



<b>Title</b>	<b>Structural Integrity Requirements for the Decommissioning and Dismantling of Fixed Offshore Installations</b>		
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## Introduction

This sheet provides guidance on structural integrity requirements for decommissioning and dismantling of fixed offshore installations. It sets out the actions duty holders should take while carrying out decommissioning activities.

This sheet has been developed from relevant regulatory requirements, industry standards and good practice, and takes into account the lessons learned from recent dismantlement cases in the United Kingdom Continental Shelf (UKCS).

## Background

When a field has reached the end of its economic life, duty holders are required to remove their offshore infrastructure, which will require the decommissioning and then dismantling of equipment, plant and structures.

Decommissioning of an installation is usually described as a series of distinct phases, from cessation of production (COP) to final dismantlement and disposal. Duty holders are required to submit a decommissioning programme<sup>1</sup> which must describe the decommissioning solution, including a high level summary of proposed dismantlement methods.

Dismantling means the dismantling or removal of the main and secondary structure of a fixed installation at the place at which it was operated. Although it normally takes place at later stages of decommissioning, planning for dismantling begins at a very early point. Engagement with HSE is encouraged early in this planning period.

As installations are progressively decommissioned, the major accident scenarios are likely to alter, which may lead to significant change of major accident hazards (MAHs) and associated safety and environmental critical elements (SECEs).

As far as structural integrity is concerned, the following changes are likely to occur during the decommissioning and dismantling process

- change of structural loadings due to the change of MAHs (e.g. when the installation becomes hydrocarbon free)



- change of structural conditions due to the change of inspection and maintenance regime
- change of structural configurations/load paths due to structural modifications

Duty holders should make a suitable and sufficient risk assessment to identify the risks arising from the above changes and put appropriate control measures in place to mitigate the aforementioned risks.

## Legal requirements

The following regulations and associated guidance are relevant to this topic

### [Offshore Installations \(Offshore Safety Directive\) \(Safety Case etc\) Regulations 2015](#) (SCR2015)

- Regulation 16 Management and control of major accident hazards, relevant [guidance L154 paragraphs 215 - 219](#)
- Regulation 20 Safety case for dismantling fixed installation, relevant [guidance L154 paragraphs 244 – 253](#)
- Schedule 8 Particulars to be included in a current safety case in respect of the dismantling of a fixed installation, relevant [guidance L154 paragraphs 505 - 506](#)

### [Offshore Installations and Wells \(Design and Construction, etc\) Regulations 1996](#) (DCR)

- Regulation 10, relevant [guidance L85 paragraphs 67 – 69](#)

## Standards and guidance

From a structural integrity perspective, very limited codes and standards are currently available for decommissioning and dismantling of offshore installations.

ISO codes only provide very brief design requirements for decommissioning and dismantling.

ISO 19900-3:2002<sup>2</sup> Section 4.12 states that consideration shall be given at the design stage to decommissioning and removal of the structure at the end of its service life.

ISO 19901-3:2010<sup>3</sup> Section 6.13 states that decommissioning and removal requirements shall be addressed during the topsides structure design phase.

ISO 19902:2007<sup>4</sup> Section 25.5 briefly mentioned that an offshore construction plan shall be prepared for structure removal and reinstallation.

## Complying with the legal requirements

### General requirements



Duty holders should ensure that an installation is decommissioned and dismantled in such a way that it will possess sufficient integrity to enable such decommissioning and dismantlement to be carried out safely.

Duty holders should ensure that a heavy lift vessel (HLV) carries out any connected activities for decommissioning and dismantlement in such a way that it will possess sufficient structural integrity to enable such connected activities to be carried out safely, so far as is reasonably practicable.

Duty holders should demonstrate that the changing major accident risk profile in relation to structural integrity has been considered, and appropriate control measures put in place as the decommissioning project progresses.

HSE engages with duty holders in different stages of decommissioning to assess compliance. The sections below set out how HSE reviews compliance with the regulations throughout the decommissioning process.

### **Planning**

Duty holders should ensure that appropriate planning is in place to provide an oversight of decommissioning and dismantling activities.

Points to be considered include

- developing an overarching plan for decommissioning and dismantling, including key milestones for each phase and proposed removal methods
- making suitable arrangements for safety case submission. Duty holders are strongly encouraged to have early engagement with HSE
- ensuring assurance and verification are in place

### **Risk assessment**

Duty holders are required to make a suitable and sufficient risk assessment of structural integrity related risks arising from decommissioning and dismantling process.

#### *Lighthouse Mode (if applicable)*

If an installation is to be left unattended until dismantlement, duty holders should make suitable arrangements to maintain sufficient structural integrity for both safe re-boarding and final removal.

Points to be considered include

- determining the duration of lighthouse mode
- conducting baseline inspections, essential maintenance and structural modifications if required prior to the installation entering lighthouse mode



- making suitable plans for structural inspection and maintenance during lighthouse mode
- putting additional mitigations in place to maintain structural integrity should lighthouse mode passes its end date
- developing a re-boarding strategy with proposed re-boarding methods

#### *Re-boarding (if applicable)*

Re-boarding may be required

- at any time during lighthouse mode in order to carry out essential maintenance work or preparatory work such as leg cutting for final removal
- at the end of lighthouse mode in order to carry out final removal work

Duty holders should ensure that structural integrity is maintained for safe re-boarding through all phases until final removal. Prior to a general re-boarding, duty holders may consider sending a small specialist team to the installation first to carry out appropriate inspection and maintenance work.

Points to be considered prior to a general re-boarding include

- conducting a structural inspection of the landing area, access and egress routes.
- assessing their structural suitability based on inspection findings
- carrying out essential repairs and/or mitigations as required

#### *Structural assessments*

Duty holders should identify, plan and carry out suitable structural assessments as required to demonstrate sufficient structural integrity is maintained through the decommissioning process.

Points to be considered include

- developing an overall plan for structural assessments
- updating structural assessment input data to the latest e.g. lifting weight, metocean data, soil data, current condition, known anomalies and structural modifications etc.
- carrying out strength analysis to ensure the installation has sufficient strength through all phases. Consideration should be given to the installation, with some or all legs in cut state, being left longer than anticipated
- carrying out lift analysis to ensure sufficient structural integrity is maintained for each planned lifting operation



- carrying out stability analysis to ensure stability is maintained before and after each stage of removal
- carrying out structural analysis other than mentioned above if required
- Identifying any structural modifications required based on structural assessment results

### *Structural modifications*

Structural modifications during decommissioning may include, but not be limited to, the following

- separating the structural connections, walkways and stairs between the modules, module support frame and jacket
- removal of redundant structures
- installation of temporary access platforms for removal work
- installation of new lifting points or reinstating existing lifting points
- structural strengthening by adding additional strengthening or temporary reinforcement to existing structures as required
- leg and pile cutting

Duty holders should ensure that sufficient structural integrity (including structural stability) is maintained by carrying out suitable and sufficient structural modifications identified in their risk assessment process for final removal.

Points to be considered include

- identifying the need for structural modifications in each phase
- re-assessing the impact to structural integrity due to structural modifications
- putting appropriate procedures in place to manage the quality of destruction and construction work

### *Final removal*

Duty holders should ensure that sufficient structural integrity is maintained to carry out final removal safely.

Points to be considered include

- identifying/implementing structural integrity requirements for each proposed removal method
- preparing a removal method statement with a step by step removal sequence



- considering whether it is necessary to carry out a trial lift if using novel lift technology
- ensuring all lifting points are structurally suitable for lift
- carrying out both strength and stability check after each step of removal, particularly after leg and pile cutting
- carrying out a dropped/swinging objects study

#### *Installation specific consideration*

Installations may have their own specific structural integrity related risks not mentioned above due to their structural layout, configuration or interaction with other plant systems. Sometimes, these risks would have a significant impact on structural integrity. For instance, the risk of availability of pumps for drawdown in a gravity-based structure after leg cutting would have a significant impact on the structural performance of jacket legs as they are interconnected SECEs. Duty holders should ensure such risks are considered in their risk assessment process.

#### **Control arrangements**

Duty holders should ensure control measures are in place to mitigate the risks identified through the risk assessment process.

#### **Assurance and verification**

Duty holders should ensure structural related SECEs, and associated performance standards, remain suitable and effective until dismantled.

The general requirements of assurance and verification for decommissioning have been set out in [Offshore Information Sheet 2/2008 Verification During Decommissioning and Dismantling](#). With regard to structural integrity, duty holders should ensure that assurance and verification are in place for all key structural assessments and modifications.

#### **Safety case submission**

SCR2015 Regulation 20 requires duty holders to submit a specific revision of the safety case for dismantling fixed installation to take account of the particular hazards and risks involved. Earlier stages of decommissioning can be covered by material changes to the current safety case under SCR2015 Regulation 24.

It is recognised that in some cases only a dismantlement safety case revision, covering the whole period from the end of current operational safety case to final removal, would be required. However, sometimes it is not practical and there is a need to submit a material change revision to bridge the gap between the current operational safety case and the dismantlement safety case. For example, duty holders should consider submitting a material change revision if they plan to switch the installation into lighthouse mode prior to final removal.



It is also recognised that there may be a significant difference in the level of complexity between the single lift removal of a small satellite installation, and that of a large asset such as typically found in the Northern / Central North Sea.

All dismantlement safety case submissions should contain the specific information as required by SCR2015. However, it is recognised that duty holders may wish to undertake small, less complex lifts, via a bundling campaign in order to minimise costs and maximise vessel availability.

#### *Small multiple installation dismantling campaigns*

In these circumstances HSE would consider an adequate demonstration to be a higher level overview of the processes, with an undertaking to update the safety case with specifics of relevant analysis results / modifications / method of transport etc, prior to dismantling which should be made available to HSE for inspection if requested.

Specifically, the safety case should contain as a minimum

- the dismantling options being considered
- the structural implications foreseen with all options
- the process by which the selected option will be identified
- the process by which the selected option will be proven to be structurally acceptable
- a statement on the structural assessments which will be carried out

Although the case could be accepted on the above, it is expected that duty holders will update the safety case prior to implementation of the works, once the studies have been completed. If any of the assumptions used to form the basis for the case have changed, duty holders will be expected to submit a material change for assessment.

#### *Single and larger installation dismantling*

For single and larger more complex dismantling activities, the higher-level overview approach will not be appropriate. In these circumstances, duty holders should ensure more detailed information from

- planning
- an overview of risk assessment process
- control measures
- verification arrangements

is included in the submission.



Specifically, the safety case should contain as a minimum

A description of planned operations

- a description of the proposed decommissioning and dismantling plan, including key milestones for each phase and proposed removal methods
- a description of assurance and verification arrangements for structural integrity

Lighthouse mode (If applicable)

- an overview of lighthouse mode including the expected duration
- a description of suitable structural integrity management arrangements prior to, and during, lighthouse mode
- confirmation that re-assessment will be carried out to ensure adequate structural integrity if the lighthouse mode is to be extended beyond the original expected date

Re-boarding (If applicable)

- a high-level summary of a re-boarding strategy with proposed re-boarding methods
- a description of structural integrity requirements for a safe re-boarding, including inspection, reassessment and maintenance etc.

Structural assessments

- a high-level summary of each structural assessment carried out, including assumptions, codes and standards, methods and findings etc.
- a description of any structural modifications identified based on structural assessment results

Structural modifications

- a high-level summary of key structural modifications, including structural strengthening work, lifting points and leg/pile cuttings
- confirmation of appropriate quality management procedures for structural modification work being in place

Final removal

- a description of the selected removal method and relevant structural integrity requirements
- a high-level summary of the methodology for final topsides/subsea removal



- potential dropped/swinging objects risk considerations such as pipelines / subsea infrastructure on the lift / transportation path, especially if transported on hook

#### Installation specific consideration

- a description of any installation specific structural related risks not addressed elsewhere

#### Control arrangements

- a high-level summary of control arrangements for lighthouse mode, re-boarding, structural assessments, structural modification and final removal.

#### Assurance and verification

- a description of suitable arrangements for assurance and verification of structural integrity throughout the decommissioning process

## References

1 [Oil and Gas: Decommissioning of offshore installations and pipelines](#)

2 BS EN ISO 19900:2002 - Petroleum industry - General requirements for offshore structures

3 BS EN ISO 19901-3:2010 Offshore Structures - Part 3 – Topsides

4 BS EN ISO 19902 2007 Fixed Steel Offshore Structures

This guidance is issued by the Offshore Safety Directive Regulator (OSDR). Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.