



<b>Title</b>	<b>The Safe Approach, Set-up and Departure of Jack-up Rigs to Fixed Installations</b>		
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## Introduction

This information sheet provides guidance to duty holders and HSE inspectors of the matters to be considered and precautions to be taken when approaching to, setting-up and departing from a fixed installation using a jack-up rig.

## Background

As a result of a safety case in which the duty holder (DH) was planning to execute a jack-up approach and departure whilst maintaining production from the fixed platform, HSE has undertaken a review of current practice regarding the precautions taken on a variety of fixed installations when conducting such an operation. For the purposes of this Information Sheet, "approach" means from the time the jack-up begins final movement into position at the fixed installation until the derrick has been skidded into position, with "departure" being the reverse operation.

Precautions on the UKCS have included combinations of the following

- Cessation of production until the jack-up derrick is in position followed by concurrent drilling and production
- Cessation of production until completion of drilling
- Depressurising, with, or without venting of the topsides plant and equipment
- Shut-in of import/export pipelines lines remain pressurised)
- Venting of import/export pipelines
- Additional risk reduction measures that would not have been in place during normal production operations

To date on the UKCS, no examples were found where production was maintained while a jack-up drilling rig approached or departed from a fixed installation.



## Legal requirements

### Health and Safety at Work etc Act 1974 (HSWA)

Sections 2 and 3 of the HSWA are relevant to defining the key legal obligations of the DH. In particular, the obligation of the DH is defined by a duty to provide and maintain plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health (section 2) and the requirement for every employer to conduct his undertaking in such a way to ensure, so far as is reasonably practicable, that persons not in his employment who may be affected thereby are not thereby exposed to risks to their health and safety (section 3).

Application of sections 2 and 3 of the HSWA, essentially requires employers to be able to show that they are taking all reasonably practicable measures based on estimating the disproportionality of sacrifice (cost) to risk reduction. In addition, **all reasonably foreseeable hazards** must be considered by employers to discharge their duty to comply with the Act.

### The Offshore Installations (Safety Case) Regulations 2015 (SCR15)

SCR 2015 requires a demonstration that the management system of the duty holder will ensure compliance with the relevant statutory provisions (including HSWA s.2 and s.3), and that all hazards with the potential to cause a major accident have been identified, these risks evaluated and measures have been, or will be, taken to control those risks to ensure that the relevant statutory provisions will be complied with. Failure to comply with the accepted safety case is a breach of SCR r. 28.

## Standards and guidance

### Oil & Gas UK guidance

In 1995 UKOOA, IADC and BROA produced the Guidelines for Safe Movement of Self-Elevating Offshore Installations (Jack-Ups) joint industry guide. This guidance described the matters to be considered for all stages of jack-up approach, jacking-up and departure, generally with respect to the marine operations control, structural integrity, stability, pre-load and safety management. This guidance did not go so far as to recommend shutting in or depressurising fixed installations during rig movement but did offer some very broad guidance on risk control during this operation. This guidance has never been updated and is no longer available from any of the respective organisations' websites.

### US codes of practice

In the US, the key document describing risk controls during jack-up approach, set-up and departure is the US Code of Federal Regulations (CFR)<sup>2</sup>. The Bureau of Safety and Environmental Enforcement (BSEE), District Guidelines to these regulations requires that operators shut-in all producible wells located in the affected wellbay below the surface and at the wellhead and they remain shut-in until to until the rig is in place, secured, and ready to begin operations.

The guidelines do not cover the issue of topsides and riser de-pressurisation, or venting, during rig approach and departure operations.

<sup>2</sup> Title 30. Mineral Resources - Chapter II. Bureau of safety and environmental enforcement, department of the interior - Subchapter B. Offshore - Part 250. Oil and gas and sulphur operations in the outer continental shelf - Subpart G. Well Operations and Equipment - Subjgrp 93. Well Operations - Section 250.723.

## Norwegian practice

The Norwegian Petroleum Directorate (NPD) does not impose prescriptive requirements, relying on DH safety assessments during the operation of the installation. In the majority of cases, the practice adopted reflects that on the UKCS. There has been an occasion in the Norwegian sector where production via a gas export pipeline was maintained during the approach, set-up and departure, but information suggests that the DH concerned carried out additional risk reduction measures to satisfy themselves that risks were controlled ALARP

## Factors affecting the level of risk during a jack-up approach, set up and departure

During the review of current practice, a study of previously accepted UK safety cases has demonstrated case specific levels of risk to assets, people and the environment. Factors affecting the level of risk include:

- Whether the topsides including any import/export pipelines are shut-in and depressurised, shut-in and vented of hydrocarbons, or merely shut-in. (Volume of release).
- The pressure, toxicity and ignitability of hydrocarbon inventory within plant and equipment during approach and departure. With regards to toxicity (e.g. high H<sub>2</sub>S), it is anticipated that very rigorous controls will be required due to the potential for multiple fatalities being significantly increased.
- The likelihood of an impact occurring - which is affected by the arrangements for manoeuvring, offset clearance between the rig and the platform, weather conditions, competency of personnel involved etc.
- The likelihood of the hydrocarbon containing plant retaining integrity after an impact, which requires the DH to estimate the ability of safety critical plant to resist a range of credible impact scenarios. Approach weather conditions, rig displacement, well robustness, anchoring arrangements and weather response motions should be part of the DH's assessment of plant and equipment integrity during an impact. Local impact effects should also be considered in addition to global platform damage studies.
- When a live approach or departure is proposed by the DH, the likelihood of an impact occurring whilst the platform is in production. This is affected by procedural and equipment controls to activate manually, or via an automated system, a platform shut-down when safe clearance distances are breached. The reliability of the ESD on demand is also relevant, as

again are prevailing weather conditions and offset distances, anchoring and tug arrangements.

- During pre-loading, jacking up, down and cantilevering over the platform, the likelihood of structural and/or foundation failure, jacking-system failure, or other failure which may lead to the collapse of some, or part, of the jack-up onto the installation. The likelihood of occurrences such as these described is dependent upon understanding the soil and structural failure conditions, specific to the site, and the reliability of the jacking systems to operate under adverse conditions. Previous experience of the rig at the site under consideration (e.g. previous footprints and penetrations) may allow for a less onerous approach to the estimate of the failure of the rig during these operations. However, historic incident data shows that structural, jacking system and foundation failures are considerably more prevalent than impact and hence require a very rigorous evaluation by the DH

## HSE consideration of jack-up approach, set-up and departure with respect to the platform's operational condition

Should a DH be considering an approach and/or departure by a jack-up to an installation, the key issue is whether the risks are ALARP and not intolerable.

ALARP is demonstrated by ensuring that all reasonably practicable measures have been implemented, usually based on the current practice of the DH in the UKCS and/or common industry practice for the operation under consideration. To date, current practice on the UKCS has largely resulted in the option of an approach and/or departure without the installation remaining in production.

However, it may be possible for the DH to argue for an option that results in a change to the risk profile in which some risks may increase (e.g. a live approach) in comparison with their current practice. This may be acceptable to the HSE **providing the DH can successfully demonstrate that there are changed circumstances that justify adopting such an option, and provided that the new option has risks which are ALARP.**

It is possible that in a case where a live approach and/or departure is proposed, the DH can make a case for changed circumstances, leading to changing the current practice. Examples of changed circumstances, in this situation, may include:

- The reservoir characteristics have altered significantly, such that the magnitude of the hazard caused by a pressurised leak is significantly reduced from that used to develop the current practice e.g. reduced reservoir pressure, artificial lift wells, higher water content etc.
- That new knowledge of the level of risk shows that the previous case specific practice provided such a low residual risk, as to make the practice unduly conservative. Such new knowledge may come about from a detailed evaluation of rig motions, impact likelihood, explicit evaluation of structural and equipment failure, leak likelihood and consequence and



the provision of additional reasonably practicable risk reduction measures, appropriate for the new proposed practice.

When a proposed option generates direct economic benefit, such as when increased production results, the DH should also consider the level of economic benefit as a measurement against which expenditure on further risk reduction measures could be evaluated. In other words, any risk reduction measures would be assessed using ALARP arguments, but with an allowance for a greater disproportionality ratio in ICAF versus CPLS to account for the cash benefit of the increased production. Incorporating the economic benefit of increased production, provides emphasis on the precautionary approach, especially where higher risk levels are being proposed, economic benefit is direct and multiple fatalities are reasonably foreseeable.

Justification for moving to a less protected, (increased risk) situation through the application of Quantitative Risk Assessments (QRA) and Cost Benefit Analysis (CBA) arguments, evaluated using industry risk reduction approaches e.g. Implied Cost to Avert a Fatality (ICAF), versus Cost Per Life Saved (CPLS) ratios, are unacceptable (the so called Reverse ALARP argument).

## Conclusion

A review of safety cases and current UK practice has shown that it is reasonably practicable in the UKCS for jack-up approach, rig set-up and departure operations to be done whilst shutting-in production from the wells and import/export from risers and pipelines on the installation being approached. Similar practice is evident in the US and the majority of operations in Norway.

Depressurisation and venting of the topsides and/or riser systems while being the preferred inherently safer option may not always be reasonably practicable during similar jack-up rig operations. However, the DH must consider these options and demonstrate that they are not reasonably practicable. HSE will review each safety case on its merits.

Approach, set-up and departure, (or combinations thereof), to and/or from a live installation, may in specific circumstances be acceptable, but the DH would be required to provide a rigorous demonstration that changed circumstances apply, and that a detailed evaluation of all reasonably practicable risk reduction measures has been undertaken. Where the DH proposes a change to current practice, such as not shutting-in the plant, which involves additional risk, further reasonably practicable reduction measures would need to be identified and implemented, to control risks ALARP.