



IADC
NORTH SEA
CHAPTER

International Association of Drilling Contractors

North Sea Chapter

HPHT

Guidance on

MODU Safety Case Content

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1. Abbreviations

Abbreviation	Abbreviation Description
EMW	Equivalent Mud Weight
FMEA	Failure Mode and Effect Analysis
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study
HPHT	High Pressure High Temperature
MODU	Mobile Offshore Drilling Unit
OSDR	Offshore Safety Directive Regulator
QRA	Quantified Risk Assessment
UKCS	United Kingdom Continental Shelf

2. Background

Health and safety in UK offshore oil and gas exploration, appraisal, development and production is regulated through a permissioning regime that requires installations to have a safety case demonstrating how the safety of their installation will be managed. Duty holders must conduct operations in accordance with the current installation safety case and in doing so should demonstrate that risks have been reduced to as low as is reasonably practicable.

The Offshore Safety Directive Regulator (OSDR) recognises the significant increased risk that is present in complex well operations; and those involving high pressure and high temperature (HPHT). Working with industry, and the involvement of HSE, the Energy Institute developed the Model Code of Safe Practice part 17 (Volume 1 -3). This model code has been periodically reviewed and is due for revision in 2016. Work is underway to produce an HPHT supplement to the Oil and Gas UK Well Lifecycle Integrity Guidelines. Both the Model Code and Well Integrity guidelines have been developed in a United Kingdom Continental Shelf (UKCS) context.

Adoption of the model code should promote safe well practices; it is viewed by the OSDR as the benchmark for HPHT operations. Each operator and duty holder should review and apply the guidance to its own policies and experience for their particular operations.

This document gives guidance to duty holders about the expectations regarding their approach to HPHT operations and specifically how to demonstrate within a UK safety case that the installation is suitable for HPHT operations in the UKCS.

3. Definition

High Pressure High Temperature (HPHT) wells are defined within the Energy Institute Model Code of Safe Practice Part 17 Volumes 1 – 3 as:

“High temperature in this context can be defined as when the undisturbed bottom hole temperature at prospective reservoir depth (or total depth) is greater than 300°F (149°C). High pressure can be defined as either when the maximum anticipated pore pressure of any porous formation to be drilled through exceeds a hydrostatic gradient of 0.8psi/ft. (representing an Equivalent Mud Weight (EMW) of 1.85SG or 15.4ppg) or, needing deployment of pressure control equipment with a rated working pressure in excess of 10,000psi (690bar, 69MPa). Note that areas of high pressure (abnormal pressure) need not necessarily be accompanied by high temperatures and vice versa.”

4. Well Conditions

The installation safety case must reflect the operating envelope that it has been determined to operate within. These may include high temperature or high pressure only; in any case the duty holder must assess the expected conditions in each well against the capability of the installation to determine if the operation can be conducted safely.

In the event that the well conditions meet the above HPHT definition the installation duty holder must consider whether the current safety case clearly identifies and addresses those conditions, or if it requires a material change. If so the following guidelines apply.

5. HPHT Safety Case Key Principles

The Model Code states that when selecting a mobile offshore drilling unit (MODU) for the operation the installation must comply with all relevant legislative requirements and have a current safety case for HPHT operations.

Within the UK safety case regime it is standard procedure for non-HPHT installations to be upgraded to HPHT capability through a material change revision to the accepted safety case.

The OSDR requires a demonstration that relevant guidelines, including the aforementioned model code, have been considered by conducting a competent gap analysis and implementing the actions identified to apply the guidance (or other equally effective means) to its own policies in light of experience so as to be prepared for future HPHT operations.

This gap analysis must be suitable and sufficient in that it must be robust and performed by a competent person, this may be internal to the duty holder or by an external third party. The selection should consider the advantage of separating this analysis from the operational management of the installation to provide additional objectivity.

A safety case is a live document that should demonstrate the current arrangements for the management of safe operations, therefore when duty holders develop safety cases for HPHT operations they should reflect on-going preparedness for HPHT wells, to ensure that any subsequent risks are identified, assessed and mitigated prior to operations. Safety case revisions should therefore describe the safe management of all HPHT activities not just the current HPHT well contract that has been won.

The sections below provide guidance on which sections of a safety case, based on the IADC template for safety cases in North West Europe, are likely to require specific attention in light of HPHT operations however duty holders must consider all parts of the safety case within any review.

6. IADC Safety Case Template Section 1 – HSE Case Introduction

Specific reference to any non-conventional operation: HPHT drilling operations underbalanced drilling operations etc. Where an installation safety case has not been accepted for HPHT operations reference to such should be removed.

7. IADC Safety Case Template Section 2 – Management System

The High Pressure High Temperature (HPHT) wells are defined within the Energy Institute Model Code of Safe Practice Part 17; in particular Volume 2 provides clear guidance on both

management systems and equipment requirements that duty holders must have reviewed to satisfy the full scope of the code.

7.1 Gap Analysis - Well Control Equipment

Reference to a competent gap analysis of the well control equipment provided on board the installation against the technical requirements of the model code. This analysis should be referenced in the safety case along with suitable description of the equipment.

A summary related to compliance with the model code should be contained in the safety case. Where a duty holder has decided to deviate from the model code this should be identified and the other equally effective means described.

7.2 Gap Analysis – Operational Procedures

Reference to a competent gap analysis of the Duty Holder relevant management systems such as the Well Control Standard against the operational requirements of the model code.

A commitment to contribute to development of, and formal acceptance of, the Joint Operations Manual should be included.

This gap analysis should also be referenced in the safety case. Where a duty holder has decided to deviate from the model code this should be identified and the other equally effective means described.

7.3 Equipment Risk Assessment

The model code requires that the equipment and systems are risk assessed through a combination of HAZID, HAZOP, FMEA or other assessments that include potential single point failure analysis. A summary of this assessment should be included in the case and the full assessment referenced, where not present in the original case.

7.4 Maintenance Management

The maintenance management system should be reviewed to ensure that it reflects the duty holder's approach to HPHT operations, taking into account any modifications to performance standards, maintenance frequency or occasional use of HPHT specific equipment.

Good practice could be to instigate a full internal equipment preparedness review as part of the 'ready to drill' work scope for each well.

7.5 Training and Competence

The model code provides expectations in regard to training and competence, in particular HPHT training and well specific briefings. Although these courses may be financed by the well operator, duty holder's safety cases should reflect the need for the training to be held along with competence assessments for HPHT operations.

8. IADC Safety Case Template Section 3 - Equipment Description

There are two common approaches to detailing equipment within safety cases; the first is to include summary descriptions of equipment and a statement that the equipment complies with the model code or alternatively there is a sufficiently detailed description of all the relevant equipment to allow an assessment against the model code requirements. Where the latter approach is adopted a detailed description of the gap analysis may not be required in the safety case.

Attention should be paid to any equipment that is not in service during non-HPHT operations such as high-pressure glycol pumps or temporary equipment reasonably expected to be required for HPHT wells that may be safety critical during the operation for example enhanced kick detection equipment.

9. IADC Safety Case Template Section 4 - Risk Assessment

Further details of the following risk assessments may be contained in this section specifically in relation to HPHT or where HPHT risks have been taken into account: HAZOP, HAZID, and FMEA.

The quantitative assessment of the risks to the installation is likely to have been contained in a QRA which must have taken into account the types of operations that the installation will undertake.

The list of safety and environmentally critical equipment may have to have changed in light of HPHT operations; new or revised performance standards may be required. When this has occurred, the changes should be reviewed by the Independent Verifier.