEE similarly can cause a shut-down of operations and a withdrawal of the Permit-to-Drill.

SEMS Audits mandated for the operator with the secondary effect of requiring compliance by the drilling contractor, are standard industry requirements and these requirements and third party auditor requirements are set out by the Center for Offshore Safety. The audit requirements of these audits are prescriptive - some of which are described below.

ISM Code (Audit of the Safety Management System)

The Document of Compliance (DOC) is issued to the Company to certify that the safety management system of the Company has been audited that it complies with the requirements of the ISM Code for each specific vessel type. The certificate is valid for a period of up to five years subject to successful annual verifications at the Company premises. It covers both marine and industrial safety missions of the MODU.

The Safety Management Certificate (SMC) is issued to a ship/vessel/MODU to certify that the safety management system has been audited and that it complies with the requirements of the ISM Code, following verification that the DOC for the Company is applicable for the vessel type. The certificate is valid for a period of up to five years subject to at least one successful intermediate verification. An SMC cannot be issued without a valid DOC for the appropriate vessel type being in place.

In the office, the auditor will typically review objective evidence related to management control processes, such as incident, near miss and defect reporting; preventive and corrective action; safety meeting minutes; management review meeting minutes etc.; and all the objective evidence that shows the relationship and communications between the MODUs and the management ashore is secure.

On the MODU, the auditor will seek to verify that the day to day requirements of the SMS are being complied with and that the communication link, specifically to the DPA, and senior company management is working.
Non-conformity means an observed situation where objective evidence indicates the non-fulfilment of a specified requirement in the SMS or the ISM Code. The auditor will require corrective action to be taken within a stated period of time dependent on the severity of the non-conformity. This is generally up to three months from the date of the audit.

A major non-conformity means an identifiable deviation that poses a serious threat to the safety of personnel or the MODU or a serious risk to the environment that requires immediate corrective action and includes the lack of effective and systematic implementation of a requirement of the ISM Code.

ISM Code Audits are carried out by an external auditor as selected by Transocean as one of the Class Societies, currently DNV. A particular interest to the Review is the ISM Code Element 8: Emergency Preparedness. The audit tests whether the policies of the company are being carried out as laid out in the approved Transocean documents, including the Emergency Management Procedures.

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section summarizes the internal classification of audit findings and the requirements for each classification of finding.

This is a comprehensive and detailed Audit policy.

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section details information in a specific audit onboard one of Transocean’s rigs.

Class Society Surveys, Flag State Surveys (depending on Registry)

The audits for Class of a MODU are not regulatory audits, and as such may cover only marine systems unless the drilling equipment is certified for classification that is a voluntary optional service (designated by a “notation” DRILL by DNV or Certified Drilling System (CDS) by ABS) that Class Societies offer and for which the majority of all MODUs are not signed up. Because there is no legal liability or warranty offered by class surveys for the additional “notation,” there is a cost/benefit tradeoff for the drilling contractor. Classed drilling equipment may be bought which then allows interchange the rigs that do have the notation.

The audits for Flag State and USCG are usually based on classification of the MODU as a pre-requisite. The Flag State administration and USCG will often delegate their inspections to be carried out by the Class Society. The delegation includes a requirement for the owner to pay for the services of the Class Society, but it may be expedient for the drilling contractor if the Regulator does not have the resources to do the inspection in a timely manner. For these delegated inspections, the Class Society must inspect and audit to the requirements of the Flag State or the Coastal State (here, the USCG) with no deviation except by decision of the Flag State or Coastal State to allow any proposed deviation. The audits for USCG and Flag State focus on marine issues, and the Classification surveys are for marine systems except in circumstances where the optional drilling equipment notation is contracted for by the drilling contractor.
For foreign flag vessels (i.e. all Transocean MODUs in the Gulf of Mexico are foreign flag), the USCG inspects only issues to do with firefighting, lifesaving and stability. That fire and gas detection, firefighting, escape routes, and lifesaving equipment is maintained appropriately is audited by the USCG, as well as the Class Society for all but the lifesaving equipment.

Manning, training, and competency of marine crews fall under the USCG and Flag State detailed requirements. Dynamic Positioning equipment is under the purview of class, but the manning qualification and experience of the dynamic positioning personnel is voluntary standard in place by regulation but is enforced by Transocean policies: USCG is anticipating changes to regulations in this area.

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section lists specific Rig audits and class surveys that were reviewed.

**BSEE & USCG Regulatory Inspections**

BSEE Requirements for Drilling Equipment and for Training are listed in the Code of Federal Regulation 30 CFR 250. Periodically, BSEE issues Notices To Lessees (NTLs) when time does not allow consideration in the CFRs. BSEE often refers to API standards for drilling equipment, in particular, API Std 53 for BOPs that will be “incorporated into regulation,” which means it is mandatory.

BSEE listings of Drilling Incidents of Non-Compliance (DINCs) are listed on the [www.bsee.gov](http://www.bsee.gov) web site. There were none found pertaining to Transocean. Additionally, for more recent ones (BSEE published data is over a year old), Transocean stated that there were none pertaining directly to it. Copies of INCs related to Operators were provided along with FOCUS items resulting from those INCs, and although not process safety issues, they were being closed out in a timely fashion.

**SEMS Audit for BSEE Compliance as Required by Operator**

The BSEE mandated SEMS are indirectly applicable to drilling companies and may provide overlap with the ISM Code where the goals are effectively the same. BSEE direct audits are on-site audits and if non-compliance is discovered, the company is issued a notice of an Incident of Non-Compliance (INCs). These are listed as DINCs when applied to a drilling contractor, with appropriate times for correction, and sometimes warnings and fines. The DINCs to drilling contractors are a new feature for BSEE.

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section lists additional information on management system audits.

**Process Safety Drill Audits (USCG and BSEE)**

The drills that are conducted on Transocean MODUs on the OCS comply with the various requirements including Flag State requirements, and Coastal State (USCG and BSEE) requirements. These are audited by the internal MSA teams, ISM Auditor, and, for marine
systems, the Flag State appointed surveyor, as well as the USCG and are generally well
executed in the industry.

Marine Drills for Fire/Emergency, Abandonment, Man Overboard, Ballast etc. are the purview of
the USCG and the record is regulatory checked by the ISM audit and the USCG inspection. If
deficient, the Certification is withdrawn and the MODU cannot work.

Well Control Drills are listed in the Well Control Manual that complies with BSEE requirements
in 30 CFR 250.

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section lists specific
drills and frequency as required in Transocean’s policies and procedures.

Training Audits: BSEE and USCG

The Transocean program of training for each employee associated with Well Control is
designed to qualify personnel and contains safeguards to verify that those passing the course
understand and can perform their assigned Well Control duties (including the DP positions
which although marine, are important to Well Control).

For the drilling disciplines the program complies with BSEE requirements as laid out in Subpart
O—Well Control And Production Safety Training starting at 30 CFR 250.1500. Personnel records
demonstrate successful completion of the courses, the records of which are kept on file at the
office and on the MODU. Depending on the level and job description, the proper program or
combination of programs is used to validate competency of the core topics and skills required.
Transocean’s personnel attend courses which are accredited to the IADC WellCAP® program,
details of which are listed on the IADC web site at www.iadc.org. BSEE inspectors check the
training of personnel during their MODU visits and INCs are noted if the documentation is not
satisfactory on board according to their requirements:

- 30 CFR §250.1503 What Are My General Responsibilities For Training?; and
- List of Potential Incidents of Non-Compliance (PINCs): G-841 through G-849, G-852
  through G-854, G-856, G-860, G-862).

The training program for marine personnel is laid out in standard IMO requirements for marine
personnel, which encompass all marine positions including OIM, Master, and Chief Engineer.
Training of the dynamic positioning personnel is a voluntary requirement (MSC.1/Circ.738/Rev.1
7 July 2006) to the Nautical Institute training based on IMCA Guidelines M 117 Rev.1 “Training
and Experience of Key DP Personnel”. Transocean has adopted this voluntary requirement as
compulsory.

OPITO Audit and Certification

The Transocean system is audited to Offshore Petroleum Industry Training Organization
(OPITO) requirements, which are considered a top industry standard. OPITO has the industry
recognized criteria to be used in approval of a company’s Competence Management System
that demonstrates employee competency to clients and regulatory bodies encompassing regular
auditing a company’s systems, ensuring continual improvement. The site audit takes place at
the organizations offices, as well as selected operational sites. Transocean has a developed
Competence Management System and certification by OPITO demonstrates the system meets with OPITO approval criteria.

Transocean’s OPITO Certification was currently valid during the time of the Review as noted in the Transocean Annual Report 2014:

“Following the Q2 audit conducted by OPITO on the Houston Training Center, new certification valid through June 30, 2017 was issued to Transocean, certifying that Transocean had been approved by OPITO for their Competency Management System.”

Additionally, the Certificate was provided confirming this expiry date together with the satisfactory OPITO Audit Report.

**IADC WellCAP® Audit and Certification**

The Transocean system for Well Control is audited to the IADC WellCAP® standard, which was verified as current. The Maersk training school follows the IADC program and itself is certified by IADC. Transocean uses feedback from its participants to audit the quality of instruction, which is a very important feature of the course to ensure the participants come away with the knowledge imparted, rather than just a passing grade. Several samples of feedback were reviewed and the comments particularly from senior personnel attending the courses confirmed that the quality of instruction is satisfactorily being audited.

**Customer Audits or Third party (Rig Condition Assessments)**

Oil Companies often use the IMCA Common Marine Inspection Document (CMID) as a template to conduct the marine audit. The CMID is considered to be a common marine auditing standard based upon guidance issued by the International Marine Contractor’s Association (IMCA).

There is no specific industry standard for audits of drilling systems.

These audits are carried out by oil companies for their own purposes, and are rarely available to Transocean.

**SECTION REDACTED**

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section describes Transocean’s process for document and closeout of customer or third-party audits.

**(iii) Confirmation of Compliance or Identification of Non-Compliance**

From the audits carried out there were no material deficiencies.

There were comments that arose from the Independent Auditor’s Annual 2014 Report, and are addressed below:

1. **Independent Auditor Comment on Well Control Equipment List for the National Response Resource Inventory Database (USCG)**

Audit Outstanding:
“Therefore, the intent and composition of the annual list of Well control equipment, provided by Transocean should be further reviewed and evaluated by the Consent Decree’s Independent Process Safety Consultant and United States agency representatives.”

The Audit Observation:

“Paragraph 21.c. of the Consent Decree requires that Transocean enter into the National Response Resource Inventory Database (USCG managed), all “Well Control and spill response equipment that they own, operate, or with which they contract”. This information was provided by Transocean to the United States for inclusion in the database as a “List of Well Control and Spill Response Equipment on Rigs as of January 13, 2014”. During the drilling rig field audits, a number of the individual well control items included on the list as being present on the Development Driller III (DD3) and Discoverer India were not present at the time of the field inspection. The missing items included, but were not limited to, spare BOP annular, spare upper and lower rams, spare LMRP connector, subsea test valves, and Yellow/Blue Pod MUX Connectors.

According to Transocean’s drilling rig personnel, selected items were on the rig’s deployed BOP or located in Transocean’s Amelia warehouse. The Independent Auditor also did not identify any Consent Decree or specific regulatory requirement that appeared to require these “Well Control” items to be maintained on drilling rigs. However, clearly the list is subject to change. Therefore, the intent and composition of the annual list of Well control equipment, provided by Transocean should be further reviewed and evaluated by the Consent Decree’s Independent Process Safety Consultant and United States agency representatives.”

The Independent Auditor’s observation was reviewed and the list of Well Control equipment evaluated. The National Response Resource Inventory database is maintained by USCG and originated as the Oil Pollution Act of 1990 mandated the creation of a national database of response resources that would be maintained by the USCG NSFCC. This voluntary equipment locator system, known as the Response Resource Inventory, does not appear to have a category for filing data on Well Control equipment, nor does the public website allow access to any information Transocean may have submitted. Spill response equipment held on drilling rigs is negligible; and a Well Control equipment list is unlikely to be of much benefit unless the program is mandated to include all drilling companies in a particular vicinity. Even so, it would an unlikely coincidence if a spare part could be sourced from another rig, and unlikely to be available to a competitor EXCEPT in an emergency when traditionally drillers have cooperated in such endeavors. Should there be a need for parts for a subsea blowout preventer, which could only be installed after the BOP was on the surface, the most efficient response would be to interrogate potential sources including other rigs with identical equipment by telephone/ or radio. Unlike for ships, it is relatively easy to locate other rigs in the vicinity and communicate with them or the organizations that own them. Current locations of rigs in the US are known to the BSEE, and must be submitted to USCG for Navigation Alerts, and are generally available at www.rigzone.com. Typically, as with relief well drilling, the industry responds in a cooperative fashion when such emergencies arise. So far as Process Safety is concerned, this outstanding item is recommended to be closed.

2. Independent Auditor Observation on Designation of Equipment as “Safety Critical”

Audit Outstanding:
“The methodology used by Transocean to identify safety critical designated equipment should be evaluated by the Consent Decree’s Independent Process Safety Consultant.”

The Audit Observation:

“The Company’s in-house process used employee experts and a “Rig Equipment Criticality & Risk Assessment” procedure that was developed as part of an operational maintenance strategy. This methodology was used to classify rig equipment and the related risk priority rating, known as the Total Risk Number (TRN). Using this methodology and TRN values for equipment, Transocean prepared and submitted a list of safety critical designated equipment organized by system and component category to the United States. The safety critical designated equipment on the list also received an electronic “tag” in the Transocean RMS II that allowed the Company to document corrective maintenance for inclusion in the summary report.

During the course of the review and audit, at least one piece of equipment used for well control during drilling operations as not identified on the list of safety critical designated equipment. The omission was consistent with Transocean methodology used and appeared to be based on reasonable technical rationale.

Transocean’s “Rig Equipment Criticality & Risk Assessment” procedure, however, is not solely focused on process safety but also incorporates impact to equipment or rig downtime and repair costs. Therefore, this risk assessment process may have gaps that result in TRN values that do not fully reflect the safety critical nature of the equipment.

Based on these observations, the methodology used by Transocean to identify safety critical designated equipment should be reviewed and evaluated by the Consent Decree’s Independent Process Safety Consultant. The identification of safety critical designated equipment would clearly be within the expertise and potential role of the Independent Process Safety Consultant. The Independent Auditor will again cooperate and assist in the review and evaluation, as requested.”

SECTION REDACTED

The following section describes the existing Transocean Equipment Criticality methodology and that it will be revised in 2016 to identify process safety related equipment within Safety Critical Systems (Operational Integrity). This will be the Transocean standard list of Safety Critical Equipment and be identified as such in RMS. This revision will also be reflected in the Maintenance Policies & Procedures Manual (CMS).

3. Independent Auditor Observation on Rig Specific Procedures

Audit Outstanding:

“As a risk management and process safety control, the revised THINK process should be evaluated by the Consent Decree’s Independent Process Safety Consultant.”

The Audit Observation:
“During the review and audit, four (4) observations were noted that were associated with practices, procedures, operations, or conditions that (1) were not a current compliance deficiency but could potentially result in a future compliance deficiency or (2) represented potential process safety or drilling risk-management issues. These observations included:

Transocean creates and uses “Rig-Specific Procedures“ (RSPs) on drilling rigs that pertain to elements of major hazard barriers in rig Safety Cases. These RSPs were not fully captured, controlled and documented in Transocean’s internal management system to meet the SEMS MOC requirements. As a result, Transocean modified the THINK Process to incorporate these RSPs.

As a risk management and process safety control, the revised THINK process should be evaluated by the Consent Decree’s Independent Process Safety Consultant.”

SECTION REDACTED

This section describes the requirements, applicable to rigs working in the United States, for the review, approval and storage of rig-specific procedures pertaining to major hazard barriers. This section also describes the content, review and approval of those rig-specific procedures deemed mandatory and those not related to process safety.

Therefore, as far as Process Safety is concerned, this outstanding item is recommended to be closed.

2B. CONCLUSIONS

The audits appear to be carried out diligently, and in the Review of the outstanding matters in FOCUs which is the tracking system for outstanding items from various surveys, inspections, audits. No process safety material deficiencies related to the Review were found and that the Non-Conformances identified in the various reports were normal with acceptable times for closing them out.

Because of the major changes to the Safety Cases incorporating the Corporate Bowtie & Rig-Specific Bowtie philosophy, the integration of the Safety Cases into the management process is not yet complete. But, Transocean is clearly leading in their approach to ensure that the Bowties, Barriers and Safety Case philosophy is adopted in their culture on board their US Fleet.

C. REVIEW OF MAINTENANCE PROCESSES, REQUIREMENTS AND TRACKING; WELL-CONTROL EQUIPMENT, PARTICULARLY WITH RESPECT TO THE BOP SYSTEM

The Review consisted of scrutinizing documentation related to the Well Control equipment, in particular the BOPs, the maintenance system and audits on the BOPs and control systems, and the marine integrity reviews, including class and flag administration audits on BOPs (for those with appropriate notations) and dynamic positioning systems, to the extent of ensuring no material non-conformances.

The Review took into account the requirements to tag safety critical equipment and ensure its path could be followed throughout the Company to assure confirmation of quality control input and assure urgency of the maintenance supply processes when required.

1. THE REVIEW PROCESS
The Review process consisted of Review of the maintenance policies and procedures, including detailed checklists where appropriate. On-Site in Transocean's premises there was an interview session where an extensive interrogation and understanding of the features of RMS II was demonstrated.

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section describes the methodology used to review the Companies maintenance system and processes. It further explains in detail, the manner in which equipment is categorized and how spares are managed.

1a. Internal Documents Reviewed

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section provides a listing of all Company documents reviewed as part of the process.

1b. 3rd Party Information Reviewed

External Documents


Regulations for Well Control Equipment & Other Documents


4. API RP 64 Recommended Practice for Diverter Systems Equipment and Operations- Covers subsea diverter systems and components, including design, controls, operating procedures, and maintenance.

5. API RP 14FZ, Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Zone 0, Zone 1 and Zone 2 Locations, First Edition (September 2001), reaffirmed (March 2007); incorporated by reference at §250.114, § 250.803, and §250.1629.


1c. Interviews

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section describes the personnel interviewed as part of the process, their titles, subject matter covered, along with any findings and comments.

1d. On-Site Assessments

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section describes the details of material reviewed during the onsite assessment portion of the process.

2. THE ASSESSMENTS, EVALUATION AND CONCLUSIONS

2a. Assessments / Evaluations

(i) Summary of Policy and/or Procedure

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section describes the proprietary details of the Companies Maintenance Management System, including an extensive, detailed breakdown on multiple levels of functionality and how the methodology used to review the Companies maintenance system and processes. It further explains the manner in which equipment is categorized and how spares are managed.

Performance Requirements of the Blowout Preventer (BOP)

The primary functions of BOP system in operation are to:

- Confine well fluid to the wellbore;
- Provide means to add fluid to the wellbore; and
- Allow controlled volumes of fluid to be withdrawn from the wellbore.

Additionally, in performing those primary functions, BOP systems are used to:

- Center and hang off the drill string in the wellbore;
- Regulate and monitor wellbore pressure;
- Shut in the well (e.g., seal the annulus (void), between drill pipe and casing);
“Kill” the well (prevent the flow of formation fluid, influx, from the annulus and drill pipe into the wellbore);
Seal the wellhead (close off the wellbore); and
Sever the casing and/or drill pipe (in case of emergencies) noting that the new requirements (30 CFR 250.416 “the blind-shear rams installed in the BOP stack are capable of shearing any drill pipe (including work string and tubing) in the hole under maximum anticipated surface pressure”).

The BOP Equipment is considered to include: the BOP body, Annular Preventers, Blind Shear Rams (which seals against fluids), Casing Shear Rams, Pipe and Test rams, Choke & Kill Valves and Lines, Connectors, and Accumulators mounted on the BOP. The Control system includes Electrical Power, a Hydraulic power unit, Control panels, Lower Marine Riser Package, which contains accumulators; and Subsea Control Systems designated with yellow and blue pods.

Current BOPs have 15,000-20,000 parts and the controls employ about 15,000 lines of computer code, although required primary maintenance issues focus on less than 10% of those parts.

Compliance to API Standards calls for robust QA/QC during manufacture and assembly; rigorous testing; regular hydrostatic pressure and function tests; and thorough documentation of the configuration, and sequences and changes.

API Standard 53 encompasses a set of Tables that describe specifically tests that need to be carried out on BOPs, both pre-deployment and subsea.

Table 6 & 7 Surface and Subsea Testing of Secondary, Emergency, and Other Systems - this lays out the system to be tested, the components that are to be function tested, the frequency and the acceptance criteria. The system includes the Acoustic system, ROV critical functions, Deadman Autoshear and EDS sequences.

Table 9 & 10 Pre-deployment and Subsea Pressure Tests including the pressure and how long it has to hold to ensure it is working properly typically 5 minutes with no visible leaks.

Pre-deployment testing includes function testing of critical components for example:

- Water must be flowed through valves in choke and kill (C/K) lines;
- Retraction or separation of connectors to ensure the lock/unlock circuit is operational;
- Rams closed from bottom to top for visible verification;
- Every function from both pods from both panels are tested as working;
- All check valves in the system, accumulator system are tested and working;
- All ROV intervention ports are tested;
- Rams tested in closed and blocked positions with locks energized.

Transocean has a specific policy for pre-deployment testing BOP Pre-Deployment Checklist and an example was Reviewed:

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This portion of the section describes the process and documentation utilized to insure the BOP is healthy prior to deployment subsea. An example of rig specific documentation is also discussed.
Specific Comments on Maintenance Scope Related to BOPs:

A careful review and evaluation was made of Transocean’s maintenance processes, requirements and tracking for BOPs. This review included review of how manufacturer’s recommendations for maintenance on specific BOPs are captured, how the practice of Transocean in using only OEM parts or the rigorous method of qualifying equivalencies is carried out. Additionally, the Transocean review of audits of manufacturers was carried out to ensure compliance with API Standard 53. That information was evaluated along with Transocean practices of how those issues are internally monitored in the computerized maintenance system.

(ii) Industry Standard Compliance, If Any

Regulatory and Industry Standards for BOPs

A drilling contractor obtains the BOP from a specialized manufacturer. At the operational stage of an asset’s life cycle, asset maintenance and reliability practices for assets are mostly comprised of inspection, test activities and pro-active maintenance. These activities are conducted to help detect and/or prevent BOP equipment failures before their occurrence and are typically performed on a time and/or event-based schedule as per the Tables 6 & 7 in API Std 53. Event-based activities are performed in conjunction with an operational activity (e.g., running the BOP Stack, upon latching on the wellhead, scheduling a test during drilling operation, prior to drilling out of cased hole, prior to drilling into a known high pressure zone, or unplanned retrieval of the BOP). The driver for these activities includes regulations (BSEE), OEM recommendations, Operator requirements, and rig-specific maintenance programs.

BSEE regulations form the backbone of the regulatory protection in process safety for the Well Control theme, and the USCG requirements form the backbone of the marine system (e.g., for lifesaving, fire and gas detection, alarms and firefighting). BSEE is responsible for regulatory compliance for drilling systems. The primary regulatory standards are contained in the CFRs for both agencies supplemented with Notices to Lessees (NTLs) for BSEE, which rely heavily on the industry standards, and supplemented with Policy Letters, NVICs and the IMO MODU code for USCG.

For the BOP maintenance processes, the primary requirements for current practice in the industry are contained in API Standard 53. The earlier version is incorporated by reference in the CFRs. The later version is current practice, and although it is not yet adopted by regulation is mandated by the Consent Decree for Transocean. The two documents are:


Diverters, shut-in devices, and rotating control devices are not addressed in the 4th Edition (see API RP 64 and Spec 16RCD, respectively) because their primary purpose is to safely divert or direct flow rather than to confine fluids to the wellbore.
Additionally, Notice to Lessees NTL No. 2009-G07 effectively applies to a policy that determines the location of the choke and the kill lines on the BOP stack. The requirement is to install both above the bottom ram, but with permission, the kill line may be installed below.

For equipment to comply with API requirements, the equipment must meet the requirements of the standard that applies to it, plus the equipment be accompanied by Certificates and must be monogrammed (symbols etched into the product) to signify approval with part specified serial numbers. Equipment that is "manufactured" to the appropriate standard and not monogrammed means that the equipment manufacturer was not certified by API, an important ingredient in the approval process.

The later API Standard 53 4th Edition incorporates a new testing requirement for the EDS, Deadman and Autoshear functioning that was not there before (Table 7 of API Standard 53). Prior to the Macondo incident, a deadman system was not required although Transocean had incorporated the deadman feature on all their rigs. After the Macondo incident, regulations were changed to require a deadman system Ref 30 CFR 250.422 (f) for dynamically positioned MODUs.

The Regulations on BOPs are laid out in the Code of Federal Regulations (CFR) 30 CFR 250.440 - 30 CFR 250.451. BSEE requirements now include¹:

- Requirements to show it is still within the manufacturer’s design specification;
- Overhaul testing, inspection and reporting of BOPs takes place to assure proper functioning; and
- Certification (on site representative) that (30 §CFR 250.417):
  - Well Control equipment has been examined to ensure that it is properly maintained.
  - ROV stabs on BOP stack have been function tested.
  - Drilling/casing/ completion programs have been reviewed to ensure that BOP equipment is not compromised at any time.

When you use a subsea BOP stack or surface BOP stack on a floating facility, independent third-party verification must be used that shows:

- The BOP stack is designed for the specific equipment on the rig and for the specific well design (i.e. shear rams must be verified as suitably designed for the project);
- The BOP stack has not been compromised or damaged from previous service: after a Well Control event, BOP system must be inspected and tested; and
- The BOP stack will operate in the conditions in which it will be used (e.g., HPHT);

The independent third-party must be a technical classification society, or a licensed professional engineering firm, or a registered professional engineer capable of providing the verifications required by 30 CFR §250-416.

A further provision requires that the records of maintenance and the BOP system are retained: 30 CFR §250.1611.

Additionally the ROV hot stab systems must:

- Be tested on the stump with similar rate pump as the ROV pump; and
- Be capable of closing the blind shear ram, a pipe ram, and unlatch from the LMRP, 30 CFR § 250.449 §250.517 §250.617.

¹ www.irfoffshoresafety.com/conferences/2010conference/presentations/1100am%20Herbst,%20Lars.pdf
U.S. regulations, do not require testing of the high-pressure BSR close function before or while the BOP is in service. This safety limitation is in contrast to the weekly testing required for other BOP functions, including the low-pressure BSR close function. API RP 53, 3rd Edition states “All operational components of the BOP equipment systems should be functioned at least once a week to verify the component’s intended operations.” The definition of “component” is commonly taken to be the various preventers (annulars, pipe rams, blind shear ram, etc.). Thus, a test using the low-pressure BSR close function would be in compliance with the requirements. Repeated testing of the high-pressure close function might cause excessive wear on the BSR and thus no provision has been required for the high-pressure BSR close function.

Other API Standards relevant to the Review that have been “incorporated by reference” in the BSEE regulations relevant to drilling equipment requiring compliance are as follows:

API RP 14FZ, Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Zone 0, Zone 1 and Zone 2 Locations, First Edition (September 2001), reaffirmed (March 2007); incorporated by reference at §250.114, §250.803, and §250.1629 and


The Drilling Safety Rule, released August 15, 2012 and now incorporated into the CFRs, addresses requirements for compliance with documents incorporated by reference, some of which relate to drilling contractor equipment:

- Requires independent third party verification of blind shear ram capability;
- Requires independent third party verification of subsea BOP stack compatibility;
- Establishes new requirements for subsea secondary BOP intervention;
- Requires function testing for subsea secondary BOP intervention;
- Requires documentation for BOP inspections and maintenance;
- Establishes new requirements for specific Well Control training to include deepwater operations;
- Requires that an operator must have two barriers in place before removing the BOP, and that the BSEE District Manager may require additional barriers, 30 CFR§ 250.451(j);
- States that a dual float valve is not considered a sufficient mechanical barrier; and
- States that all BOP systems must include a wellhead assembly with a rated working pressure that exceeds the maximum anticipated wellhead pressure instead of the maximum anticipated surface pressure as was previously provided 30 CFR§250.443.

(iii) Confirmation of Compliance or Identification of Non-compliance

The requirements were reviewed and it was determined that the maintenance records include the latest standards requirements, and the audits examined show Transocean documentation is in compliance with the mandated requirements, and has incorporated the regulatory requirements anticipated to be incorporated in API Std 53 in the near future. It can be concluded that Transocean is in compliance with the industry standards.

2b. Conclusions

The RMS II system appears to be very robust, performed satisfactorily through all the scenarios put to the demonstrator, and was quite impressive. The Supply Chain management software was demonstrated and all questions responded to with satisfactory answers including the issue of payment schedules to suppliers which is tracked through the system (so that there is no
holdup for orders on safety critical equipment due to non-payment of invoices). The system demonstrated very satisfactory results for all the extensive interrogations.

This is a very comprehensive scheme; it is detailed in specifying to a rigor that would be admired by an efficient military organization. The scheme was additionally subject to the MSA Audit attended by the Independent Auditor.

D. REVIEW OF TRAINING AND COMPETENCY ASSESSMENT OF RIG WORKERS INVOLVED IN PROCESS SAFETY ACTIVITIES

Training is a Company requirement and a Regulatory Requirement. Marine positions on MODUs have specified internationally recognized regulatory requirements that are addressed by Flag State requirements, and USCG requirements much of which are embedded in IMO requirements. Regulatory Requirements for Training of Industrial (Well control) personnel are addressed by BSEE in 30 CFR §250.1500-1600.

Well Control personnel have Well Control training suitable to their position on the rig, which is mandated in the United States by BSEE. The relevant CFRs are as follows:

- 30 CFR §250.1503 What Are My General Responsibilities For Training?
- 30 CFR §250.1504 May I Use Alternative Training Methods?
- 30 CFR §250.1505 Where May I Get Training For My Employees?
- 30 CFR §250.1506 How Often Must I Train My Employees?
- 30 CFR §250.1507 How Will BSEE Measure Training Results?; and
- 30 CFR §250.1509 What Must I Do When BSEE Administers Or Requires Hands-On, Simulator, Or Other Types Of Testing?

30 CFR §250.1503 states that “you must establish and implement a training program so that all of your employees are trained to competently perform their assigned Well Control, deepwater Well Control, and production safety duties. You must verify that your employees understand and can perform the assigned Well Control, deepwater Well Control, or production safety duties”.

No specific requirements are given for Competency by BSEE, only that you attend and pass any tests and receive a Certificate showing successful course completion. Marine positions required by USCG have extensive training and experience requirements that are mainly based on international conventions. Dynamic positioning is not currently mandated for training in regulation, although it is a recommendation of USCG.

1. THE REVIEW PROCESS USED:

The Review Process relied in part upon the documents contained in the Transocean Management System, which had been verified by the Independent Auditor. The Training matrix provided a basic check on requirements over and above any regulatory entry requirements.

Competence was assessed on a subjective basis after review of the Competence Assessment Management system and comparison to the program evolving at IADC, which attempts to provide an industry standard for Competence.

Certification to OPITO is the only industry wide recognized standard, although guidance is also offered through a number of organizations.

The bigger Operators often carry out their own checks on Training prior to committing to a contract.

1a. Internal Documents Reviewed
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This sections lists internal documents reviewed relating to how Transocean assesses competency of offshore employees.

1b. 3rd Party Documents Reviewed

REGULATIONS AND GUIDELINES
2. ISM Code.
4. IMCA Guidelines IMCA M117 on Dynamic Positioning.
5. Regulatory Requirements for Training of Industrial (Well Control) personnel are addressed by BSEE in 30 CFR §250.1500-1600.
6. Offshore Installation Manager (OIM) Requirements (in accordance with IMO Assembly resolution A.891(21)).
8. IMCA Guidelines M 117 Rev.1 "Training and Experience of Key DP Personnel".
11. IADC Knowledge, Skill, and Ability (KSA) Competencies Program.
12. OPITO Competence Assessment Program Details.
1c. Interviews

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section details the people interviewed as part of the review of Transocean’s competency assessment policies and procedures. This includes a summary of the subject matter and additional commentary by the report author.

1d. On-site Assessment

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section refers to Appendix B and Appendix C below.

2. THE ASSESSMENTS, EVALUATION AND CONCLUSIONS

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section clarifies the position of the report author with respect to comments made in the following sections.

2a. Assessments / Evaluations

(i) Summary of policy and/or procedure

Safety Case Training

SECTION REDACTED
NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section details internal safety case training for specific positions.

Overall Training
Industrial Training Requirements (related to Well Control)

Transocean’s Well Control personnel training plan incorporates both traditional classroom WellCAP® Supervisory and Introductory WellCAP® as well as hands-on OJT. The WellCAP® is an approved certification of the content of the courses and is the industry standard. Transocean also recognizes the IWCF standard for Well Control certification. For a course to be approved the “school” has to provide qualified instructors, establish criteria standardized to the IADC agreed (industry) course content, an agreed test program, and student assessment. For each “discipline,” there are four levels: Introductory, Fundamental, Supervisory, and WellCAP® Plus. This allows the industry to have uniform training standards. Successful completion of IADC WellCAP® WCT programs verify that personnel engaged in Well Control operations know and understand their assigned Well Control duties. The programs are designed to assess competency of personnel. They incorporate safeguards to verify that those passing the course understand and can perform their assigned well control duties. The Transocean system complies with BSEE requirements as laid out in Subpart O--Well Control And Production Safety Training starting at 30 CFR 250.1500 and is voluntarily audited to OPITO requirements. Personnel records demonstrating successful completion of the courses are maintained in GMS and are easily and readily accessible at any location on shore or on the MODUs. Depending on the level and job description, the proper program or combination of programs are used to validate competency of the core topics and skills required. Course requirements by course type for the IADC WellCAP® program are listed on the IADC web site at www.iadc.org.

The training requirement of Transocean for the personnel included in the Review rates as current best industry practice.

Marine Training Requirements (related to Well Control):

Marine Training for all marine personnel including OIM, Master, Chief Engineer, Lifeboat operators follows the requirements for MODUs as laid out in IMO regulatory requirements. The training and certification is mandated by the Flag State and USCG. The competency of seafarers is assumed when the Certification is received or endorsed. The Dynamic Positioning Operators have no mandated regulatory requirement for training, however, Transocean has an internal policy of following the IMO recommended training as well as their own rig-specific training. A new requirement in place since January 2012 that personnel taking the Nautical Institute training for certification in dynamic positioning will have to hold a ship deck officer’s or an engineer qualification prior to enrolling in the DP Operator’s Training Scheme.

Training at Transocean involves the following courses related to personnel responsible for station-keeping for dynamically positioned MODUs. Maintenance and Electrical training in DP
systems is also carried out for the persons responsible for maintaining the system, but those are not addressed in this Review.

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section includes a table of specific courses related to station keeping and details the positions that are required to complete these courses.

Competence

The Competence Assurance Management System Manual was examined and determined to have a comprehensive policy statement and program of establishing knowledge and proficiency of the key skilled jobs for offshore, auditing internally and externally with third party auditors.

No industry or regulatory standards are directly relevant, and the Transocean competence system is, to the Reviewer's knowledge, the “first of its kind” in the offshore drilling industry. The IADC are developing a program and a set of KSA templates, covering all skilled rig worker positions, with priority focus on safety-critical positions. The main objective is to provide the tools for confirming competency/proficiency levels of the current drilling work force. The IADC KSA offering is not considered to be in a form that it can be adopted and considered an industry standard. Based on talk with members of the Committee creating this template, there may be some time before it is ready for adopting.

Based on the Review and considerations of the process systems, the Transocean Competence Assurance management system is deemed a very positive step in raising the bar on assuring competence/proficiency of the workforce. The Competency Assurance and Assessment program at Transocean are currently “state-of-the-art” and they have set the standard for Best Practice.

On-the-Job Training

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section provides a description of various on the job training modules required for Transocean offshore personnel.

The OJT assessment of Competence is very satisfactory.

Well Control Competency Assessment Plan

The Well Control Competency Assessment Plan included assessments for the senior drilling personnel on the rigs was examined. It complies with the training requirements in 30 CFR. § 250.1500-1510 (Subpart O) in particular 250.1503. It identifies the skill sets and other competencies needed to recognize, evaluate, and respond to Well Control events. It provides for the assessment of skills and competencies necessary to cope with those events and provides appropriate corrective actions for personnel who do not demonstrate the identified skills or competencies, including but not limited to, ensuring that any such personnel who have not demonstrated such skills and competencies shall work under direct supervision of a competent person until such skills and competency have been demonstrated, and results
documented. Management mechanisms to review and improve the system as time progresses are stated.

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section describes Transocean’s policy for ensuring well control competency for offshore employees.

Thus, the training together with the procedures provided in the updated Well Control Handbook provides appropriate guidance for process safety.

**Driller Competency Assessment Program**

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section describes Transocean’s policy for ensuring competency for those offshore employees in the position of Driller.

**Dynamic Positioning Competency Assessment Program**

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section describes Transocean’s policy for ensuring competency for those offshore employees in the position of Dynamic Positioning Operator.

The Transocean DPO Competency program meets voluntary regulatory requirements, the Certification requirements of the MODU Flag state, the best industry standards, and best practice.

**Subsea Supervisor Competency Assessment Program**

**SECTION REDACTED**

**NON-CONFIDENTIAL SUMMARY OF INFORMATION:** This section describes Transocean’s policy for ensuring competency for those offshore employees in the position of Senior Subsea Supervisor or Subsea Supervisor.

The Review confirmed that the competency requirements of Transocean comply with the regulatory requirements and best practices of the industry in related to this position.

**(ii) Industry standard compliance, if any**
Marine Manning requirements are determined by the MODUs Flag Administration. The Master, OIM and Chief Mate and other marine personnel are set out in requirements adopted in the 1999 IMO Resolution A.891(21), “Recommendations on Training of Personnel on Mobile Offshore Units (MOUs).” This document in 48 pages sets out the required knowledge that is expected of the personnel. It does not set out the service time or the service history of the personnel. It also does not deal with the position of a DP operator. The Flag State requirements for personnel include service time for marine personnel as well as adopting the qualifications. The number and categories of personnel on board are laid out by the flag registry requirements. Marshall Islands’ document Marine Notice 7-038-2 Rev 11/12, for example, sets out the minimum manning requirements: the qualifications for and length of service is laid out in MI-118.

There is no specific coastal or international regulatory requirement for DPO training. There is recommended guidance provided by the IMO and a Flag State requirement for DPO Certification.

**IMO GUIDELINES FOR DYNAMIC POSITIONING SYSTEM (DP) OPERATOR TRAINING**

**MSC.1/Circ.738/Rev.1 7 July 2006.**

This document notes guidelines for the DPO training agreeing to make a reference to the IMCA Guidelines M 117 Rev.1 “Training and Experience of Key DP Personnel” in the footnote to section 4.12 of the 1989 MODU Code. This Guideline covers all DP generic vessel operator training on all type of DP vessels including MODUs. The Nautical Institute course with compliance for watchkeeping and sea service qualifies the DP personnel for the recommended industry standard. Recommended watchkeeping standard is contained in an STCW Part B requirement Section B-VI “Guidance on the training and experience for personnel operating dynamic positioning system”, adopted 2 July 2010.

Transocean has an internal requirement of a marine qualification for its personnel having achieved a marine license and completed the Nautical Institute course on Dynamic Positioning.

Regulatory requirements in the US are under the watch of the USCG and, at the time of writing, USCG recommends the IMO proposed documented training of the DPO as appropriate: it has yet to be codified in a NVIC or CFR.

"Until the Coast Guard publishes a DP Rule, the Coast Guard recommends owners and operators of dynamically positioned MODUs (not leaseholders who contract MODUs) operating on the U.S. Outer Continental Shelf (OCS) voluntarily follow guidance provided in the “DP Operations Guidance Prepared through the Dynamic Positioning Committee of the Marine Technology Society to aid in the safe and effective management of DP Operations,” March 2012 Part 2 Appendix 1 (dynamically positioned MODUs), available at [http://www.dynamic-positioning.com/dp_operations_guidance.cfm](http://www.dynamic-positioning.com/dp_operations_guidance.cfm).

The MTS Guidance Notes refer to IMCA 117 as the appropriate document, which states:

“Key DP personnel include masters, DPOs, engineers, electricians, electronic technicians and anyone involved in the safe position keeping capabilities of the vessel and includes those involved in the deployment of PRSs. Owners/operators are encouraged to develop their own competency verification processes for all key DP personnel.

**IMCA M117 provides the DP sector with detailed guidance on the training and experience of key DP personnel. M117 has been adopted by the IMO and issued as IMO MSC/Circ 738 (1996). A reference to M117 is also made in the MODU Code.**

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M117 provides guidance on formal training courses for DPOs and other key DP personnel, including watchkeeping marine engineers and electronic maintenance staff.

M117 recognizes the formal training and certification scheme for DPOs administered by the Nautical Institute. The Nautical Institute scheme is universally recognized as the industry standard for formal training and certification of DPOs.”

The regulatory organizations that require and audit training are given in Table 1 (above Section B) and training drills are undertaken as indicated in Table 2 (above Section B). Transocean provided GOM Training Matrix 01.24.14, and updated Matrix 03.12.15, which follow the regulatory requirements and good industry practice.

The drilling and Well Control personnel training requirements are stipulated by the Regulator BSEE and this is the industry standard.

There is currently no regulatory requirement for competency testing, outside of specified training required by BSEE as outlined above. The IADC is developing a program and a set of KSA templates, covering all skilled rig worker positions, with priority focus on safety-critical positions with well-control responsibilities. The main objective is to provide the tools for confirming competency/proficiency levels of the current drilling work force. The IADC system is currently a work-in-progress but not yet an industry standard. Based on a review of the IADC system as of the end of 2014, it was not up to the Transocean standard and was looking like it is unlikely to get there in the near future.

(iii) Confirmation of Compliance or Identification of Non-compliance

Competence depends not only on the individual but also on the instructional information provided to carry out the activities assigned to the individual. Two documents illustrate the information available in procedures which instruct on carrying out the activities relevant to this Review.

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section is a list and description of additional policies and procedures where Transocean details activities that are relevant to employee competency.

These two example documents appear to be comprehensive in the assignments of both activities and responsibilities.

2b. Conclusions

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section detail internal training for Transocean’s safety cases, well control and the overall method of assigning training for Transocean offshore employees.
The training requirement of Transocean for the DPO and Drilling personnel, including the OIM and Master in the Review rates as current best industry practice.

Based on the Review and considerations of the process systems the Transocean Competence Assurance management system is deemed a very positive step in raising the bar on assuring competence/proficiency of the workforce. The Competency Assurance and Assessment program at Transocean are currently “state-of-the-art” and they have set the standard for Best Practice. No industry or regulatory standards are directly relevant, in the knowledge of the Reviewer, and this is the “first of its kind” in the offshore drilling industry.

Guidance on the Bridging Document has been provided in API Bulletin 97 Ref 3. This document has not yet been mandated by regulation, nor does it contain specific recommendations on the training or competence or procedures to be put in place for the oil company subcontractors on board or the Oil Company Supervisor.

Records of training are kept for a period of five years for all of its active duty personnel and personnel that have been on active duty within the past five years.

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E. FINAL CONCLUSIONS

Process safety aboard MODUs is a shared responsibility between the Operator and the Drilling Company. Many of the major accident hazard risks are evaluated out of the view of the Drilling Company. Some components of these risks are:

- Operator Representative - Competency including experience, and Management Style;
- Mud Engineer - Competency and communications about risks for a major accident event due to mud issues, diligence in fluid monitoring, and type of liquids introduced into the well;
- Cementing Engineer - Competency and communications about risks for a major accident event due to cementing issues (a well documented frequent source of potential blowout events);
- Competence of Equipment supplied by operator i.e. float valves, downhole packers, tubulars, etc. at time it leaves the OEM, and after transport and handling on the rig; and
- Potential change in risk resulting from changing equipment from original plan, or change by adding or deleting tests that might result in remedial actions to provide a risk ALARP.

All these items fall into the responsibility of the Operator Representative, for which there is except in extreme circumstances little opportunity for the drilling company to effect change in the field. Nor is it generally a custom to include the drilling company in all the risk decisions made by the well designers and well control experts, who are generally ashore and communicate through the Operator Representative on board. Simply because they are not on the Rig they are enormously less aware of the complete array of risk factors affecting their input to the decisions. While the benefits to the availability of experts on shore are obvious, the situational awareness and context may be missing. Industry concentration on arrangements to provide for more of a team approach would be of benefit.

The drilling company shares in the Process Safety by provision of:

- Equipment that meets or exceeds industry standard;
- Equipment that is maintained appropriately, spares available, etc.;
- Personnel who are Competent including those who are managing the drilling (primarily OIM), the drillers (Toolpushers/Drillers), those involved with BOPs and support equipment (Subsea Supervisors), and those responsible for station-keeping over the well (DPO); and
- Procedures that explain the system of work which identifies and reduces the probability of a major accident particularly in the area of Well Control and associated activities.

The focus of this Review has been only the drilling company Transocean’s role in Process Safety.

There is no doubt that maintenance of the drilling contractor’s safety “barrier” equipment, in particular BOPs, is high value for them. A study funded by the BSEE Technology & Research, study 713, gives two instances of an anonymous drilling contractor’s losses in the study:

• Faulty BOP valve resulted in an inability to test the shear/blind ram which required the BOP to be pulled out of water which took 14 days round trip and cost $10.1 million downtime to a drilling contractor; and
• BOP downtime loss for this drilling contractor was $80 million in 2011 and $60 million in 2012.

During the Review the maintenance system was examined in detail in the office, on the Deepwater Nautilus, through the supply chain delivery system and was found to be a satisfactory and appropriate system for priority attention to BOP and Well Control equipment. The procedures and verification of actions to be taken in inspection, re-certification, and pre-deployment checks for the BOP were examined. The supply chain system included quality control audits at the equipment supplier locations. The designation of safety critical equipment was specifically reviewed in relation to the BOP and Well Control equipment that maintained an appropriate designation in the system as well as the highest priority throughout.

Documents regarding Transocean’s safety policies and programs and the implementation of those programs have been Reviewed and requested enquiries were answered with interviews of subject matter experts to explain the systems in place. The Review included documents from top to bottom in the hierarchy: from the Governing Principles describing the overall Company Management System to the operating manuals, and maintenance manuals examining the policies and procedures throughout. The system of process safety as described is very comprehensive and does contain the information required to minimize the probability and consequence of a major accident event. When the safety case revisions are complete with the latest Bowties and Barriers, rated against customary practice for process safety in the offshore drilling industry will be nothing short of exemplary.

Transocean management attitude emphasizes and encourages process safety as an example most recently through changes in the MSA, which emphasize compliance with the Corporate Bowties and Rig-Specific Bowties as its theme. This philosophy is communicated through the organization and appears to be being effectively implemented at all levels. Transocean management’s support for safety is embodied in the Transocean Safety Vision: “operations will be conducted in an incident-free workplace—all the time, everywhere.” While many companies work under the assumption that this applies only to Occupational Safety, Transocean has embraced applying the concept to Process Safety. The effort to foster an effective safety management culture and ensure that the company’s safety vision resonates through to the crew members aboard its MODUs appears to be a priority. The procedure of “take time out for safety” is a good name for the “stop the job” policy, and because of its name is much more likely to be used.

Transocean has taken a major step in developing Safety Cases for each of their MODUs operating in US waters, in order to summarize the management commitment to process safety, the process safety characteristics of the physical MODU, the personnel training and competence aboard, the hazard identification and barriers put in place to prevent process safety incidents, and an audit trail. This is infusing “safety case culture” into the workforce.

For the Review of documentation, Review of the audits on BOP and associated equipment, Review of competence training of personnel, quality and content of the instruction courses, the conclusion is that Transocean have risen to the task of using “best practice” in a satisfactory system of managing process safety with respect to Well Control, Blowout Preventers and Training in carrying out their work.

Based on discussions with respect to the plans to improve the Safety Case still further from the latest revision to modifying it into a much more crew-friendly document it is anticipated that the next Review will show yet more progress on the journey to change the culture of the workforce.
F. REFERENCES

MACONDO REPORTS
1. The Chief Counsel of the National Commission on the Deepwater Horizon Oil Spill and Offshore Drilling (2011).
2. Transocean Investigation Report incl. Appendix H.

OTHER REFERENCES
4. API Standard 65 Isolating Potential Flow Zones During Well Construction, (December 2010). The purpose is two-fold; firstly, to help prevent and/or control flows just prior to, during, and after primary cementing operations to install or “set” casing and liner pipe strings in wells. Some of these flows have caused loss of Well Control. They threaten the safety of personnel, the environment, and the drilling rigs themselves. The second objective is to help prevent sustained casing pressure (SCP), also a serious industry problem, incorporated by reference at §250.415.
5. API RP 90, Annular Pressure Casing Management in Offshore Wells provides guidelines on managing annular casing pressure (ACP) including SCP, thermal casing pressure, and operator-imposed pressure. These guidelines include monitoring, diagnostic testing, establishing the maximum allowable wellhead operating pressure, documenting annular casing pressure, and risk assessment methodologies.


12. Randy Smith Well Control training 264 pgs.


15. The ISM Designated Person - Keystone or Scapegoat? Original Article for Maritime Risk International by Dr Phil Anderson.


19. IMCA Guidance to Simultaneous Operations IMCA M203 (March 2010)


24. IMCA DP Safety Flash 01-14 Loss of 3 Gyros on DP-3 Drill Ship


34. Oil and Gas Producers Association (OGP), Deepwater Wells Global Industry Response Group recommendations Report No. 463 (May 2011), subject Bridging Documents.


36. Fire system integrity Assurance Report No. 6.85/304 Oil and Gas Producers Association (June 2000).


APPENDIX A : MAP OF TRANSOCEAN’S PROTECTIONS: PROCESS SAFETY

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section maps between specific components of Transocean’s Safety and Environmental Management System (SEMS) with specific consideration for Process Safety to relevant external requirements.

SECTION 1 - COMPANY ORGANIZATION

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section describes Transocean’s key documents providing governance on process safety.

SECTION 2 REGULATORY AREA

The subject of the Review refers to Well Control personnel, Marine and Subsea personnel, and Subsea equipment. This section provides an overview of the factors in place related to process safety and controls in place whether through personnel, equipment, or overall regulatory compliance.

1. The Regulator for Well Control and Subsea issues is BSEE. BSEE does not delegate any inspections. The Marine crew is subject to requirements of USCG and the MODU’s Country of Registry requirements (a.k.a. Flag State requirements) both of which rely on the IMO MODU Code. Class societies often carry out these surveys on behalf of the Flag, or Coastal state, and have their own voluntary requirements which take into account their technical rules.

2. The Safety Management System is effectively a requirement for drilling contractors for US operations for which the Company although following the Company Management System also benefits for having that system summarized in a Safety Management System document.

3. The International Ship Management Code (ISM) is an IMO required safety management system and the Port Facility Security Code (ISPS Code) is a comprehensive set of measures to enhance the physical security of ships and port facilities. In the ISM Code the Master is always considered in overall command on a non-moored vessel, and the OIM is appointed PIC when the vessel is unable to move. For dynamic positioning the Master’s job is seen by Code interpretations to provide the Master in charge but deferring to the PIC for Well Control matters which often control the action prior to the declaration of an Emergency. (There appears to be no confusion for the personnel on board even though the issue is often discussed in legalities ashore. This is not considered a process safety issue).

4. GOM Training Matrix - This lays out all the training required for each of the crews and covers overall knowledge that key personnel on board are required to take and also the skill specific training for certain positions. Safety Case training is carried out though not currently noted in the Matrix.
5. Training Skill Specific - refers to skill proficiency training in the profession of the key personnel: the things they have to know to prevent a process safety incident (in areas subject to the Review). OJT is a vigorous process at Transocean.

6. Safety Case Training which addresses specifically process safety protections is not currently on the GOM Training Matrix, and so the training on Safety Critical Duties, and Safety Awareness and Video training is included as a separate line item. It is slated to be included in the GOM Training matrix within 6 months.

7. Competence assurance is an important part of ensuring that the full understanding of the tasks since personnel on board the rig must act as a team and must have sufficient knowledge, skills and abilities to carry out their assigned duties. This is undertaken as described in the Competency Assurance Management System Manual. Competence is assured through Specific Transocean Requirements (i.e. Well Control competency; having a voluntary requirement that DP personnel carry at least a 3rd mate’s license and that they have been through the Nautical Institute or equivalent program as recommended by IMO, and that the subsea personnel are properly trained by a combination of understanding manuals and BOP OJT).

8. In relation to competence in all cases the key personnel are required to take and pass all OJT requirements for their skill set undertaken with the Competency Assessment Plan for each of the disciplines.

9. The responsibility for the Emergency Disconnect Sequence (EDS) is officially authorized to the Forward Driller position. Several other senior personnel on board the rig are also authorized i.e. Snr. Toolpusher and OIM as well as the Dynamic Positioning officer under some conditions if the rig reaches Red Alert status for loss of station-keeping.

SECTION 3. OPERATIONS

1. Each MODU has its own Rig-Specific Safety Case currently modeled after the IADC HSE Case Template. This is a key document as it sets out in summary form the information needed by personnel to understand the company policies and commitments, the safety management system, the rig-specific equipment, the hazards the MODU is subject to and these are categorized to understand the risks, followed by a Prohibited Operations chart and a list of safety critical equipment and duties of specific personnel. The Audits that are mandatory (carried out during the MSA) verify the system assumptions in place in the Safety Case are still valid.

2. The Maintenance Policies are described in detail and safety critical systems and equipment are designated in the Transocean system, by a “score” where the BOP and Well Control equipment is the highest priority. Significant checks are made and signed off before the BOP is deployed subsea as outlined in the Operations Policies and Procedures.


4. Deepwater Field Operations Manual for DP MODUs & Midwater Field Operations Manual for moored MODUs are procedure documents - specific instructions as to procedures carried out by the field crew and the responsibilities are designated for detailed activities in the procedures. The Drilling Operations Activities include Kick Detection Monitoring and a number of items concerned with drilling activities and BOP testing are included.

5. Skill-specific information. Each skill (for those addressed in the Review) has skill-specific resources that provide information and reminders about the knowledge the person needs to have the function competently. The DPO and Driller have a Well Specific Operating Guidelines
to cover the issues developed for the specific task the MODU and crew are undertaking. The Well Control Handbook and Rig Specific Procedures provide appropriate information.

6. Knowledge and Lessons Learned: It is important to keep up with the distribution of safety alerts from OEMs and other Advisory bodies and these are distributed for action and understanding.

SECTION 4 EMERGENCY RESPONSE

1. The ISM Code requires specific Emergency Training for Marine Personnel and this is a regulatory requirement for all the key positions involved in the Review.

2. For each MODU a Rig-Specific Emergency Response Manual is prepared which details the layout of the MODU, Evacuation and Escape Plan, the Station Bill emergencies and for providing instructions for key personnel, Safety Plan (fire control plan) for the locations of the firefighting and lifesaving equipment, posted documents. The Plan extends the interest to the shore-side supporting systems. This includes details of contacts and procedures.


4. The Safety Management Systems document referred to in section 2 REGULATORY AREA provides guidance on training, qualifications and competency of the Emergency Management system on board the rigs and ashore. This is also summarized in the Rig-Specific Safety Case.

5. Station Bills are rig-specific and lay out the duties of the crew in emergencies. The person in command during an emergency is listed; the responsibilities of the key members and their duties on each of the Emergency Response team; the Helideck team; the Medical team; the Accommodations Clearing team; the Well Control team; the Fast Response team; the Engineering and Damage Control team and the Fast Rescue Boat team. The Station Bill also allocates personnel to Abandonment stations (Lifeboats) and gives other key emergency instructions. The Station Bill, Fire control Plan, Egress and Evacuation Plan are all posted on each rig.

SECTION 5 WORKER INVOLVEMENTS

This section chronicles the various opportunities for workplace involvement which consists of Safety Meetings, some of which require worker representative attendance, HSE Advisories, Safety discussion at daily meetings, Toolbox talks, etc.

Workers have the opportunity to call Time-Out-For-Safety.

There are also rig posted Notices for Helpline, DPA Ashore and “Whistleblower” reporting when appropriate.

SECTION 6 CUSTOMER AND SUBCONTRACTOR PARTICIPATION

The section notes the Operator Bridging Document and the Subcontractor Bridging Document to ensure that all participants on the MODU are in line with the agreed safety protocols.

SECTION 7 AUDITS

This section describes the various Audits available for the Review, which were sampled when available.

SECTION 8 ADDITIONAL MANUALS/GUIDANCE

This section lists some further details of the manuals, and some further Manuals/References which are important to the process safety and complete the list of documents reviewed.
APPENDIX B: OBSERVATIONS ON WELL CONTROL SCHOOL:

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section details the author’s attendance in IADC WellCAP and the people interviewed as part of the review of the course. This includes a summary of the subject matter and additional commentary by the report author.

Conclusion:
1. The course audited was EXCELLENT.
2. It is very important that Transocean continue to audit the courses provided to ensure it satisfies the high Transocean standard needed both in the content and the instructor’s ability to deliver the participants the knowledge they need.
APPENDIX C: OBSERVATIONS ON MAHRA:

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section provides detailed observations on a Transocean workshop for major accident hazard risk assessment as part of the development of a rig-specific Safety Case.
APPENDIX D: OBSERVATIONS ON INTERVIEWS ON DEEPWATER HORIZON:

SECTION REDACTED

NON-CONFIDENTIAL SUMMARY OF INFORMATION: This section details the author’s discussions regarding the Deepwater Horizon and the people interviewed as part of the review.

This includes a summary of the subject matter and additional commentary by the report author.

Conclusion:

The crew were very forthcoming in their answers to questions, and reflected a very satisfactory understanding of the Transocean procedures and issues which could result in a major accident hazard. There were no major non-conformances or issues arising from the interviews. All the BOP issues appear to be being handled per procedures and the answers to questions and follow-on discussion appeared to be given frankly.
APPENDIX E: SCOPE OF WORK:

TRANSOCEAN CONSENT DECREES INDEPENDENT PROCESS SAFETY CONSULTANT
[DEVELOPED JOINTLY BETWEEN TRANSOCEAN AND OFFSHORE RISK & TECHNOLOGY INC. BASED ON CONSENT DECREES AND PERFORMANCE PLAN LANGUAGE]

Per Consent Decree and Performance Plan. The role of the Independent Process Safety Consultant is to assist Transocean in evaluating its process safety, including operational risk identification and management of risk, by reviewing Transocean’s practices related to the process safety related aspects of the Consent Decree, specifically BOP testing and maintenance, training, and well control. Primary deliverable involves two reports; one presented by October 2, 2015 and the other by October 17, 2017.

Based on a review of Transocean’s systems and processes, as well as a good understanding of how offshore drilling companies in the Gulf of Mexico should and do address process safety, the following will be the four areas that the Process Safety Consultant will review in order to prepare the two required reports. In addition, prior to each report being completed, the Process Safety Consultant will conduct at least two rig visits to interview employees involved in the process and evaluate first hand whether there is good knowledge and compliance with process safety.

1. **A careful review and analysis of the extensive process safety related information contained in the Transocean HSE Safety Case** applicable to the individual rigs operating in waters of the US. The Safety Cases are over 350 pages in length and address numerous related issues. These include, in sequence as outlined in the safety cases:
   a. **Overall management system description** (essentially same for each rig) including objectives, functions involved, responsible parties, competencies, standards and procedures for specific areas such as Drilling and Well Control Operations and Alerts and Bulletins, and finally a description of required performance monitoring including audit and compliance and verification of HSE critical activities/task and equipment/systems.
   b. **Rig-Specific description and supporting information including information on classification and design of the rig, detailed drilling, completion and well control systems, fire and explosion protection, evacuation and escape systems, and well testing.**
   c. **A risk management section** which includes information on crude oil under pressure and hydrocarbons in formation.
   d. **Emergency Response Section** detailing the policy, plans, control and command, training for emergency, and evacuation and escape.
   e. **Performance Monitoring requirements** including periodic monitoring and analysis of any incidents, behavior based observations, audit and audit compliance, verification of HSE critical activities/tasks and equipment/systems.

2. **A careful review and evaluation of Transocean’s Audit and Compliance Policies and Requirements** documents that have been provided to the US government agencies.
These documents are the basis for the mandatory rig audits that are conducted by Transocean’s corporate HSE audit group and the Process Safety Consultant will participate in one or more of such rig audits to evaluate the auditing effort relating to process safety related issues. These audits look for any non-compliance and in particular whether there are any major non-conformances/material deficiencies at the rigs.

3. **A careful review and evaluation of Transocean maintenance processes, requirements and tracking for well control equipment, in particular BOPs.** This review and evaluation will include the need to assess one or more BOP manufacturer’s recommendations for maintenance, requirements to use only OEM parts and related issues. That information will be evaluated along with Transocean practices and how those issues are internally reviewed and addressed within the Gulf of Mexico.

4. **A careful review of Transocean’s training and competency assessments for rig workers involved in process safety activities.** This evaluation will include the need to review in detail training and/or assessment standards developed by IADC, OPITO and any others as agreed to by Transocean and the Process Safety Consultant. The evaluation will include the Process Safety Consultant directly participating in process safety related courses and reviewing other relevant modules the Process Safety Consultant believes are important for the review.

The Process Safety Consultant will also attend the Q2 or Q3 2014 Transocean Offshore Drilling Ltd. HSE Committee and Board meetings to understand what information the Committee is already periodically receiving and obtain input regarding what information would be of assistance for their required process safety related evaluations.

In addition, through conducting the reviews as described above, if other areas to review are identified, the Process Safety Consultant, Transocean and the US government agencies will in good faith discuss the possible expansion of the scope provided it is reasonable and consistent with the applicable language of the Consent Decree and Performance Plan.

It is intended that the Process Safety Consultant’s report will focus on a summary of the review and any observations, conclusions or opinions regarding Transocean’s process safety efforts. The report shall include at a minimum a detailed description of 1) the review process used; 2) the assessments, evaluations and conclusions made; and 3) the background and rationale for conclusions.

The intent of the report is to provide this important independent information to Transocean management and the Transocean Offshore Deepwater Drilling Inc. HSE Committee of the Board of Directors as part of their obligation to evaluate the risks and processes associated with process safety, specifically BOP testing and maintenance, training and well control. The report will not focus on recommendations for any improvements and Transocean will need to carefully determine appropriate steps for any required remedial plan to better understand the actual implications and help ensure the greatest possible positive impact.

In addition, as referenced above, if at any time while the Process Safety Consultant is conducting the review the Process Safety Consultant concludes that there are any “material deficiencies” in
Transocean’s process safety relating to this Scope of Work, the Process Safety Consultant is to immediately report this conclusion in writing to Transocean, the TODDI HSE Committee and the US government agencies. For purposes of this scope of work, the definition of material deficiency is the same definition used within Transocean’s internal Audit and Compliance Manual for “major non-compliance”: A deviation from requirements that pose a serious threat to 1) the safety of personnel; 2) the vessel; 3) the environment; or 4) indicates the lack of effective systemic implementation of a requirement.
APPENDIX F: METHODOLOGY AND SCOPE:

This Review Report was prepared by Dr. Malcolm Sharples with Offshore: Risk & Technology Consulting Inc. and represents the Process Safety Consultant’s Report as agreed upon as the Scope of Work in Appendix E. This Reviewer’s intent is to provide a comprehensive view of Transocean’s methods of assuring Process Safety and as such required an in-depth and well-considered Review of the system of safety to prevent and/or mitigate results of a major accident event related to the requirements outlined in the Scope of Work. In some cases, an explanation of the background to the requirement is provided to ensure that the reader understands the basis of the issues and opinions.

The Review activities used by the Process Safety Consultant (PSC) to identify the method by which Transocean’s system of safety takes care of preventing a Process Safety accident or minimizing the consequences should it occur are outlined:

Provision and audit of several Safety Cases and referenced safety management documents referred to in the Safety Cases. Ultimately, more than 120 documents were produced some with additional revisions as they became available. The Review of written documentation was supplemented with examination of Management System internal audits, by external audits, with real time reviews of Transocean databases (FOCUS, RMS II, GMS, and HSE Toolbox) and interviews with managers and with crew members to confirm that the intended documented safety system was a reality for the field crews/teams.

Many industry standards and documents were acquired including API standards and recommended practices; OPITO (safety) standards; IMCA standards (marine and dynamic positioning guidance); OGP Reports on BOPs, Competency and process safety; IADC guidelines on Well Control training and competency. Additionally, the reports (18+) from the Macondo inquiries were reviewed together with many of the documents available publically from the investigations, trials etc. in order to ensure that the Review considered any legitimate issues that had bubbled up from testimony or exhibits presented which were in the subject areas.

Many industry papers/books were reviewed including some on cultural and social psychology issues to do with crew activities. Industry databases (e.g., BSEE, USCG, OGP etc.) on reported accidents were independently searched and data reviewed in order to ensure that any Transocean incident had been recorded and acted upon.

Interviews were conducted with a wide range of personnel, and over a wide range of subjects related to process safety, at Transocean’s premises located in Houston, Texas. A five-day Well Control course taught to crew was audited from June 8 to June 12, 2015, as well as the test administered and an opportunity was taken to have some crew interviews, discussions and evaluation. An in-depth enquiry session was held at the Transocean Training Facility during the course with exposure to the training simulation techniques used to teach Well Control. Observations are provided in Appendix B.

Attendance at the Major Accident Hazards Risk Assessment workshop from June 22 to June 26, 2015, provided insight into the process that identified the major accident hazards, identifying the items where the Well Control (among all other major accident hazards) provided barriers and an opportunity was taken to have some crew interviews, discussions and evaluation during those days. This was conducted by an expert facilitator. Observations are provided in Appendix C.

A field audit was conducted on Transocean’s MODU Deepwater Nautilus, which is stationed in the Gulf of Mexico on June 25, 2015. Several crew members were interviewed at a facility that was being overhauled so that in-depth examination could be made on the maintenance system.
in relation to safety critical systems and particularly the arrangements for the new BOP equipment.

Independent Auditor CALENDAR YEAR 2014 FINDINGS were reviewed and observations investigated and commented on.

The Review did not result in any material deficiencies in Transocean’s drilling rigs’ Major Accident and Hazard Risk Assessments (MAHRAs) or operational oversight of Well Control equipment which might produce a Process Safety accident event.

Transocean was alerted to several items that could lead to improvement which included as two examples, enhancement of the Register of Permitted Operations (ROPO), and the issue of potential lack of appreciation by the crew of the role of the ISM required Designated Person (even though it is well signposted on the MODUs) as tagged in a DNV ISM audit. Part of the ISM issue is that the normal reporting appears to be sufficient so, for Transocean, it appeared rare to have a situation arise which would have the crew report through this channel instead of using their normal safety management system procedure.

**TRANSEOCEAN’S COOPERATION AND TRANSPARENCY**

Transocean’s senior management and all other company employees fully cooperated with the Process Safety Consultant during the Review in response to the company’s compliance with the Consent Decree and Performance Plan. This included responding to a large number of requests for additional information as the Review progressed, and the document trail was being followed and mapped. Transocean was also fully transparent regarding the information, documents, and disclosures of issues. In all cases, documents requested were supplied efficiently or made available for viewing; where requested presentations were given and computer programs for items such as supply chain management and maintenance systems were demonstrated and all interrogations satisfactorily passed.

The Process Safety Consultant was provided full access to Transocean employees, as needed including subject matter experts for particular questions. As the Review progressed to optimize the understanding of the issues, when it became apparent that there was an ongoing Bowtie session to identify Barriers with a MODU crew and see and hear the crew in action on the development of the Barriers, a request was made to attend this valuable session and Transocean facilitated the attendance. Likewise, to evaluate the current training for drilling crew Transocean offered a Review of their new simulation training facility in Houston, which likewise was made available.
## NOMENCLATURE

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
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<td>API RP</td>
<td>API Recommended Practice</td>
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<tr>
<td>API Std</td>
<td>API Standard</td>
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<tr>
<td>BHA</td>
<td>Bore Hole Assembly</td>
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<tr>
<td>BOP</td>
<td>Blowout Preventer</td>
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<td>BSEE</td>
<td>Bureau of Safety and Environmental Enforcement</td>
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<tr>
<td>BSR</td>
<td>Blind Shear Ram</td>
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<tr>
<td>CAMS</td>
<td>Competence Assessment Management System</td>
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<tr>
<td>CDS</td>
<td>Certified Drilling System</td>
</tr>
<tr>
<td>CAP</td>
<td>Competency Assessment Program (OPITO certified)</td>
</tr>
<tr>
<td>DINC</td>
<td>Incident of Non-Compliance (BSEE term for non-conformance) assigned to a Drilling Contractor</td>
</tr>
<tr>
<td>DOC</td>
<td>Document of Compliance (ISM Code)</td>
</tr>
<tr>
<td>DOI</td>
<td>Department of the Interior</td>
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<tr>
<td>DOJ</td>
<td>Department of Justice</td>
</tr>
<tr>
<td>DP</td>
<td>Dynamic Positioning - system of holding position at a specific location</td>
</tr>
<tr>
<td>DPA</td>
<td>Designated Person Ashore</td>
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<tr>
<td>DP-CAP</td>
<td>Dynamic Positioning Competency Assessment Program</td>
</tr>
<tr>
<td>DPO</td>
<td>Dynamic Positioning Operator</td>
</tr>
<tr>
<td>Drill</td>
<td>Notation of DNV which notes they have a certified drilling system</td>
</tr>
<tr>
<td>EDS</td>
<td>Emergency Disconnect System</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<tr>
<td>ERP</td>
<td>Emergency Response Plan</td>
</tr>
<tr>
<td>ESD</td>
<td>Emergency Shutdown</td>
</tr>
<tr>
<td>FOCUS</td>
<td>Planning and tracking tool for corrective and improvement actions: Formulate an action plan, Organize resources to carry out the plan, Communicate the action plan, Undertake the action, Summarize and capture lessons learned.</td>
</tr>
<tr>
<td>GMS</td>
<td>Global Management System</td>
</tr>
<tr>
<td>GOM</td>
<td>Gulf of Mexico</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Explanation</td>
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<tr>
<td>HPHT</td>
<td>High Pressure High Temperature</td>
</tr>
<tr>
<td>HSE</td>
<td>Health Safety and Environment</td>
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<tr>
<td>HSE Case</td>
<td>Synonym for the Safety Case (as used in this document)</td>
</tr>
<tr>
<td>HSE Toolbox</td>
<td>Procedures (usually electronic) for interfacing with crew before a job starts</td>
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<tr>
<td>IADC</td>
<td>International Association of Drilling Contractor's</td>
</tr>
<tr>
<td>IBOP</td>
<td>Internal BOP</td>
</tr>
<tr>
<td>INC</td>
<td>Incident of Non-Compliance (BSEE term for non-conformance)</td>
</tr>
<tr>
<td>IMCA</td>
<td>International Marine Contractor’s Association</td>
</tr>
<tr>
<td>IMO MODU CODE</td>
<td>International Maritime Organization standards for Design and Construction of MODUs.</td>
</tr>
<tr>
<td>Integrity Management</td>
<td>Another term for Process Safety</td>
</tr>
<tr>
<td>ISM Code</td>
<td>International Safety Management Code; The maritime code, as defined in 46 U.S.C. §3201(1), for the international standard for the safe management and operation of ships and for pollution prevention</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
</tr>
<tr>
<td>KSA</td>
<td>Knowledge, Skills and Ability Competencies (IADC Program)</td>
</tr>
<tr>
<td>LC &amp; E</td>
<td>Legal Compliance &amp; Ethics</td>
</tr>
<tr>
<td>Level 1 Documents</td>
<td>Executive Level (Corporate)</td>
</tr>
<tr>
<td>Level 2 Documents</td>
<td>Operational Hub Level</td>
</tr>
<tr>
<td>Level 3 Documents</td>
<td>Rig Specific</td>
</tr>
<tr>
<td>MAHRA</td>
<td>Major Accident Hazards Risk Assessment</td>
</tr>
<tr>
<td>MMS</td>
<td>Minerals Management Service, Dept. of Interior - former name of BSEE</td>
</tr>
<tr>
<td>MODU</td>
<td>Mobile Offshore Drilling Unit</td>
</tr>
<tr>
<td>NAM</td>
<td>North American Operational Hub</td>
</tr>
<tr>
<td>Notation</td>
<td>An optional Classification society certification to include drilling equipment</td>
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<tr>
<td>Abbreviation</td>
<td>Explanation</td>
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<tr>
<td>NTL</td>
<td>Notice to Lessee - an requirement promulgated by BSEE in addition the CFR requirement</td>
</tr>
<tr>
<td>NVIC</td>
<td>Navigation and Vessel Inspection Circular (USCG)</td>
</tr>
<tr>
<td>OCS</td>
<td>Outer Continental Shelf</td>
</tr>
<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
</tr>
<tr>
<td>OPM</td>
<td>Original Parts Manufacturer</td>
</tr>
<tr>
<td>OIM</td>
<td>Offshore Installation Manager</td>
</tr>
<tr>
<td>OJT</td>
<td>On-the-Job Training</td>
</tr>
<tr>
<td>Operator</td>
<td>The person the lessee(s) (Oil Company/Operator) designates as having control or management of operations on the leased area</td>
</tr>
<tr>
<td>OPITO</td>
<td>Offshore Petroleum Industry Training Organization</td>
</tr>
<tr>
<td>OPM</td>
<td>Original Parts Manufacturer</td>
</tr>
<tr>
<td>PSC</td>
<td>Process Safety Consultant</td>
</tr>
<tr>
<td>Review</td>
<td>Capitalized Review - means the examination undertaken as reported in this document</td>
</tr>
<tr>
<td>Rig</td>
<td>Synonym for MODU</td>
</tr>
<tr>
<td>RMS II</td>
<td>Rig Maintenance System: a computer based Maintenance Program</td>
</tr>
<tr>
<td>ROPO</td>
<td>Register of Permitted Operations; synonymous with Summary of Operational Boundaries and SIMOPS as used in this Report</td>
</tr>
<tr>
<td>ROV</td>
<td>Remotely Operated Vehicle</td>
</tr>
<tr>
<td>SEMS</td>
<td>Safety and Environmental Management System</td>
</tr>
<tr>
<td>SCE</td>
<td>Safety Critical Equipment or Element</td>
</tr>
<tr>
<td>SICP</td>
<td>Shut in Casing Pressure</td>
</tr>
<tr>
<td>SIMOPS</td>
<td>Simultaneous Operations-that can be carried out at the same time, and those that cannot (usually a chart); Summary of Operational Boundaries - synonymous with ROPO and SOOB as used in this Report</td>
</tr>
<tr>
<td>SMART</td>
<td>System Management Review Team Process - the means to communicate and implement change to the management system (represented in manuals and other documents) to corporate, division and field personnel.</td>
</tr>
<tr>
<td>SMC</td>
<td>Safety Management Certificate - for a MODU for the ISM Code</td>
</tr>
<tr>
<td>SMS</td>
<td>Safety Management System synonymous with Safety and Environmental Management System as used in this Report</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Explanation</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>SOOB</td>
<td>Summary of Operational Boundaries - synonymous with ROPO and SIMOPS as used in this Report</td>
</tr>
<tr>
<td>START</td>
<td>START Conversations are used to observe to workplace practices and conditions in order to maintain and improve safe behavior.</td>
</tr>
<tr>
<td>SV-DV</td>
<td>Self-Verification - Division Verification - a program to test specific knowledge of procedures on Transocean MODUs</td>
</tr>
<tr>
<td>Time Out for Safety</td>
<td>A summary of Transocean's current stop work procedure.</td>
</tr>
<tr>
<td>TODDI</td>
<td>Transocean Offshore Deepwater Drilling Inc.</td>
</tr>
<tr>
<td>TOFS</td>
<td>Time out for Safety</td>
</tr>
<tr>
<td>USCG</td>
<td>United States Coast Guard</td>
</tr>
<tr>
<td>UPS</td>
<td>Uninterruptible Power Supply (Battery)</td>
</tr>
<tr>
<td>UWA</td>
<td>Ultimate Work Authority - (30 C.F.R. § 250.1931).</td>
</tr>
<tr>
<td>WC</td>
<td>Well Control</td>
</tr>
<tr>
<td>WSOG</td>
<td>Well Specific Operating Guideline</td>
</tr>
</tbody>
</table>
INDEX OF SUBTITLES

Bridging Documents, 21
BSEE & USCG Regulatory Inspections, 46
Class Society Surveys, Flag State Surveys
(depending on Registry), 46
Competence, 76
Customer Audits or Third party (Rig
Condition Assessments), 49
Driller Competency Assessment Program, 79
Dynamic Positioning Competency
Assessment Program, 79
Emergency Response System, 30
Hardware Audits, 44
Hazard Identification, Bow-Ties and the
Register of Permitted Operations, 29
IADC WellCAP® Audit and Certification, 49
Independent Auditor Comment on Well
Control Equipment List for the National
Response Resource Inventory Database
(USCG), 49
Independent Auditor Observation on
Designation of Equipment as “Safety
Critical”, 50
Independent Auditor Observation on Rig
Specific Procedures, 52
Industrial Training Requirements (related to
Well Control), 74
ISM Code (Audit of the Safety Management
System), 44
ISM DPA, 24
MACONDO REPORTS, 88
Management Commitment to (Process)
Safety, 22
Management System Audits, 41
Marine Training Requirements (related to
Well Control), 75
MODU Characteristics that Make the MODU
Safe, 27
OJT Audit of Questions, 44
On-the-Job Training, 76
OPITO Audit and Certification, 48
Overall Training, 74
Performance Monitoring, 32
Performance Requirements of the Blowout
Preventer (BOP), 64
Placards, Whistleblower Opportunities,
and the Chief Compliance Officer, 25
Process Safety Drill Audits (USCG and
BSEE), 47
Regulatory and Industry Standards for
BOPs, 66
Regulatory Documents, 18
Safety Case Auditing, 39
Safety Case Training, 73
Safety Management System, 23
Self Verification/Division Verification Audits,
42
SEMS Audit for BSEE Compliance as
Required by Operator, 47
Specific Comments on Maintenance Scope
Related to BOPs, 66
Subsea Supervisor Competency
Assessment Program, 81
Training Audits: BSEE and USCG, 48
Well Control Competency Assessment Plan,
77
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