Commission for Energy Regulation

An Coimisiún um Rialáil Fuinnimh

Safety Case Requirements

Part of the Safety Case Guidelines under the Petroleum Safety Framework

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Table of Contents

Glossary of Terms and Abbreviations

List of Abbreviations

Abbreviation	Meaning
AIS	Automatic Identification System
ALARP	As Low As is Reasonably Practicable
ARPA	Automatic Radar Plotting Aid
BOP	Blow-out Preventer
CAS	Chemical Abstract Service
CER	Commission for Energy Regulation
CMAPP	Corporate Major Accident Prevention Policy
HVAC	Heating Ventilation Air Conditioning
ICB	Independent Competent Body
IRCG	Irish Coast Guard
IUPAC	International Union of Pure and Applied Chemistry
MAH	Major Accident Hazard
MEI	Major Environmental Incident
NUI	Normally Unattended Installation
OSCP	Oil Spill Contingency Plan
PDCA	Plan Do Check Act
POB	Persons on Board
QRA	Quantified Risk Assessment
S(E)CE	Safety (and Environmental) Critical Element
SEMS	Safety and Environmental Management System
SMS	Safety Management System
TEMPSC	Totally Enclosed Motor Propelled Survival Craft

List of Defined Terms

Words and phrases defined in section 13A of the Act shall, unless the context otherwise requires, have the same meanings when used in this document.

Term	Definition or Meaning
ALARP Guidance	The *ALARP Guidance* document, which is part of the Safety Case Guidelines and may be amended from time to time, describes processes that must be used to determine whether a safety risk is ALARP.
Combined Operations Notification	A notification submitted to the CER in accordance with the requirements of section 8 of the *Safety Case Requirements* for the purposes of gaining acceptance by the CER to carry out the activities described therein.
Decommissioning Safety Case	A safety case submitted to the CER for acceptance for the purpose of gaining a Decommissioning Safety Permit.
Decommissioning Safety Permit	A safety permit issued by the CER under 13P of the Act which permits the decommissioning activity as set out in the associated Decommissioning Safety Case.
Designated Petroleum Activities Regulations	The *Petroleum Safety (Designation of Certain Classes of Petroleum Activity) Regulations 2013, (S.I. No. 89 of 2013)*.
Design Notification	A notification submitted to the CER in accordance with the requirements of section 6 of the *Safety Case Requirements* for the purpose of gaining acceptance by the CER
Facilities Verification Scheme	A Facilities Verification Scheme is a description of the work carried out by Independent Competent Body(s) to verify whether an operator or owner has identified and continues to meet suitable performance standards for S(E)CEs for pipelines and Facilities (except wells).
Facility	A piece of petroleum infrastructure other than a pipeline.
Framework	The Petroleum Safety Framework established under section 13I of the Act that comprises a collection of regulations, written regulatory documents and procedures which, taken together, describe the system the CER uses to regulate the activities of petroleum undertakings, operators and owners with respect to safety.
Good Practice	The recognised risk management practices and measures that are used by competent organisations to manage well-understood hazards arising from their activities.
Independent Competent Body	An independent organisation engaged by the operator or owner to execute a Verification Scheme.
Lower Tolerability Limit	The boundary between risks that are broadly tolerable and tolerable if ALARP and given in the *ALARP Guidance*.

Term	Definition or Meaning
Non-production Safety Case	A safety case submitted to the CER for acceptance for the purpose of gaining a Well Work Safety Permit.
Production Installation	A Production Installation is equipment used in the extraction and/or processing of reservoir fluids and includes fixed and floating offshore installations, onshore installations and associated pipelines. A floating production storage and offloading vessel is a Production Installation due to its connection to the reservoir whereas a shuttle tanker is not.
Production Safety Case	A safety case submitted to the CER for acceptance for the purpose of gaining a Production Safety Permit.
Production Safety Permit	A safety permit issued by the CER under 13P of the Act which permits the production activity as set out in the associated Production Safety Case.
Residual Risk	The risk that remains once a risk reduction measure has been implemented.
Safety (and Environmentally) Critical Elements – S(E)CE	Safety (and Environmental) Critical Elements S(E)CE are such parts of an installation and its plant, including computer programs, a purpose of which is to prevent or limit the effect of a major accident, or the failure of which could cause or contribute substantially to a major accident. The environmental term is only applicable offshore and relates to the definition of a major hazard, which includes major environmental incidents offshore.
Safety (and Environmental) Management System (S(E)MS)	The framework of policies, processes and procedures that enable the operator or owner to manage its risks to safety (and the environment) and continually improve its performance.
Upper Tolerability Limit	The boundary between intolerable risks and risks that are tolerable if ALARP and given in the *ALARP Guidance*.
Well Verification Scheme	A Well Verification Scheme is a description of the work carried out by Independent Competent Body(s) to verify whether a operator has identified and continues to meet suitable performance standards for well-related S(E)CEs and that well integrity is maintained.
Well Work Activity	An activity that constructs or alters the pressure containment boundary of a well whether temporarily or permanently; or introduces wire, cable or pipe into a well. Such an activity requires a Well Work Safety Permit.
Well Work Safety Case	A safety case submitted to the CER for acceptance for the purpose of gaining a Well Work Safety Permit.
Well Work Safety Permit	A safety permit issued by the CER under 13P of the Act which permits the Well Work Activity as per the associated Well Work Safety Case and Non-production Safety Case.

Term	Definition or Meaning
Verification Scheme	Denotes the Facilities Verification Scheme and/or the Well Verification Scheme.

Public Interest Statement

As the regulator for safety for all onshore and offshore oil and gas exploration and production activities in Ireland, the CER publishes this paper as one element of its overall Petroleum Safety Framework, a system made up of a number of public regulatory documents and legislation, which the CER have put in place to effectively regulate the industry.

This paper sets out the CER requirements on industry related to the contents of the safety cases they must submit in order to gain a safety permit for the CER to enable them to carry out designated petroleum activities. This version of the paper is published to incorporate updates required by the European Union Offshore Safety Directive. While broadly aligned with the existing Framework, these updates compliment the system that the CER has developed and will continue to effectively operate, and is intended to give further confidence to the public that a strong regulatory system is in place for oil and gas production in Ireland.

1 Introduction

1.1 The Act, PSF and Safety Case Requirements

The *Electricity Regulation Act 1999* (the Act), as amended *inter alia* by the *Petroleum (Exploration and Extraction) Safety Act 2010* and the *Petroleum (Exploration and Extraction) Act 2015*, gives the Commission for Energy Regulation (CER) responsibility for the safety regulation of petroleum exploration and extraction activities in Ireland. The Act requires the CER to prepare and publish *Safety Case Guidelines* as part of an overall Petroleum Safety Framework (PSF) relating to the preparation of and appropriate contents of a safety case. The CER Safety Case Guidelines consist of the:

- *Safety Case Requirements* (this document);
- *NSAI Petroleum Exploration and Extraction Technical Standards Committee recommended standards selection policy, Issue date: 2013-09-09* (see section 2.4);
- *ALARP Guidance; and*
- *Compliance Assurance System*.

The Act establishes a permissioning system for certain petroleum activities that are classed as *designated petroleum activities*[1]. An operator[2] or owner[3] shall not carry out a designated petroleum activity (other than an established petroleum activity) unless:

a) It has submitted a safety case to the CER;
b) The CER has accepted the safety case; and
c) A safety permit has been issued in respect of the designated petroleum activity.[4]

The Act prescribes certain things that have to be included in a safety case[5] and the minimum conditions that must be satisfied in order for the CER to accept it.[6] All safety cases submitted to the CER under the Act are required to be prepared in accordance with the Safety Case Guidelines, which includes these Safety Case Requirements. In respect of a designated petroleum activity or activities, each safety case must at least contain the particulars specified in these Requirements that relate to that activity.

Safety cases and notifications are required to be submitted by operators carrying out established petroleum activities, or proposing to carry out designated petroleum activities, except the safety case for a non-production installation[7], which is the responsibility of the owner and a Combined Operations Notification which may be submitted by an operator or owner.

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[1] 'designated petroleum activity' is defined under the Act as'*…a petroleum activity which is designated by regulations under section 13D'.*
[2] 'operator' is defined in section 13A of the Act as '*…the entity appointed under section 13KA(1) to conduct designated petroleum activities including managing and controlling the functions of petroleum infrastructure (except nonproduction installations) in carrying out petroleum activities'.*
[3] 'owner' is defined in section 13K of the Act as '*…a person entitled to control the operation of a non-production installation'.*
[4] Section 13M of the Act.
[5] Section 13M(4) of the Act.
[6] Section 13P(1) of the Act.
[7] 'non-production installation' is defined in section 13A of the act as '*…the class of installation involved in carrying out offshore petroleum exploration or other designated petroleum activity or activities whilst station in the licensed area, but does not include installations involved in production of petroleum'.*

Acceptance of a safety case by the CER and the issuing of a safety permit shall not be interpreted as relieving an operator or owner of their duties under the Act.

1.1.1 Related Documents

These Requirements form part of the Safety Case Guidelines, which also include:

- *ALARP Guidance* – guidance on methods and techniques to determine whether a risk is ALARP;
- The *Compliance Assurance System, w*hich defines the requirement on owners and operators to:
    - Implement a Verification Scheme using one or more Independent Competent Body(s);
    - Report on safety performance indicators to the CER each quarter; and
    - Conduct Independent Safety Case Reviews.

  The *Safety Case Requirements* require operators and owners to demonstrate compliance with relevant parts of the *Compliance Assurance System* document (in particular with respect to Verification).

1.2 Structure and Interpretation

1.2.1 Safety Case and Document Structure

The structure and outline contents for each of type of safety case and notification is set out in sections 3 to 8 of these Requirements. The structure presented in each of those sections is suggested as an appropriate structure for each respective type of safety case. An operator or owner is not bound to follow this structure, but must supply all of the information identified.

The Requirements are divided into a further 13 sections:

- Applicable to all safety cases:
    - Prescriptive Requirements (section 2);
- Requirements for specific safety cases:
    - Production Safety Cases (section 3);
    - Well Work Safety Cases (section 4);
    - Non-production Safety Cases (section 5);
    - Design or Relocation Notifications (section 6);
    - Decommissioning Safety Cases (section 7);
    - Combined Operations Notifications (section 8)
- Applicable to all safety cases:
    - ALARP demonstration (section 9);
    - Safety (and environmental) critical elements, performance standards, assurance and verification (section 11);
    - S(E)MS (section 12); and
    - Safety Emergency Response (section 13);
- Applicable to all offshore safety cases:
    - Environmental ALARP Assessment (section 10); and
    - Environmental Emergency Response (section 14).

1.2.2 Interpretation

Where the word ‘will’, ‘shall’, ‘must’ or ‘should’ is used in these Requirements, it describes the information that is needed in the safety case, but the operator or owner generally has to decide how to present this information.

For ease of interpretation, the CER has summarised certain provisions of the Act in these Requirements. Such summaries are provided for convenience only and are not a substitute for reading the Act and shall not relieve any operator or owner from any obligation under the Act or operate as a defence to any failure to comply with its obligations under the Act.

In accordance with section 13B of the Act, nothing in the Act or within these Requirements shall be read as to be restrictive of any other duty, requirement or obligation imposed by law in respect of safety which would otherwise apply to a petroleum undertaking, operator or owner.

For brevity, this document uses the term “safety case” to mean safety case and / or notification where the requirements apply to all classes of safety cases and notification. Where requirements only apply to safety cases or notifications, this will be explicitly stated.

A number of terms are used in defining the required contents of a safety case and these are:

Include	The item must be included in the safety case in its entirety.
Describe	The item must be described in the safety case, but does not need to be included in its entirety.
Demonstrate	The safety case must demonstrate how a certain goal has been achieved.

The examples provided in the example boxes are illustrative only and are included to aid understanding and are not prescriptive or exhaustive. They do however represent the CER’s understanding in relation to the subject matter of the example.

1.3 Level of Information Provision in a Safety Case

Although these Requirements define requirements on the contents of safety case(s), they do not give absolute instructions on the information or the structure required for every safety case as each combination of designated petroleum activity or activities, petroleum infrastructure and location is unique. It is the responsibility of the operator or owner to provide a well-structured and coherent safety case which demonstrates that the operator or owner is capable of implementing the S(E)MS described in the safety case, and which provides sufficient information to allow judgement by the CER of whether the safety case complies with the Act and is consistent with these Requirements.

The operator or owner needs to provide sufficient information so that the safety case can be understood and assessed in the appropriate context. Data sources should be referenced, or their source identified in the safety case. The level of information provided should be

appropriate, which will vary according to the lifecycle stage; excessive detail may serve to unintentionally obscure the argument for safety within a safety case.

The safety case is expected to make reference to detailed calculations, assessments, procedures, or similar. All information referenced within a safety case must be retained by the operator or owner and must be made available to the CER if required.

It should be noted that the environmental requirements within the safety case apply to offshore activities and infrastructure only.

2 Prescriptive Requirements

The Act prescribes and the Framework implements a goal-setting safety case regime, but within this, prescriptive requirements can be made by the CER where:

- The hazards are well understood and there are established protective or preventive measures adopted in the industry;
- Cost benefit analysis would not necessarily support the adoption of Good Practice; or
- The CER recognises some advantage in having a common approach.

This section sets out prescriptive requirements and safety cases must demonstrate compliance with these prescriptive requirements where relevant to their petroleum activity.

This Act also allows for standards identified by National Standards Authority of Ireland to be included with the Framework and these are identified in section 2.4.

2.1 Prevention

Safety cases for installations which include offshore, above sea surface petroleum infrastructure, must describe how the following requirements are achieved:

- Offshore helicopter landing areas must comply with relevant national and international guidelines;[8]
- Aids to navigation for offshore installations must comply with relevant national and international guidelines[9]; and
- All above sea surface offshore petroleum infrastructure must have AIS complying with relevant national and international requirements.

2.2 Control and Detection

The safety case must describe how the following requirements are achieved with regard to control and detection of major accident hazard:

- Petroleum infrastructure shall have suitable means to detect hazards and then achieve a safe condition, if necessary, by shutting down;
- For petroleum infrastructure where a release of a substance can give rise to gas or vapour with the potential for a major accident hazard, an appropriate detection system shall be installed to detect that hazard and initiate a suitable response;
- For petroleum infrastructure where a fire could occur with the potential to create a major accident hazard, an appropriate detection system shall be installed to detect the fire and initiate a suitable response;
- All hydrocarbon risers on offshore Facilities, shall have a remotely operated topside fail-safe isolation valve located at the lowest practicable point on the riser that allows safe access for testing and maintenance, has a minimum of pipework and

[8] The specific requirements of the Irish Coast Guard are relevant here.
[9] In accordance with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Guidelines - Marking of Man-Made Offshore Structures (O-139)

potential leak points outboard of this valve and is protected from fire and explosion as far as is reasonably practicable;

- All pipelines that contain or may contain hydrocarbons crossing the boundary fence of an onshore Facility shall have a remotely operated fail-safe isolation valve suitably located; and
- All Facilities shall have appropriate emergency power such that loss of the normal power supply does not impair the ability to manage major accident hazards.

2.3 Emergency Response

The safety case must describe how the following requirements are achieved:

- Appropriate means of alerting persons to an emergency;
- Multiple communication channels with any external body whose assistance is required to manage the emergency;
- For an offshore Facility, totally enclosed motor propelled survival craft (TEMPSC) for at least the maximum number of persons onboard to allow a means of evacuation;
- For an offshore Facility, sufficient liferaft capacity for at least the maximum POB;
- Provision to allow persons to safely muster in an emergency;
- Adequate communication between muster points on a Facility;
- Multiple escape routes to muster points from all normally manned areas of petroleum infrastructure;
- For an offshore Facility, multiple escape routes from muster points to embarkation points;
- For an onshore Facility, an escape route from each muster point to a safe boundary exit point;
- On an offshore Facility, adequate protection to allow persons to muster, assess the emergency situation, communicate within the Facility and to external bodies, control the emergency as far as possible and manage an appropriate response and for a normally manned Facility this must be a temporary safe refuge; and
- Suitable personal protection equipment in appropriate locations for the hazardous conditions that may be encountered in an emergency situation.

2.4 Standards

Section 13L(3)(c) of the Act provides that the Safety Case Guidelines may include

> *"the standards and codes of practice applicable to designated petroleum activities including relevant standards and codes of practice, that have been formulated or recommended by the National Standards Authority of Ireland".*

The National Standards Authority of Ireland has formulated a list of relevant standards and codes of practices that are applicable to designated petroleum activities. The document is located on the CER website and is:

NSAI Petroleum Exploration and Extraction Technical Standards Committee recommended standards selection policy, Issue date: 2013-09-09.

2.5 Safety and Environmental Critical Elements

The environmental term within SECE is only applicable offshore and relates to the definition of a major accident, which includes major environmental incidents offshore.

For any above sea surface offshore petroleum infrastructure, the CER consider the following to be required and to be SECEs:

- Emergency response and rescue vessel (ERRV); and
- Automatic identification system (AIS).

3 Requirements for Production Safety Cases

Sections 3.1 to 3.9 provide the structure and requirements for a Production Safety Case. Demonstration of the adherence to the prescriptive requirements set out in section 2 must be addressed where relevant within a Production Safety Case.

3.1 Context and Structure

3.1.1 Petroleum Authorisation and Operator

The safety case will detail:

- The petroleum authorisation to which the safety case refers; and
- The name and address of the operator of the installation.

3.1.2 Designated Petroleum Activity

The safety case must give an outline description of the designated petroleum activities being carried out detailing:

- the location and nature of the petroleum infrastructure to be used in the designated petroleum activity;
- the nature of the surroundings; and
- connected, or related petroleum infrastructure.

3.1.3 Safety Case Structure Alignment with Requirements

The safety case will show how its structure aligns with the structure presented in this document by, for example, use of a cross-reference table.

3.1.4 Response to Design Notification

The first submission of a Production Safety Case following a Design Notification (including one made for a material change) must include a description of the account taken of the CER's response to the Design Notification.

3.2 Petroleum Infrastructure Description

3.2.1 Infrastructure Location

For a pipeline, suitable descriptions and appropriate drawings will be provided, together with a map defining the start, end and route of the pipeline and including proximity to population, topography, locations of valves and points of interconnection with other pipelines or petroleum infrastructure.

For a Facility, detailed drawings will be provided to show the:

- Location and orientation of the Facility (for offshore installations this should be on an admiralty large scale nautical chart of the area in question with positions in latitude and longitude using WGS 84 datum);
- Location and purpose of any wells, including identification of water depth for subsea wells; and
- Location of other Facilities and pipelines that may have a bearing on the hazards presented by the Facility or their management.

For onshore Facilities, the surroundings that could be affected by a hazard from the designated activity will be described with sufficient detail to allow the assessment of the hazards created and how they are affected by the choice of location. The location of nearby petroleum infrastructure will also be given if they have a bearing on the hazards.

3.2.2 Location Specific Conditions

The location specific conditions to which the petroleum infrastructure is exposed and designed for shall be described including (as relevant):

- Maximum wind conditions;
- Extreme temperature conditions (sea and air);
- Wind rose and prevailing wind information where this has an impact on petroleum infrastructure layout;
- Extreme water current and wave conditions;
- Sea bed conditions relevant to jacket and anchoring requirements; and
- Relevant seismic information for the locality.

The safety case must demonstrate how location specific conditions that have an impact on operations are monitored, including those that may have a long-term effect such as fatigue of structures.

3.2.3 Installation Description

The safety case must include a description of the installation and any association with other installations or connected infrastructure, including wells; and

- Layout of the Facility’s plant and key safety systems;
- Utility systems that are needed to support operation of the facilities;
- Personnel welfare (accommodation, medical etc.); and
- For a floating Installation, the means of ensuring that it safely remains in position.

3.2.4 Hazardous Substances

The following information is required for hazardous substances with the potential to cause a major accident:

- The behaviour of the hazardous substances during major accidents, including those that could be formed from chemical changes during a major accident[10] (e.g. combustion);
- The CAS number and name under IUPAC nomenclature for each hazardous substance; and
- Physical, chemical, toxicological characteristics and indication of the hazards to people, both immediate and delayed.

Drawings will be provided to show the:

- Locations of the hazardous substances;
- Segregation and barriers employed to separate hazards from safe areas; and
- Routes of all pipelines and risers including those connected to other petroleum infrastructure and wells.

3.2.5 Reservoir and Well

3.2.5.1 Reservoir

The following information must be provided for the reservoir(s) that the wells are located in:

- Formation geological and geophysical details;
- Basic reservoir data, including:
    - Pressure and temperature;
    - Formation petro-physical properties; and
    - Depth to reservoir tops and reservoir thicknesses;
- Reservoir fluid composition, and physical and chemical attributes of the reservoir fluids (including produced water):
    - A specific note should be made of the presence of H_2S and CO_2.

3.2.5.2 Well Description

The following must be described for each well, with suitable diagrams where appropriate:

- Well identification and top hole location (either specific point or defined area);
- Purpose of well (production, injection, etc.);
- Maximum, operating and shut-in pressures and temperatures at the wellhead and bottom-hole;
- Wellbore fluids;

[10] 'major accident' is defined in section 13A of the Act as '*…in relation to petroleum infrastructure or petroleum activities— (a) an event involving an explosion, fire, loss of well control, or release of oil, gas or dangerous substances involving, or with a significant potential to cause, fatalities or serious personal injury, (b) an event leading to serious damage of petroleum infrastructure involving, or with a significant potential to cause, fatalities or serious personal injury, (c) any other event leading to fatalities or serious injury to multiple persons, or (d) any major environmental incident resulting from incidents referred to in paragraphs (a), (b) and (c) and which relates to petroleum activities carried out offshore'.*

- Pumping designs and other aids to production, such as gas-lift;
- Well construction data (including for all of the below specific reference to the suitability for pressure and temperature conditions and fluids):
    - Casing and completion designs, including schematics specifying components, barriers, locations and depths;
    - Wellhead type and configuration;
    - Xmas tree type and configuration;
    - Material specification, including elastomers;
- Monitoring:
    - Pressure and temperature measurement location and frequency; and
        - Erosion assessment and mitigation.

Duplicate information is not required for wells with the same design and operation.

3.2.6 Petroleum Infrastructure Connected to the Facility

A description of any petroleum infrastructure to which the Facility is connected is required. The physical and organisational arrangements for safely managing the interfaces between the Facility and connected infrastructure (for example, pipelines) will be described with cross reference to the S(E)MS if needed.

3.2.7 Persons Affected

The safety case must document the maximum number of persons that can be on the Facility at any time and the minimum number required to operate the Facility safely.

The location and numbers of persons whose safety may be at risk from the petroleum infrastructure will be identified including workers associated with the petroleum infrastructure and members of the general public.

For onshore sites the location and numbers of the local population should be shown on a map.

3.2.8 Operations

The safety case will describe all designated petroleum activities and all activities that may have an impact on the safety of persons, especially those that have the potential to cause a major accident including at least:

- Activities relating directly to the processing of petroleum. To describe the hydrocarbon processing, a process flow diagram will be provided showing at least hydrocarbon isolation and blowdown valves;
- Personnel transportation (helicopter, marine access, onshore vehicle control);
- Logistics (supply boats, offloading, laydown, Facility loading);
- Any diving operations carried out from the relevant petroleum infrastructure; and
- Marine operations that may safely be performed including the means of ensuring that marine and other operations, do not conflict in an unsafe manner.
- The full range of maintenance and service activities need not be described in this section. These will be managed through the S(E)MS.

3.2.9 Well Operations

3.2.9.1 Normal Well Operations

Normal well operations are those designated petroleum activities that can be carried on pursuant to Production Safety Permit and which do not require a Well Work Safety Permit and these must be clearly identified and described in the safety case.

3.2.9.2 Well Work

If the Production Installation can carry out well work activities, then this should be described in the Production Safety Case in such a way that it covers all well work activities that are capable of being carried out from that Production Installation (otherwise a material change of the Production Safety Case will be needed before such well work activities could be undertaken).

The well operations that the Production Installation can carry out should be described in a manner such that they are independent of a particular well, though any pre-conditions for safe operations should be stated. Such operations may include:

- Drilling;
- Completion;
- Workover;
- Well testing;
- Formation stimulation operations (e.g. hydraulic fracturing);
- Intervention (e.g. wireline, E-line or Coiled Tubing);
- Suspension; and
- Abandonment.

In describing the above, details of the associated utilities should be given.

In terms of well control, the following must be described within the safety case:

- Equipment and arrangements to control pressure in a well and prevent the uncontrolled release of hazardous substances;
- Well control techniques used to balance pressures and keep the wellbore stable. It should be demonstrated that procedures are provided for monitoring and controlling drilling fluid (mud) density and bottom hole pressure against the reservoir (formation) pressure; and
- The response to be taken in the event of a kick being detected and subsequent isolation of the wellbore from the surface, for example through the activation of blow-out preventers, closing in the well and circulating out any influx fluids in a controlled manner. This will include the type of trigger signal, the level of redundancy built into the signal system and the locations from which the blowout preventer or similar equipment can be activated.

If well work is planned, a Well Work Safety Case would have to be submitted and demonstrate that the Production Installation's well work equipment is capable of safely carrying out the operation.

3.2.9.3 Suspension and Abandonment

The safety case must provide a summary of the proposed method for well plugging by cement, and not solely mechanical means, carried out for the purposes of suspension or abandonment. The safety case should demonstrate that the well can be plugged in this way:

- In a safe manner; and
- In such a way to ensure that as far as is reasonably practicable there can be no unplanned escape of fluids from the well.

3.3 ALARP Demonstration

The fundamental obligation placed upon the operator under the Act is to reduce the major accident hazard[11] risks to safety to a level that is ALARP. A safety case must include a demonstration that all the major hazards have been identified, their likelihood and consequences assessed and that their control measures including associated safety and environmental critical elements are suitable so as to reduce the risk of a major accident to an acceptable level.

Requirements for demonstrating ALARP within a Production Safety Case are given in section 9 and, for offshore only, also section 10.

3.4 Safety (and Environmental) Critical Elements, Performance Standards, Assurance and Verification

Requirements in relation to S(E)CEs, performance standards, assurance and verification within a Production Safety Case are given in section 11.

3.5 Safety Management System / Safety and Environment Management System

The safety case for an onshore installation must describe the operator's Safety Management System (SMS). The safety case for an offshore installation must describe the operator's Safety and Environmental Management System (SEMS).

Section 12 defines requirements for the description of the S(E)MS required in a safety case.

[11]'major accident hazard' is defined in section 13A of the Act as'… *a hazard that if realised could result in a major accident'.*

3.6 Emergency Response (Safety)

The requirements for describing the emergency response arrangements are given in section 13.

3.7 Emergency Response (Offshore Environment)

In relation to offshore operations only, the requirements for describing the environmental emergency response arrangements are given in section 14.

3.8 Combined Operations

The safety case for an offshore Facility must include a description of the arrangements in place should any combined operations[12] between the Production Installation and a non-production installation be planned. This information is complementary to a Combined Operations Notification that must be submitted for each combined operation.

3.8.1 Arrangements for Combined Operations

The safety case must address:

- Arrangements for interfaces with an adjacent installation, including walkways; electrical and / or hydraulic power; communications facilities; alarm signals; firewater connections and other safety-critical element interfaces as appropriate;
- The maximum number of persons who may be on the Production Installation during combined operations;
- Provisions for any additional persons especially as required in an emergency;
- Additional or altered arrangements to protect persons from the effects of major accidents during combined operations and changes in the provision of means for evacuation.

3.8.2 ALARP Demonstration

The safety case should demonstrate that the infrastructure provided for combined operations is sufficient to reduce the risks to ALARP insofar that the operator can reasonably anticipate the nature of combined operations. Requirements for demonstrating ALARP are included in section 9.

The ALARP demonstration should include assessment of:

- the generic major accident hazards that may arise from the operation of two installations in close proximity (for example moving a non-production installation alongside the Production Installation);

[12] 'combined operation' is defined in section 13A of the Act as '*…a designated petroleum activity carried out from an installation with another installation for purposes related to the other installation which thereby materially affects the risks to the safety pf persons or the protection of the environment on any or all of the installations'.*

- the potential that a major accident hazard on one installation may affect the safety of people on the other;
- the major accident hazards arising as a direct result of the combined operations activities and which are not present during stand-alone operations (for example simultaneous drilling and production); and
- the effect of the personnel distribution during combined operations on the risks from major accident hazards.

3.8.3 Safety (and Environmental) Critical Elements, Performance Standards, Assurance and Verification

The safety case should state whether the safety and environmental critical elements and their performance standards are likely to change for combined operations and the impact this may have on combined operations.

> Example
>
> Positioning a non-production installation alongside a Production Installation may impair the ability to launch the Production Installation lifeboats, and alternative provision may be required. This may be provided by a bridge to the non-production installation, but this will depend on the ability to protect the bridge from the effects of major accident hazards and provide suitable facilities for the additional persons on the non-production installation.

3.8.4 Management System Interfacing

The Production Safety Case should describe the management systems' interface during combined operations, which should be through a bridging document, or similar. The contents of the bridging document and the joint process between the operator and an owner for developing it must be described in the safety case.

The safety case should document the process to identify and implement any additional controls required to conduct normal operations safely during combined operations, including restriction or suspension of those operations during combined operations.

Example

A bridging document for stationing a non-production installation alongside a production facility should consider safe management of:

- Movement of the non-production installation to be alongside the facility;
- Continuation of normal operations during combined operations;
- Combined operations activities including simultaneous operations restrictions; and
- Emergency response for the range of foreseeable emergencies during combined operations (and in particular the nomination of key positions and their roles and responsibilities during an emergency).

3.9 Workforce Consultation

The safety case must describe how workforce consultation and involvement has been achieved such that members of the workforce have the opportunity to contribute to the safety case and are able to arrive at informed opinions about the management of hazards to which they may be exposed on the installation.

4 Requirements for Well Work Safety Cases

Sections 4.1 to 4.7 detail the requirements for a Well Work Safety Case. The prescriptive requirements set out in section 2 should also be addressed where relevant within the Well Work Safety Case.

A Well Work Safety Case should demonstrate that the operator has carefully considered all available data in the planning of the proposed Well Work Activity and that the risks associated with the design and execution of the activity have been reduced to ALARP. The exact conditions that are encountered subsurface and the performance of the Well Work Activity cannot be known with total certainty when the Well Work Safety Case is submitted. Therefore, the Well Work Safety Case should define an envelope of Well Work Activity and well design that can be completed safely. Careful and thorough planning and design through both scenario and contingency planning should be used to establish acceptable operating envelopes for critical design features and these should be described in the Well Work Safety Case.

Examples of the parameters that define the envelope are given below.

Example

The possibility of variations in a range of parameters should be considered such that it is known that drilling and well design is acceptable within defined parameter limits for:

- *Surface (well spud) location*: to allow movement to avoid boulders, local topography, shallow gas, etc);
- *Target location:* to allow for movement of the well target location during drilling;
- *Pore or fracture pressure gradients:* to allow for planning of mud weight etc;
- *Reservoir fluid composition:* the petroleum undertaking should consider the possibility of encountering all fluid phases in the well design;
- *Well trajectory:* tolerable limits to the proposed well path (in the context of the geology and pore/overburden pressure regime anticipated); and
- *Casing scheme:* changes to the casing scheme in a well (i.e. casing sizes, shoe depths, cementing, etc), the need for additional casing strings (contingent strings), variation in the setting depth of casing shoes, etc.

4.1 Context and Structure

4.1.1 Petroleum Authorisation and Operator

The safety case will detail:

- The petroleum authorisation to which the safety case refers;
- The name and address of the operator that is submitting the safety case; and
- the name of the installation to be used and the name and address of the owner or, in the case of a Production Installation, the contractor undertaking drilling activities.

4.1.2 Designated Petroleum Activity

The safety case must give an outline description of the designated petroleum activities being carried out detailing:

- the location and nature of the petroleum infrastructure to be used in the designated petroleum activity;
- the nature of the surroundings; and
- connected, or related petroleum infrastructure.

4.1.3 Associated Safety Cases

The safety case will describe the purpose and scope of all other safety cases referenced within the Well Work Safety Case.

4.1.4 Safety Case Structure Alignment with Requirements

The safety case will show how its structure aligns with these Requirements.

4.2 Petroleum Infrastructure Description

4.2.1 Location Specific Conditions

The location specific conditions to which the petroleum infrastructure is exposed to (as relevant):

- Maximum wind conditions;
- Extreme temperature conditions (sea and air);
- Wind rose and prevailing wind information where this has an impact on petroleum infrastructure layout;
- Extreme water current and wave conditions;
- Water depth;
- Sea bed conditions relevant to jacket and anchoring requirements; and
- Relevant seismic information for the locality.

4.2.2 Non Production Installation Suitability for the Well Operations

This section should demonstrate that the well work being carried out is within the stated capabilities of the non-production installation including:

- Suitability of the emergency response plan for MEIs;
- Environmental and metrological conditions; and
- Where relevant suitability of seabed conditions.

The safety case should describe and demonstrate that suitable equipment and arrangements are provided for the planned well operations, including:

- Details concerning safety equipment to be deployed that are not described in the safety case for the production, or Non-production Installation that is carrying out the Well Work Activity.
- The well control philosophy and equipment including BOP type and configuration (including specific reference to the suitability for the pressure and temperature conditions and fluid characteristics). The Well Work Safety Case should demonstrate that the BOP is suitably dressed for the planned well operations.
- For equipment and processes not detailed in the Non-production Safety Case, a summary of the arrangements made by the operator which ensure that the use of the equipment provided secures the safety of the well operation. As relevant, this should cover the integration of the different equipment, the operating procedures and the competence of the crew to execute the procedures safely.

> Example
>
> 3rd party pressure control equipment (such as a rental riser package) must be suitable for the pressure, temperature and fluid composition (e.g. NACE rated for high H_2S or qualified gas tested valves for gas service). It must also be suitable for the operations performed, and valves should be capable of cutting tubulars, E-Line or coiled tubing and sealing afterwards if required to do so to ensure the integrity of the well during the Well Work Activity

4.3 Reservoir and Well Description

4.3.1 Reservoir

The following information must be provided for the reservoir that the well is located in:

- Formation geological and geophysical details;
- Basic reservoir data, including:
- Pressure and temperature;
- Formation petro-physical properties; and
- Depth to reservoir tops and reservoir thicknesses;
- Reservoir fluid composition, and physical and chemical attributes of the reservoir fluids (including produced water):
- A specific note should be made of the presence of H_2S and CO_2.

4.3.2 Well Location

For onshore and offshore wells, diagrams must be provided that show the:

- Location and orientation of the well; and
- Location of other petroleum infrastructure and pipelines that may have a bearing on hazards or their management.

A Well Work Safety Case for an onshore well must include:

- A description of the surroundings that could be affected by a hazard from the well with sufficient detail to allow the assessment of the hazards created or affected by the choice of location.
- The location of nearby petroleum infrastructure if it has a bearing on the hazards.
- The location and numbers of persons whose safety may be at risk from the well work including workers associated with the well work, well related petroleum infrastructure and members of the general public.
- The position of the wells with respect to the location and numbers of the local population shown on a map.

4.3.3 Well Description

The following information must be provided for each well insofar as it is relevant to the Well Work Activity and the management of the hazards associated with it, with suitable diagrams where appropriate:

- Well identification and top hole location (either specific point or defined area);
- Purpose of well (production, injection, etc.);
- Maximum, operating and shut-in pressures and temperatures at the wellhead and bottom-hole;
- Overburden geological and geophysical data:
    - Geological setting;
    - Formation fluid pressure profile;
    - Formation fracture gradient profile including known or anticipated reservoir fluid contacts;
- Well construction data:
    - Well trajectory;
    - Wellbore fluids;
    - Casing and completion designs, including schematics specifying components, barriers, locations and depths;
    - Pumping designs and other aids to production, such as gas-lift;
    - Wellhead type and configuration (including specific reference to the suitability for the pressure and temperature conditions);
    - Xmas tree type and configuration (including specific reference to the suitability for the pressure and temperature conditions); and
    - Material specifications, including elastomers (including specific reference to the suitability for the pressure and temperature conditions).

In addition for the initial drilling of a well:

- Seismic anomalies related to shallow gas;

- Depth references; and
- List of relevant offset wells.

In addition for an existing well:

- A summary of its history and condition.

4.3.4 Well Work Activity

The Well Work Activity that is being carried on in relation to the well must be described including a clear description of the well before and after the activity has been completed. A summary of the well work programme is required including:

- The period of the Well Work Activity;
- Details of barriers against loss of well control (equipment, drilling fluids and cement etc.), which can refer to information in Section 4.5;
- Directional control of the well path; and
- Limitations on safe operations.

4.3.5 Suspension and Abandonment

If any arrangements for suspension or abandonment are affected by the Well Work Activity, they need to be described including a summary of the proposed method for well plugging by cement, and not solely mechanical means. The safety case should demonstrate that the well can be plugged:

- In a safe manner; and
- In such a way to ensure that as far as is reasonably practicable there can be no unplanned escape of fluids from the well.

If the Well Work Safety Case is being submitted to obtain a Well Work Safety Permit for well abandonment:

- The proposed status of the well after abandonment should be described; and
- The safety case should outline how the operator will address potential re-pressurisation of all the formations to virgin pressures, changes in fluid composition in the wellbore and the deterioration of the abandoned well over time.

4.4 ALARP Demonstration

The ALARP demonstration in respect of the Well Work Activity should be carried out in line with section 9 and the *ALARP Guidance* document and, for offshore only, also section 10 and the *ALARP Guidance* document and must incorporate a description of:

- the risks associated with seabed and marine hazards such as pipelines and moorings of adjacent installations;
- the subsurface hazards; and

- any surface or subsea operations which introduce new, combined, or simultaneous major hazards .

4.5 Safety (and Environmental) Critical Elements, Performance Standards, Assurance and Verification

The requirements of this section are as per section 11, insofar as they relate to the Well Verification Scheme and the Well Work Activity.

The safety case must also include a statement by the operator of the well that, after considering the report and findings of independent well verification by the ICB, the risk management relating to well design and its barriers to loss of control are suitable for all anticipated conditions and circumstances.

4.6 Safety (and Environmental) Management System

The S(E)MS for the Well Work Activity must be described in the Well Work safety case in accordance with section 12 as it pertains to how the management systems of the operator of the well and the owner are to be coordinated to ensure effective control of major hazards at all times.

It must describe the role of each party during all stages of the well work programme and identify the boundaries between the processes and procedures of the operator and owner.

4.7 Emergency Response (Safety)

If the Well Work Activity is being carried out from a Production Installation, no further information on emergency response in relation to safety is required.

If the Well Work Activity is being carried out from a Non-production Installation, this section should describe how the onshore arrangements dovetail with the emergency response described in the Non-production Safety Case and should include:

- Helicopter locations and evacuation timings;
- Stand-by vessel arrangements; and
- Onshore emergency response co-ordination.

4.8 Emergency Response (Offshore Environment)

In relation to offshore operations only, requirements for describing the environmental emergency response arrangements are given in section 14.

Reference can be made to the Production, or Non-production Safety Case as required, though the information must be relevant to the Well Work Activity that is being carried out. Repetition of information provided in relation to generic drilling emergency response information in the production, or Non-production Safety Case is not required, though

evidence needs to be provided that all MEIs are covered and that any bridging issues are managed.

5 Requirements for Non-Production Safety Cases

Sections 5.1 to 5.9 provide the requirements for a safety case for a Non-production Installation. The prescriptive requirements set out in section 2 should also be addressed where relevant within a non-production installation Safety Case.

The requirements are written primarily to encompass the requirements for an offshore non-production installation safety case submitted by the installation owner. Refer to the *Petroleum Safety Framework Requirements* Section 6.3.2.2 on how these requirements are to be interpreted for onshore well work.

5.1 Context and Structure

5.1.1 Non-production Installation Owner

The safety case will give the name and address of the owner of the non-production installation.

5.1.2 Safety Case Structure Alignment with Requirements

The safety case will show how its structure aligns with these Requirements.

5.2 Non-production Installation

5.2.1 Installation Description

The safety case must include a description of the:

- Non-production Installation type and where and when it was built;
- Layout of the non-production installation's plant and key safety systems (including detailed clear drawings);
- Utility systems that are needed to support operation of the non-production installation;
- Personnel welfare (accommodation, medical, etc.);
- In the case of a mobile installation, a description of its means of being positioned on location, and its stationing system;
- For a Jack-Up, the operational limits for the support structure (load limits of jacket or legs), and the seabed requirements; and
- Environmental, meteorological and seabed limitations on safe operations.

5.2.2 Hazardous Substances

The following information is required for hazardous substances with the potential to cause a major accident (if the hazardous substances vary according to the well worked on, maximum values should be given):

- The behaviour of the hazardous substances during major accidents, including those that could be formed from chemical changes during a major accident (e.g. combustion);

- The CAS number and name under IUPAC nomenclature for each hazardous substance; and
- Physical, chemical, toxicological characteristics and indication of the hazards to people, both immediate and delayed.

Drawings will be provided to show the:

- Locations of the hazardous substances; and
- Segregation and barriers employed to separate hazards from safe areas.

The hazardous substances within the well should not be described as this will vary from well to well. However, some operations may mean that well fluids are seen at the surface, for example, during a well test. The Non-production Safety Case should demonstrate that the equipment on the installation (including the provision for temporary equipment) is appropriate for the maximum inventory described with respect to pressure, composition etc.

> Example
>
> Equipment for handling well returns on a non-production installation include well test equipment and facilities for flaring. The maximum inventory in the well test equipment and the safety systems in place, including those for major accident detection and response, should be described, and the risk from hazards associated with the well test must be shown to be ALARP.

5.2.3 Well Operations

The well operations that the non-production installation can carry out should be described in a manner such that they are independent of a particular well, though any pre-conditions for safe operations should be stated. The requirements are the same as section 3.2.9.2.

5.2.4 Non-well Operations

The safety case will describe all non-well operations during normal operational activities, and all activities that may have an impact on the safety of persons, especially those that have the potential to cause a major accident including at least:

- Personnel transportation (helicopter, marine access, onshore vehicle control);
- Logistics (supply boats, offloading, laydown, Facility loading);
- Any diving operations carried out from the relevant petroleum infrastructure;
- Marine operations that may safely be performed including the means of ensuring that marine and other operations, do not conflict in an unsafe manner;

5.2.5 Persons Affected

The safety case must document the maximum number of persons that can be on the non-production installation at any time and their typical location on the installation, and the minimum number required to operate the Facility safely.

5.3 ALARP Demonstration

A safety case must include a demonstration that all the major accident hazards have been identified, their likelihood and consequences assessed and that their control measures including associated safety and environmental critical elements are suitable so as to reduce the risk of a major accident to ALARP; this demonstration shall include an assessment of oil spill response effectiveness.

The demonstration that all risks to safety have been reduced to ALARP should be carried out in line with sections 9 and 10 and the *ALARP Guidance* document, subject to the following additional guidance:

- A non-production installation may be used at many different locations. The Non-production Safety Case should therefore identify the range of potential hazards it may encounter in its intended use and define the conditions that will apply to ensure its safe use;
- The specific hazards for a specific well do not need to be described in a Non-production Safety Case. However the hazards presented by the range of well work activities for which the petroleum infrastructure is suitable will be identified and a demonstration made that the risks are ALARP; and
- The ALARP assessment should include the arrangements for identifying risks from seabed and marine hazards such as pipelines and the moorings of adjacent installations.

5.4 Safety (and Environmental) Critical Elements, Performance Standards, Assurance and Verification

The requirements of this section are given in section 11.

5.5 Safety (and Environmental) Management System

The requirements for this section of the safety case are described in section 12.

5.6 Emergency Response (Safety)

The requirements for this section of the safety case are described in section 13 insofar as they are generic for different well locations, but with the following additional requirement:

- A non-production installation Safety Case will provide an overview of the procedures in place to review and amend, as necessary, the petroleum infrastructure's emergency response arrangements so as to ensure they are suitable for the location of the Well Work Activity for which the petroleum infrastructure is selected.

Note that any associated Well Work Safety Case must include emergency response measures that are specific to the well being worked on.

5.7 Emergency Response (Offshore Environment)

The requirements for this section of the safety case are as per section 14 insofar as they are generic for different well locations and emergency response in relation to the Well Work Activity itself is covered in the Well Work Safety Case.

5.8 Combined Operations

The safety case for a non-production installation must include a description of the arrangements in place should any combined operations between the Non-production Installation and a Production Installation be planned. This information is complementary to a Combined Operations Notification that must be submitted for each combined operation. The issues to be considered in the non-production installation Safety Case are described in this section. Any information included in other parts of the safety case need not be repeated.

5.8.1 Infrastructure for Combined Operations

The safety case should include:

- The seabed and environmental limitations for stationing the Non-production Installation alongside a Production Installation. It should also state any weather limitations for combined operations that may require the non-production installation to move-off;
- Arrangements for interfaces with an adjacent installation, including walkways; electrical and / or hydraulic power; communications facilities; alarm signals; firewater connections and other safety-critical element interfaces as appropriate; and
- Provisions for any additional persons, especially as required in an emergency;
- Additional or altered arrangements to protect persons from the effects of major accidents during combined operations and changes in the provision of means for evacuation.

5.8.2 ALARP Demonstration for Combined Operations

The safety case should demonstrate that the infrastructure for generic combined operations is sufficient to reduce the risks to ALARP insofar that the owner can reasonably anticipate the nature of combined operations. Requirements for demonstrating ALARP are included in section 9.

The ALARP demonstration should assess:

- the generic major accident hazards that may arise from the operation of two installations in close proximity (for example moving the non-production installation alongside a Production Installation);
- the potential that a (stand-alone) major accident hazard on one installation may affect the safety of people on the other;
- the major accident hazards arising as a direct result of the combined operations activities and which are not present during stand-alone operations (for example simultaneous drilling and production); and

- the effect of the personnel distribution during combined operations on the risks from major accident hazards.

5.8.3 Safety (and Environmental) Critical Elements, Performance Standards, Assurance and Verification for Combined Operations

The safety case should consider whether the safety and environmental critical elements and their performance standards are likely to change for periods of combined operations and the impact this may have on combined operations.

> Example
>
> Positioning a jack-up non-production installation alongside a Production Installation may expose the legs of the jack-up to the risk of intense radiation from a fire on the Production Installation. In this case, the design of the jack-up should consider whether it is appropriate to provide passive fire protection or deluge on the legs to protect against structural collapse. Therefore the ALARP considerations in the design of the jack-up may limit the ability to carry out combined operations.

5.8.4 Management System Interfacing

The safety case for a non-production installation should describe how the owner will ensure the management system interfaces during combined operations, which should be through a bridging document, or similar. The contents of the bridging document and the joint process between the operator and an owner for developing it must be described in the safety case.

The safety case should document the process to identify and implement any additional controls required to conduct normal operations safely during combined operations, including restriction or suspension of those operations during combined operations.

Refer to section 3.8.4 for an example on interfacing management systems during combined operations.

5.9 Workforce Consultation

The safety case for a non-production installation must contain adequate demonstration of workforce consultation and involvement such that members of the workforce have the opportunity to contribute to the safety case and are able to arrive at informed opinions about the management of hazards to which they may be exposed on the installation.

6 Requirements for Design Notifications for a Production Installation

The operator must submit a Design Notification for a planned new Production Installation or for relocating an existing Production Installation.

An operator must also submit a Design Notification for a material change to an existing Production Installation with an accepted safety case prior to implementing the material change. This Design Notification only needs to cover aspects that are relevant to the material change.

Sections 6.1 to 6.6 provide the requirements for a Design Notification.

6.1 Context and Structure

6.1.1 Petroleum Authorisation and Operator

The Design Notification will detail:

- The petroleum authorisation to which the safety case refers; and
- The name and address of the operator submitting the notification.

6.1.2 Designated Petroleum Activity

The Design Notification must give a description of the designated petroleum activities being carried out detailing:

- the location and nature of the petroleum infrastructure to be used in the designated petroleum activity;
- the nature of the surroundings; and
- connected, or related petroleum infrastructure.

6.1.3 Notification Structure Alignment with Requirements

The notification will show how its structure aligns with these Requirements.

6.2 Petroleum Infrastructure Description

6.2.1 Position

For a pipeline, suitable descriptions and appropriate drawings will be provided, together with a map defining the start, end and route of the pipeline and including proximity to population, topography, locations of valves and points of interconnection with other pipelines or petroleum infrastructure.

For a Facility, drawings will be provided to show the:

- Location and orientation of the Facility (for offshore installations this should be on an admiralty large scale nautical chart of the area in question with positions in latitude and longitude using WGS 84 datum);
- Location and purpose of any wells, including identification of water depth for subsea wells; and
- Location of other Facilities and pipelines that may have a bearing on the hazards presented by the Facility or their management.

For onshore Facilities, the surroundings that could be affected by a hazard from the designated activity will be described with sufficient detail to allow the assessment of the hazards created and how they are affected by the choice of location. The location of nearby petroleum infrastructure will also be given if they have a bearing on the hazards.

6.2.2 Location Specific Conditions

The location specific conditions to which the petroleum infrastructure is exposed and designed for shall be described including (as relevant):

- Maximum wind conditions;
- Extreme temperature conditions (sea and air);
- Wind rose and prevailing wind information where this has an impact on petroleum infrastructure layout;
- Extreme water current and wave conditions;
- Sea bed conditions relevant to jacket and anchoring requirements; and
- Relevant seismic information for the locality.

6.2.3 Installation Description

The notification must include:

- The layout of the Facility's plant and key safety systems;
- A description of the Installation and any association with other installations or connected infrastructure, including wells, and marine hazards such as pipelines and the moorings of adjacent installations;
- A summary description of utility systems that are needed to support operations of the facilities;
- A summary description of personnel welfare arrangements (accommodation, medical, etc.);
- For a floating Installation, the means of ensuring that it remains on station; and
- A description of any environmental, meteorological and seabed limitations on safe operations.

6.2.4 Hazardous Substances

There should be sufficient information available with the Design Notification to show the identification and approximate quantity of all the hazardous substances with the potential to cause a major accident that will be on or flowing through the petroleum infrastructure.

Diagrams must be provided to show the:

- Locations of the hazardous substances;
- Segregation and barriers (fire and blast walls) employed to separate hazards from safe areas; and
- Routes of all pipelines and risers including those connected to other petroleum infrastructure and wells.

6.2.5 Reservoir and Well

A Design Notification is only required as a precursor to a Production Safety Case. As such well and reservoir characteristics need only be described where there is a well that is intended for production purposes whether that be hydrocarbon production, water injection, or otherwise. An exploration well does not need a Design Notification.

6.2.5.1 Reservoir

The following information should be provided for the reservoir or reservoirs that the well(s) is located in:

- List of offset wells (exploration, appraisal or offset) that allow reservoir data to be collated;
- Basic reservoir data, including:
    - Pressure;
    - Temperature; and
    - Depth to reservoir tops and reservoir thickness.
- Reservoir fluid composition; and
- A specific note should be made of the presence of H_2S and CO_2.

6.2.5.2 Well

The following should be described for each well:

- Well top hole location (either specific point or defined area);
- Purpose of well (production, injection, etc);
- Well operating parameters:
    - Maximum expected operating pressure; and
    - Maximum and minimum expected operating temperature.

6.2.6 Petroleum Infrastructure Connected to the Facility

A summary description of any petroleum infrastructure to which the Facility will be connected is required.

6.2.7 Persons

The location and numbers of persons whose safety may be at risk from the petroleum infrastructure will be identified including workers associated with the petroleum infrastructure and members of the general public.

For onshore sites the location and numbers of the local population should be shown on a map.

In addition, the Design Notification must show how the proposed manning arrangements have been derived such as to provide an adequate level of manning for safe operations.

6.2.8 Operations

The Design Notification must outline all intended designated petroleum activities and related petroleum infrastructure. This will include a description of operations with major accident hazard potential.

The intended operations relating to petroleum processing should be described. Other activities that are needed to carry out the designated petroleum activity, such as marine operations and the ability to stay on station for an FPSO should be described and any weather limitations given.

The Design Notification should also contain a high-level description of operations that will be required to service and maintain the petroleum infrastructure, which may include:

- Personnel transportation (helicopter, marine access);
- Personnel welfare (accommodation, medical, etc); and
- Any diving operations from the petroleum infrastructure.

6.3 ALARP Demonstration

The notification must demonstrate how the operator will reduce risks associated with petroleum activities it will carry on to a level that is ALARP.

The ALARP demonstration for the proposed design must follow the requirements in Section 9 and 10 for critical aspects that could have a significant impact on the risk generated by the proposed designated petroleum activity. It must cover and describe the full range of concepts that have been considered (essentially as risk reduction measures) for exploitation of a field. The location of significant equipment items (such as a compressor package) would also need to be included (the details of such items would not be required).

> Example
>
> For offshore developments consideration should be given to options such as fixed, floating, bridge-linked structures, Normally Unattended Installations (NUIs) or a subsea development and pipeline options. For onshore developments, options on wells, plant and pipelines and their locations are likely to need consideration.

Specific details to include in the design process (where relevant) include:

- Where an existing Production Installation is to be moved to a new location to serve a different production operation, a demonstration that the installation is suitable for the proposed production operation;

- Where a Non-production Installation is to be converted for use as a Production Installation, a justification demonstrating that the installation is suitable for such conversion.

6.3.1 Methodology

The requirements for this section are described in section 9.1.

6.3.2 Hazard and Risk Reduction Measure Identification

The requirements for this section are as per section 9.2, but only in relation to the identification and description of the high level and more critical hazards and risk reduction measures as they relate to parts of the design that cannot readily changed.

6.3.3 Good Practice

The requirements for this section are as per section 9.3. It is emphasised that the notification must demonstrate how inherent safety has been implemented.

6.3.4 Risk Tolerability

A quantified risk assessment should be used to produce a risk estimate to judge against the risk tolerability criteria. This assessment should be to a level of detail sufficient to show that the proposed option does not impose risks that are intolerable. Guidance on how to undertake such a risk assessment at the early stage of a design is given below.

For the first well of a number of wells, the notification should also demonstrate that the risk from the final arrangement of all wells is below the Upper Tolerability Level.

6.3.5 Quantitative Risk Assessment

For the Design Notification, the broad approach to QRA is as described in 9.5, except that the level of detail may be less. Design philosophies may also specify return frequencies to be used for accidental loads, such that, although the accident loads are not defined, the frequency of them being exceeded is known. Combined with basic facts about location, ventilation and the expected process details, the risk may be estimated to a degree that is sufficient to show that risks are not intolerable.

> Example
>
> In a Design Notification, the quantitative risk assessment for an offshore process area might use leak frequencies for process units based on comparison with similar existing designs.

Consequence assessment using exact process parameters may only be needed in certain circumstances. For example, setting the distance between an onshore boundary fence and the process equipment, or determining the length of a bridge between two offshore platforms.

6.3.6 ALARP Assessment

ALARP assessment within a Design Notification is described in Section 9.6. This should recognise the enhanced ability to minimise risks early in the design process.

It must include a description of the design process for the production operations and systems, from an initial concept to the submitted design or selection of an existing installation that has led to the risk for the proposed design being ALARP.

6.4 Safety (and Environmental) Critical Elements, Performance Standards, Assurance and Verification

For those safety (and environmental) critical elements that can be readily altered as the design progresses and do not have a fundamental impact on the layout, or design, only the fact that they have been identified as safety critical is required to be demonstrated. Examples of this include positions of exit points from a boundary fence on onshore petroleum infrastructure (which may be important, but can usually be moved) and emergency lights and liferaft locations offshore.

For those safety (and environmental) critical elements that are fundamental to the design, the high level performance of the S(E)CEs must be given in quantitative terms wherever possible and should demonstrate how those choices that have been made in relation to S(E)CEs are ALARP. For a Design Notification the level of detail required is such that the quantitative requirements may be high level and the CER would not require reliability of individual components at this stage

If this performance is not critical to the design at this stage and does not have a material effect on the risk, then the broad process for deciding this should be described. For the S(E)CEs that need to be described, just those factors that cannot easily be changed during the design, or have a significant impact on the risk, should be identified.

> Example
>
> If the layout of an offshore platform includes a blastwall, its location should be identified, but the precise blast withstand capacity that it will eventually have does not need to be provided, but the high-level process by which it will be determined and ALARP is achieved needs to be described. In addition, the process by which it was determined that the blastwall is required as opposed to, say, a solution involving a bridge-linked platform where the blastwall was not required should be described in the ALARP demonstration.

Example

The temporary refuge and evacuation arrangements for an offshore installation need to be designed for a certain number of people. This number is difficult to change as the design progresses and so the number of persons on the installation needs to be given in the Design Notification and this number should correspond to the expected operations to be carried out on the installation.

Example

As part of the hydrocarbon containment S(E)CE, an overview of the corrosion management strategy is required, but without the need for specific corrosion allowances to be identified.

Example

If 3 × 50% fire pumps have been selected rather than 4 × 50%, this should be included in the ALARP demonstration as it is usually not possible to add an additional fire pump later in the design. If the choice has not been made, a high level description of the process that will be used to determine the layout should be given with the safety case showing that the design is equally capable of both outcomes.

In relation to on-going assurance once the plant is operational, where critical decisions are made early in the design process that have a significant bearing on the risk, the number of persons required on the petroleum infrastructure or similar, this should be described. For example, if a pipeline is such that internal inspection by a pig is not possible, this restricts the type of assurance activities that can be done and so a demonstration of why it is ALARP to do this is required.

6.4.1 Hazards and Inherent Safety

The notification must summarise the range of the options for the development and summarise how the selected concept reduces risks to a level that is ALARP. In doing so, it must demonstrate that the risk from each hazard is reduced to a level that is ALARP. This will involve the consideration of, amongst other things, inherent safety and risk reduction measures that are not in themselves S(E)CEs including:

- Elimination and substitution of hazards;
- Overall concept (subsea wells, manned platforms etc);
- Inherent safety;
- Layout;
- Reduction of potential leak points;
- Location of the petroleum infrastructure;
- Distribution and number of persons; and
- Means of transportation.

6.4.2 Verification

The notification must include an initial list of safety and environmental critical elements and their required performance. It must also include a summary of the Verification Scheme that will be used during the on-going design, construction and commissioning process (see sections 2.2.1 and 2.4 of the *Compliance Assurance System* document for further details).

6.5 Safety (and Environmental) Management System

Although there is no requirement for detailed operational aspects to be included, the Design Notification must provide a general description of the Safety (and Environmental) Management System including (following a similar structure to section 12, but at a suitable level):

- How the intended major accident risk control measures are to be maintained in good effect); and
- The broad approach to safety management.

6.6 Emergency Response

The Design Notification requirements recognise that details of the emergency response plan are unlikely to be available at the time of submission, and consequently only a short summary of the emergency response arrangements is required.

7 Requirements for Decommissioning Safety Cases

The requirements for a decommissioning safety case are the same as for a Production Safety Case, but with the additional requirement to clearly identify the infrastructure that is to be decommissioned.

In addition, the Decommissioning Safety Case should identify all relevant organisations contracted to the operator, or with whom the operator must co-operate in order to secure the safe management of decommissioning as a designated activity. These may include among others, accommodation installations, heavy lift vessel operators and diving support vessels.

8 Requirements for Combined Operations Notifications

Sections 8.1 to 8.6 provide the structure and requirements for a Combined Operations Notification. The combined operations notification is complementary to the safety cases for the installations involved in the combined operations, and as such is not a stand-alone document.

The stand-alone operations of the installations will be described in their respective safety cases and are not required to be repeated in the Combined Operations Notification.

8.1 Context and Structure

8.1.1 Petroleum Authorisation and Operator

The notification will detail:

- The petroleum authorisation to which the notification refers;
- The name and address of the operator that is submitting the notification; and
- The names and addresses of all other operators or owners involved in the combined operations (if any), and confirmation that they agree with the contents of the notification.

8.1.2 Combined Operations Activity

The notification must give an outline description of the designated petroleum activities being carried out detailing:

- The location and nature of the petroleum infrastructure to be used in the designated petroleum activity;
- The nature of the surroundings; and
- Connected or related petroleum infrastructure.

8.1.3 Associated Safety Cases

The notification will describe the purpose and scope of all safety cases referenced within the notification.

8.1.4 Notification Structure Alignment with Requirements

The notification will show how its structure aligns with these Requirements.

8.2 Petroleum Infrastructure Description

8.2.1 Location

For all Facilities engaged in combined operation, detailed drawings will be provided to show the:

- Location and orientation of the Facilities during combined operations (for offshore installations this should be on an admiralty large scale nautical chart of the area in question with positions in latitude and longitude using WGS 84 datum); and

- Location of other Facilities and pipelines that may have a bearing on the hazards presented by the Facility or their management.

8.2.2 Location Specific Conditions

The notification should demonstrate that the Non-production Installation can be operated safely in the environmental conditions that may be experienced by reference to the Production and Non-production Safety Cases.

8.2.3 Combined Operations Description

The notification must include.

- A description of any equipment to be used in connection with the combined operation, but which is not described in the current safety cases for any of the installations involved in the combined operations; and
- Layout of the Facilities' plant and key safety systems that are additional or altered by the combined operations.

8.2.4 Persons Affected

Any changes to the number of personnel on board and their location on any of the installations needs to be described.

8.2.5 Operations

The Combined Operations Notification must include a description of the combined operation, including all designated petroleum activities and the related petroleum infrastructure pursuant to the combined operations. This must include all activities that have the potential for a MAH.

8.3 ALARP Demonstration

The notification must demonstrate how the operators and owners of the installations engaged in the combined operations reduce risks associated with the combined operations to a level that is ALARP.

Sections 9 and 10 and the *ALARP Guidance* document provide guidance as to how demonstrate that all risks to safety have been reduced to ALARP.

8.4 Safety and Environmental Critical Elements, Performance Standards, Assurance and Verification

The notification requirements are as per Section 11, but only in relation to any additional SECEs and their required performance arising from the assessment of the combined operations major accident hazards, and also any changes to the performance standards for existing safety critical elements on any of the installations arising due to the combined operations. It must also include the Verification Scheme for the additional or modified SECEs and performance standards for verification (refer to 2.2.1 and 2.4 of the *Compliance Assurance System* document for further details).

8.5 Safety and Environmental Management System and Emergency Response

The S(E)MS for the Combined Operations must be described in the Combined Operations Notification in accordance with section 12 as it pertains to how the management systems of the operator and the owner(s) are to be coordinated to ensure effective control of major hazards at all times. It must describe the role of each party during all stages of the combined operations and identify the boundaries between the processes and procedures of the operator and each owner.

Similarly, emergency response according to sections 13 and 14 must be covered.

The management of the Combined Operations may be documented in a bridging document authorised by all parties, of how the management systems for the installations involved in the combined operation will be coordinated so as to reduce the risk of a major accident to an acceptable level. The operator and owner(s) may choose to include the entire bridging document in the notification.

Refer to section 3.8.4 for an example on interfacing management systems during combined operations.

8.6 Workforce Consultation

The notification for a combined operation must contain adequate demonstration of workforce consultation and involvement such that members of the workforce on all installations involved in the combined operations have the opportunity to contribute to the notification and are able to arrive at informed opinions about the management of hazards to which they may be exposed on the installation.

9 ALARP Demonstration (Safety)

It is the responsibility of the operator or owner to ensure that the cumulative risk from its activities is reduced to a level that is ALARP and to demonstrate this through its safety case(s). The ALARP demonstration forms a central part of a safety case and the operator or owner must decide how best to demonstrate in its safety case(s) that the risks from its activities are ALARP. To demonstrate ALARP, the *ALARP Guidance* document must be followed and the sections below give requirements on how such an ALARP demonstration should be presented within a safety case.

Once hazards and risk reduction measures have been identified, the cumulative risk that persons are exposed to must be compared to the tolerability criteria, represented in the ALARP diagram in Figure 1 in the *ALARP Guidance* document, so as to invoke the correct assessment of the hazards that affect those persons. Between the Upper Tolerability Limit and the Lower Tolerability Limit, a detailed ALARP demonstration is required to provide sufficient evidence that all reasonably practicable risk reduction measures have been identified and implemented. Provided Good Practice has been followed (and is duly evidenced), where the cost of further risk reduction measures is grossly disproportionate to the safety benefit achieved, such further measures can be rejected.

The ALARP demonstration for cumulative risks below the Lower Tolerability Limit will often be met by demonstration of adherence with current Good Practice.

As well as describing the risk reduction measures that have been implemented, the ALARP demonstration must describe those measures that have not been implemented and the reasons for this. This is especially important where circumstances or hazards change, as previously discarded measures might need to be implemented to maintain the risk ALARP. Also, in many cases a risk reduction measure may simply be provision of ‘more’ of a particular safety measure and in this case the reason why it is not reasonably practicable to provide ‘more’ of the safety measure needs to be included in the ALARP demonstration.

9.1 Methodology

The safety case must describe the methodology used to demonstrate that the major accident hazard risks are reduced to a level that is ALARP in accordance with section 4.1 of *ALARP Guidance* document. It must contain details of the following:

- Hazard and Risk Reduction Measure Identification (section 9.2);
- Good Practice (section 9.3);
- Assessment of Risk against Risk Tolerability Limits (section 9.4);
- Quantitative Risk Assessment (section 9.5); and
- ALARP Assessment (section 9.6).

9.2 Hazard and Risk Reduction Measure Identification

A comprehensive hazard and risk reduction identification process and its results must be demonstrated in the safety case. The operator or owner must demonstrate that they have

carried out a comprehensive identification of hazards that could have an immediate or long term safety impact to people. This must be in sufficient detail to fully understand the nature of each hazard and to identify the most appropriate risk reduction measures necessary for hazard management. The assessment must cover all human factors, infrastructure, plant and equipment that could cause or contribute to an accident, including subsea systems, pipework, process plant and plant areas and utilities. Major accident hazards should be specifically identified. If the decision is made to implement a risk reduction measure as opposed to not implementing it, the justification does not need to be included in the ALARP demonstration as the critical decisions are those where a risk reduction measure is not implemented.

9.3 Good Practice

Meeting Good Practice or its equivalent, where this is defined, is the first requirement which must be adopted in order to demonstrate that the risk has been reduced to a level that is ALARP. The safety case must give an overview of how this is achieved in operations and design (referring to the S(E)MS if required). Reference to a list of standards that represent Good Practice in Ireland is given in section 2.4. As outlined in the *ALARP Guidance* document, Good Practice changes with time and so there is a need for the operator or owner to assess on an on-going basis whether an improvement in Good Practice leads to any safety critical deficiencies between the existing situation and the updated Good Practice. The safety case should demonstrate how this process is undertaken and how it assures any safety critical deficiencies are resolved.

9.4 Assessment of Risk Against Risk Tolerability Limits

For activities that have the potential to give rise to a major accident hazard, the individual risk and the societal risk (in each case as described in the *ALARP Guidance* document) must be compared to the risk tolerability limits to determine whether the risk is intolerable, broadly tolerable, or tolerable if ALARP. Quantitative risk assessment must be used to make this comparison. The risk assessment itself must be described in the safety case and the requirements for this and the risk assessment itself are given below.

9.5 Quantitative Risk Assessment

9.5.1 Overview

A quantitative risk assessment (QRA) is required in the safety case in order to determine the cumulative risk, compare against tolerability criteria and identify what drives that risk so that the hazards can be managed.

The QRA should demonstrate that the likelihood and the consequences of each major accident hazard have been assessed in a systematic manner. The methodology and the results of the QRA will be documented in the safety case and should include:

- Methods and assumptions used;
- Failure rate data used, which must be relevant to the application and composed of a dataset for which there is sufficient certainty in its accuracy; and
- Justification for data in terms of:

- Site-specific circumstances;
- Processes and methods used to assess the consequences of each event; and
- Sensitivity of the conclusions to the assumptions made and the inherent uncertainty in the data inputs and the modelling used.

For any hazard that may occur, there are likely to be a large number of possible outcomes dependent on, for example, whether emergency systems respond as intended or not, the location of an accidental hydrocarbon release and its size. The QRA should contain sufficient detail such that these variations can be considered as part of the analysis and:

- Improve understanding of the hazards and what drives the risk from it;
- Show where risk reduction measures could be improved; and
- Identify whether the risk is tolerable or not.

A degree of conservatism relative to the level of uncertainty in the risk assessment and its inputs should be included to ensure that the risk assessment results are robust.

9.5.2 Frequency Assessment

The frequency assessment needs to assign a frequency to each of the events modelled in the consequence assessment (below) in a way that is robust and conservative and this needs to be demonstrated in the safety case.

> Example
>
> The frequency and consequence of a hydrocarbon release vary depending on the size of the leak and so a range of release sizes should be used in the QRA. Too few release sizes will result in inaccurate assessment and too many will be cumbersome and, in this instance, robust frequency data is unlikely to be available. For an offshore platform, this balance would be struck by using around four releases size, while for onshore pipelines, a minimum of two hole sizes is appropriate, of which one should be full bore rupture.

As described in section 9.5.1, if a range of events is modelled, the frequency of each event will be required to be calculated using an event tree technique or similar that takes into account the reliability of risk reduction measures such as fire and gas detection for loss of containment releases, ARPA for ship collision events, escape routes and, where appropriate, evacuation means such as lifeboats and life-rafts.

9.5.3 Consequence Assessment

For each hazardous event modelled in the assessment, the consequence modelling should assist the understanding of the hazard and Risk Reduction Measures and must include:

- A systematic process for assessing consequences taking into account, where appropriate:
  - Composition, size, location and duration of releases;
  - Weather conditions;

    - Contribute to of the equipment in the Facility and/or terrain on the hazards;
    - Worst-case and typical scenarios;
    - Control and mitigation measures such as emergency shutdown, blowdown, deluge;
- Realistic estimates of the severity and extent of each major accident hazard, which may include calculation of:
    - Harmful doses of toxic gases;
    - Thermal fluxes and duration of exposure likely to harm persons or lead to escalation;
    - Explosion overpressures with effects on structure and persons; and
- Justification of all assumptions used.

The consequence models used in the analysis must take account of the current scientific knowledge about the hazards.

Where a hazard contributes a small proportion to the cumulative risk, or if a detailed QRA of the hazard is not required to demonstrate that the risk is ALARP, it can be modelled conservatively and in less detail.

9.5.4 Risk Assessment

The risk assessment combines the frequency and consequences of the hazardous event. A summary of the risk assessment must be included in the safety case and cover:

- Occupancy levels for buildings and areas;
- Harm criteria for different hazards; and
- POB distribution.

The risk assessment must show Individual Risk, Societal Risk in the form of an FN curve (if members of the public can be affected) and also location specific risks – the risk at a particular location independent of occupancy, or POB.

The safety case will show the comparison of the risk with the tolerability criteria defined in the *ALARP Guidance* document.

9.6 ALARP Assessment

As part of the overall major accident hazard management process, S(E)CEs must be identified and performance criteria defined for them such that the Residual Risk is reduced to a level that is ALARP. However, even if each chosen S(E)CE is designed and operated such that the Residual Risk from failure of the S(E)CE is ALARP, it may not mean that the overall risk associated with a designated petroleum activity is ALARP. As a consequence, as well as each S(E)CE, each hazard and the achievement of inherent safety also needs to be considered and the demonstration requirements for this are given in section 9.6.2.

9.6.1 Safety (and Environmental) Critical Elements

Each S(E)CE reduces a particular part of the risk from a major accident hazard, but not necessarily to zero depending on the availability, reliability, survivability and the actual functionality chosen for the S(E)CE. Therefore, for each S(E)CE, it should be demonstrated

that the process by which its performance was chosen ensures that the risk is ALARP. This does not mean that the whole analysis needs to be described, but the process must be given in sufficient detail that it can demonstrate that it leads to a risk that is ALARP. Reference to more detailed studies or assessment should be provided. The *ALARP Guidance* document describes a number of ways in which it can be shown that a particular risk reduction measure reduces the risk to a level that is ALARP and the methods that are used to demonstrate this should be described here.

In most cases, semi-quantitative or quantitative risk assessment techniques should be used to determine the appropriate S(E)CE performance as engineering judgement and qualitative risk assessment are unlikely to be accurate enough assessment tools to do this.

> Example
>
> Hydrocarbon containment is safety critical as a release of hydrocarbon has the potential to be a major accident hazard. The hydrocarbon containment system (the S(E)CE) is composed of valves, pipes, flanges, vessels etc that are rated to a certain pressure. The way in which this pressure is determined such that the risk of over-pressurisation is appropriately managed should be given in the safety case, but without necessarily the need for an exhaustive list of pressure ratings of the hydrocarbon containment system. If the inlet part of the process system is fully rated for the maximum pressure, this should be stated along with the justification for what the maximum pressure is. Other parts of the process plant may have a lower rating as they are protected by pressure safety valves and pressure instrumentation that causes the source of pressure to be isolated. The way in which this is appropriately designed and managed should be stated.

> Example
>
> The process used to define the rating and required location of passive fire protection (PFP) must be described, but the details of each element of PFP do not necessarily need to be described.

9.6.2 Hazards and Inherent Safety

The ALARP assessment must demonstrate that the risk from each hazard is reduced to a level that is ALARP. This will involve the consideration of, amongst other things, inherent safety and risk reduction measures that are not in themselves S(E)CEs including:

- Elimination and substitution of hazards;
- Overall concept (subsea wells, manned platforms etc);
- Layout;
- Reduction of potential leak points;
- Location of the petroleum infrastructure;
- Distribution and number of persons; and
- Means of transportation.

Example

During the design process for an offshore platform, the need for an additional hydraulic power unit in a naturally ventilated module is identified. As part of the ALARP assessment it needs to be considered how the skid affects the natural ventilation and ensure that the risk from explosion and fire hazards are still ALARP with the change in ventilation. As the layout can be more readily changed during design, it is likely that ventilation considerations can be accommodated such that the additional risk is minimal and ALARP.

10 Environmental ALARP Assessment

All reasonably practicable measures must be taken to protect the environment for the risk of a MEI to be ALARP. There is less maturity in interpretation of reasonable practicability for the environment though and so the way in which it may be demonstrated is by

- Reference to the ALARP demonstration for safety;
- The adequacy of the oil spill contingency plan (OSCP); and
- Confirmation that the scenarios in the OSCP are appropriate for the installation and petroleum activity being carried out.

As part of the overall risk assessment, the safety case must include an assessment of the environmental consequences associated with major accidents in order to determine the potential for a major environmental incident to be realized.

Analysis of environmental consequences should be based on the sensitivity of the environmental receptors, the toxicity and characteristics of the hazardous substance, and the potential exposure to the hazardous substance. The consequences can be determined by modelling or by extrapolation from experimental studies, historical events or other available data for the relevant hazardous substances.

The consequence analysis could include dispersion, or fate and trajectory modelling of the released substance. The modelling output should reflect local metrological and oceanographic data (e.g. currents and wind), and climatic conditions to provide input to the location specific environmental consequences.

A minimum severity of harm criteria should be selected to perform the consequence analysis, this will enable the level of environmental damage to be evaluated and its potential to constitute an MEI assessed.

The output of the frequency assessment for each major accident as presented in Section 9.5.2 should be used in conjunction with the outputs of the environmental consequence assessment in order determine the associated level of risk for each potential MEI.

11 Safety (and Environmental) Critical Elements, Performance Standards, Assurance and Verification

The identification, design and operation of safety (and environmental) critical elements are key to the management of major accident hazards. As such the safety case must include a description of the process to:

- Identify Safety (and environmental) critical elements;
- Determine and document the required performance standard of S(E)CEs to establish and maintain risks ALARP;
- Establish and execute inspection and maintenance processes to provide assurance to the operator or owner that S(E)CEs are meeting their performance standards; and
- Prepare, operate and maintain a Verification Scheme to provide an independent review of the above activities, as described in section 2.4 and 2.5 of the *Compliance Assurance System* document.

Offshore environmental response equipment such as capping devices, booms and dispersants, that are not normally part of the offshore petroleum infrastructure are not S(E)CEs.

11.1 Safety (and Environmental) Critical Elements

The safety case must demonstrate how S(E)CEs have been identified, list them and describe their hazard management role. The description should focus on the way in which the hazard management role of the S(E)CE is achieved rather than the detailed way in which it is implemented.

> Example
>
> All risk reduction measures should be considered as to whether they are S(E)CEs, including, but not limited to the following in respect of mitigation: ventilation control systems, fire resistant coatings, fixed extinguishing systems, deluge systems, secondary containment, blastwalls and firewalls.

The codes or standards to which each S(E)CE is designed to must be stated in the safety case either directly, or in the performance standards (see Section 11.4)[13]. Reference to a list of standards that represent Good Practice in Ireland is given in section 2.4.

[13] See also the example operational performance standard and Facilities Verification Scheme in appendix 1 of the Compliance Assurance System document, which contains a requirement to give the basis for performance criteria which may also be a code or standard.

11.2 Performance Standards

The performance standard for a S(E)CE defines what is required of it to meet its hazard management role such that risks are reduced to a level that is ALARP. The performance standards must be included in the safety case. It is noted that it may be convenient for the performance standards to be contained in an appendix to the safety case.

As far as possible, each performance standard must be expressed in quantitative terms such that initial and continued performance can be measured and assessed.

As a minimum, the performance standards, must define:

- **Functionality**: A statement of the performance required of the S(E)CE to fulfil its role either as a passive or active system;
- **Availability**: A statement of the required availability of the S(E)CE. Most safety systems will need to be available at all times;
- **Reliability**: For some active systems, the minimum required reliability needs to be stated (further detail in section 11.2.1);
- **Survivability**: The required performance of the system following an emergency (if any); and
- **Interactions**: The identification of the dependency of the S(E)CE on the operation of other S(E)CEs.

The performance as defined by the first four parts above must be shown to be achieved initially by the design and construction of the S(E)CE (termed initial suitability) and on an on-going basis during operations (termed continued suitability). The performance standards should include references as to how the design part of initial suitability is achieved (this will normally be by reference to a design document, or engineering assessment) and identify how continued suitability is achieved (normally by reference to assurance processes involving monitoring, inspection and maintenance).

The performance standards need not describe the actions to be taken when the failure of a S(E)CE is identified (by whatever means), but this is one of the key processes at the heart of the S(E)MS and so the process used to determine such action must be described (often referred to as operational risk assessments). An overview of the assurance process for S(E)CEs (section 11.3) and a summary of the process by which the design element of initial suitability has been achieved must be given (this is the same requirement as to show that the Residual Risk related to each S(E)CE is ALARP – section 9.6.1).

11.2.1 Reliability Targets

For active systems there is always the possibility that the systems will not operate on demand. Therefore, reliability targets for operation on demand are required in performance standards for components of active systems where their reliability can be measured with sufficient certainty (such that corrective action can confidently be taken if the reliability target is not met). Therefore, reliability targets must be provided in the performance standards for at least the following systems:

- Flammable and toxic gas detectors;

- Fire and smoke detectors;
- Emergency shutdown valves and blowdown valves;
- Safety critical process instrumentation and pressure safety valves;
- Firewater pumps (to start);
- TEMPSC (launch and engine start systems); and
- HVAC (dampers to close and fans to stop).

For systems where reliability is achieved by redundancy and there is no effect on the performance standard of a single failure, it may not be necessary to define reliability targets.

> Example
>
> Emergency lighting could be expected to have very high reliability, but each individual light may have a much lower reliability with the overall lighting level target still being achieved and so a target reliability for each light is generally not required.

Prescriptive requirements outlined in section 2 should be addressed in this section where necessary.

11.3 Assurance

For each S(E)CE, the process that ensures its continued suitability through assurance must be summarised.

The assurance process must entail active testing of the full functionality of each active S(E)CE on a time interval that ensures that the risk from failure is ALARP. The process by which this interval is defined must be summarised. The assurance processes should ensure that all potential failure modes of the S(E)CE are tested.

Similar processes must be described for each passive S(E)CE and although testing is not usually required, the process by which the inspection of passive components (for example passive fire protection, hydrocarbon containment), especially to counter ageing, is achieved must be demonstrated.

For any wells included in the safety case, it must demonstrate that well integrity is maintained under all of the design operating conditions throughout the well's life.

11.4 Verification

Verification is carried out for an operator or owner by an ICB to establish the extent that the Facility S(E)CEs comply with their performance standards and well integrity is maintained. It is in addition to the operator's or owner's assurance activities. The Verification Scheme defines the ICB's activities to verify the performance of each S(E)CE and it must comply with the requirements of the *Compliance Assurance System*.

The requirements for documentation of a Verification Scheme in a safety case, or notification are set out below. It is noted that it may be convenient for some of this information to be contained in an appendix to the safety case.

Safety Case or Notification	Documentation Requirements for the Verification Schemes
Design Notification	• A summary of the Facilities Verification Scheme that will be implemented during design.
Production Safety Case	• A summary of the Facilities Verification Scheme and Well Verification Scheme. • A list of the performance standards. • Statement that design and construction Facilities Verification[14] and Well Verification up to production have been completed and summarise the work done to achieve this.
Combined Operations Notification	• Any changes to the Facilities Verification Scheme for the production or Non-production Installation.
Non-production Safety Case	• A summary of the Facilities Verification Scheme. • A list of the performance standards. • Statement that a process that meets the same aims as design and construction verification has been completed and a summary of the work done to achieve this.
Decommissioning Safety Case	• As per Production Safety Case.
Well Work Safety Case	• A statement of completion and summary of work carried out to complete the design part of the Well Verification Scheme. • A summary of the Well Verification Scheme for the Well Work Activity itself in its entirety. • A list of the performance standards.

Where a summary of the verifications scheme is required, an alternative option to submit the verification scheme in full is available to the owner or operator.

[14] If, for reasons of practicality, this cannot be completed before submission of the safety case, it will be made a condition of the safety permit. It is not required for established petroleum infrastructure. If a Design Notification is not required, this applies to a process that achieves the same aims as design verification.

12 Safety (and Environment) Management System

A safety case must include a description of the operators or owner's safety and environmental management system (SEMS) for the safety case for an offshore Facility. A safety case for an onshore Facility must include a description of the operator's safety management system (SMS).

Rather than giving detailed specifications for the design of an S(E)MS, this section defines requirements on the description of the S(E)MS in a safety case. The operator or owner may adopt any suitable S(E)MS that meets its operational needs; however it must meet the objectives of the methodology described here, which is known as Plan Do Check Act (PDCA). PDCA is summarised as follows:

- **Plan**: Set a clear safety (and environmental) policy and establish the processes necessary to deliver results in accordance with the policy (for example by setting targets and objectives, identifying hazards, assessing risks and establishing standards against which performance can be measured);
- **Do**: Organise persons to manage safety (and impacts on the environment) and implement the processes;
- **Check**: Monitor and measure the processes against the safety (and environmental) policy and procedures and report the results, including periodic audit and review; and
- **Act**: Take action to continually improve safety (and environmental) performance and learn the lessons from experience and from the results of assurance activities within the operator or owner, other companies and the oil and gas industry as a whole.

The description of the S(E)MS within the safety case should provide evidence that the S(E)MS satisfies these requirements, however it is not intended that it need include a detailed description of the entire management system.

The S(E)MS must cover all persons involved in the petroleum activity including those that are employed by the operator or owner and those employed by contractors, ensuring that any interfaces between different companies' systems are appropriately described and managed.

12.1 CMAPP

A safety case must include the operator's or owner's corporate major accident prevention policy (CMAPP) which must include:

1. The responsibility at corporate board level for ensuring, on a continuous basis, that the corporate major accident prevention policy is suitable, implemented, and operating as intended;
2. Measures for building and maintaining a strong safety culture with a high likelihood of continuous safe operation, including with regard to securing cooperation of the workers through;
    - visible commitment to tripartite consultations and actions arising therefrom;

    - working effectively with elected safety representatives; and
    - protecting whistle-blowers.
3. The extent and level to which auditing is carried out;
4. Measures for rewarding and recognising desired behaviours including the reporting of accidents and near misses;
5. The evaluation of the company's capabilities and goals;
6. Measures for maintenance of safety (and for offshore environment) protection standards as a corporate core value;
7. Formal command and control systems that include board members and senior management of the company;
8. The approach to competency at all levels of the company; and
9. A statement that the CMAPP also covers their production and non-production installations outside of the European Union.

12.2 Plan

12.2.1 General Requirements

The safety case must demonstrate that there is a planned and systematic approach to implementing the CMAPP through a suitable S(E)MS in order to reduce and maintain all risks at a level that is ALARP.

The planning activities during the design, operation and decommissioning stages of the lifecycle of petroleum infrastructure and associated petroleum activity, including risk assessment and the risk reduction measures installed, maintained, assured and verified are described in detail elsewhere in these Requirements. The S(E)MS must include processes and procedures for managing and documenting these activities and a description of them should be included in the safety case to demonstrate this is the case.

12.2.2 Risk Assessment

The safety case should demonstrate how the operator or owner has established, implemented and maintained procedures for on-going hazard identification, risk assessment and the determination of necessary barriers to maintain the risk from all major accident hazards to the safety of people and the environment at a level that is ALARP. Further requirements on the assessment of risks to people are provided in section 9. Requirements on assessing the risks to the environment are given in section 10.

The safety case should demonstrate how, as part of the S(E)MS, the results of the identification of hazards, risk assessments and risk reduction measures are documented and kept up-to-date.

12.2.3 Human Factors

Human factors can be described as the way individual, job and organisational factors combine to potentially contribute to behaviour at work in a way that could impact on safety. Human factors should be integrated into many aspects of the S(E)MS, not just risk assessment, including but not limited to:

- Management of change;

- Design and procurement of systems, equipment and machinery;
- Job and activity design such that the potential for human failure to lead to a major hazard is suitably minimised;
- Training of workers;
- Safety reporting and data analysis; and
- Incident investigation.

In considering the above areas that require human factors to be considered the following stages should be considered:

- Identify potential human failures that may occur with hazardous consequences (e.g. a lapse of attention, a slip of the finger, a misunderstanding, or even a deliberate violation of a procedure);
- Identify performance influencing factors that make human failure more or less likely to occur (e.g. inadequate manning, job factors such as inadequate procedures or system/equipment interface, individual factors such as fatigue and motivation or organisational factors such as safety culture and work pressures); and
- Engage the workforce in carrying out the assessment and ask for their suggestions about risk reduction measures to prevent or reduce the human failures identified.

The safety case will demonstrate how this is achieved within the S(E)MS and how the assessment has been undertaken for the relevant activities.

12.2.4 Management of Change

The safety case must demonstrate that there is a process by which the operator or owner identifies the hazards and risks associated with changes in the organisation, the SEMS, or its activities, prior to the introduction of such changes.

12.2.5 Planning for Safe Control of Operations

The safety case must demonstrate that there are effective processes and procedures for planning routine and non-routine activities (including minor works, maintenance and testing etc.) to enable them to be conducted safely by competent people.

The requirements for managing the safe execution of those activities are included in Section 12.3.5.

12.3 Do

12.3.1 Senior Management Roles and Responsibilities

An effective management structure and arrangements should be in place for delivering the CMAPP. The safety case will demonstrate how management:

- Ensures the availability of resources essential to establish, implement, maintain and improve the SMS; and
- Defines, documents and communicates roles, responsibilities, accountabilities and authorities, to facilitate effective safety management.

A safety case should include a description of the organisation structure and its application to the management of the installation. The safety case should identify the job title of a member of senior management with specific responsibility for safety, irrespective of other responsibilities, and with defined roles and authority for:
Ensuring that the S(E)MS is established, implemented and maintained in accordance with the safety case; and
Ensuring that reports on the performance of the S(E)MS are presented to senior management for review and used as a basis for improvement of the S(E)MS.

The identity of this senior manager should be made available to all persons working under the control of the operator or owner.

12.3.1.1 Installation Manager

The role of the installation manager, who has day-to-day responsibility for the safety of the installation, should be described in the safety case. The safety case should demonstrate that the identified competence, authority and available resources for the role are appropriate and complied with.

12.3.1.2 Safety Representatives

The safety case should demonstrate how the persons working on, in or from an installation are able to select and appoint from among their number safety representatives to represent them in consultations with the operator or owner in matters of safety.

12.3.2 Competence and Training

The safety case should demonstrate how the operator or owner ensures that any persons performing safety critical activities are competent and have the necessary information and supervision when carrying out the activity and will describe the process for this in the safety case.

Where training is required to meet, or maintain these competency levels, the safety case should demonstrate how safety training needs are evaluated, the effectiveness of the training or action taken and the process for retaining associated records.

12.3.3 Communication, Participation and Consultation

The safety case should demonstrate how safety arrangements are:

- Underpinned by effective involvement and participation; and
- Sustained by effective communication and the promotion of competence that allows all employees and their representatives to make a responsible and informed contribution to the safety effort.

The safety case should summarise procedures for:

- Internal communication among the various levels and functions of the organisation, including those required to enable the lessons from accidents to be learned across the organisation;

- Informing workers about their participation arrangements, including who their representatives are for safety matters;
- Communication with third parties working on behalf of the operator or owner ; and
- Receiving, documenting and responding to relevant communications from external organisations.

The safety case should summarise procedures to ensure the participation of workers and contractors through:

- Appropriate involvement in hazard identification, risk assessments and determination of risk reduction measures;
- Appropriate involvement in incident investigations;
- Involvement in the development and review of the CMAPP, objectives, and the safety case;
- Consultation where there are any changes that affect their Individual Risk; and
- Representation on safety matters.

The safety case should summarise how the operator or owner has implemented a safety forum on each Facility, and a safety committee for the company.

The safety case should describe how persons working on, in or from a Facility select and appoint from among their number members of the safety forum to assist the operator or owner in securing the compliance with the safety case and other hazard management activities as may be appropriate.

The safety case should describe how each safety forum should select and appoint from among their number a safety delegate to represent them on the operator's or owner's safety committee for the purposes of achieving effective involvement in safety consultation at the company wide level.

12.3.4 Documentation and Control

The safety case must demonstrate that the documentation process in the S(E)MS ensures the effective planning, operation and control of processes that relate to the management of all its safety risks.

12.3.5 Implementing Safe Control of Operations

The safety case should describe (and demonstrate the effectiveness of) the managerial processes and procedures that are required for safe control of operations. This will include the following as a minimum:

- Operational controls that are integrated into its overall S(E)MS;
- Controls related to purchased goods, equipment and services;
- Controls related to third parties and contractors;
- Documented procedures to cover situations where the absence of the control (for example a S(E)CE) or the deviation from a stipulated operating criteria could lead to deviations from the accepted safety case. If these changes become more significant and affect the basis of the safety case, the operator or owner needs to consider the need for a material change; and

- Communication protocols for:
    - Managing vessels offloading supplies to an offshore Facility or offloading petroleum to a tanker onshore; and
    - Liaison with connected Facilities.

The safety case must demonstrate that the management procedures include a robust permit to work system that ensures that interactions between nearby activities, and activities which pass between shifts, are controlled such that the risks are maintained at a level that is ALARP.

12.4 Check

The safety case should demonstrate that there is a process to monitor, audit and review within the S(E)MS. The monitoring process is a day-to-day process, which produces performance data. This process is then audited on a regular basis (section 12.4.2) to determine whether the SMS is meeting the aims of the safety policy and delivering continuous improvement.

Further to the requirements below, the safety case must demonstrate the adoption of suitable measures to use suitable technical means or procedures in order to promote the reliability of the collection and recording of relevant data and to prevent possible manipulation of that data. Relevant data includes data used to measure the performance of the management system including management of integrity of the hardware.

12.4.1 Monitor

Monitoring should include both hardware (equipment and materials) and human and procedural aspects (persons, procedures and systems) of the S(E)MS.

The safety case must demonstrate that there is a process to monitor safety performance that provides for:

- Monitoring the extent to which the operator's or owner's safety objectives have been met;
- Monitoring the effectiveness of risk reduction measures;
- Leading safety performance indicators that actively monitor risk reduction measures to ensure their continued effectiveness ;
- Lagging safety performance indicators that reactively monitor specific occurrences to uncover weaknesses in the risk reduction measures ; and
- Recording sufficient monitoring data to enable analysis to inform future decisions.

12.4.2 Audit

Audit encompasses the structured process in which independent information is collected on the efficiency, effectiveness and reliability of the S(E)MS and plans for corrective action are created.

The safety case must demonstrate that there is a process for internal audits of the S(E)MS that are conducted at planned intervals to determine whether the S(E)MS is suitable, sufficient, and effective, and is maintained to enable the operator or owner to manage its safety risks.

The safety case must demonstrate how the operator or owner plans, establishes, implements and reviews an S(E)MS audit programme.

Audit procedures should be established, implemented and reviewed to address:

- The responsibilities, competencies and requirements for planning and conducting audits, reporting the results and retaining records; and
- The determination of audit criteria, scope, frequency and methods to be used.

The selection and conduct of auditors must ensure the objectivity and impartiality of the audit process.

12.4.3 Incident Investigation

The Petroleum Safety (Petroleum Incident) Regulations 2016 (S.I No. 81 of 2016) define those incidents that must be reported to the CER. This section covers the safety case requirements for the SMS in relation to all incidents.

The safety case must demonstrate that procedures are in place to record, investigate and analyse incidents (including near misses and unsafe conditions) in order to:

- Determine underlying safety deficiencies and other factors that might be causing or contributing to the occurrence of incidents;
- Identify the need for corrective action;
- Identify the need for improved risk reduction measures; and
- Communicate the results of such investigations throughout the organisation as appropriate to enable lessons to be learned.

The safety case should demonstrate how investigations are performed in a timely manner and the results documented and maintained.

The safety case will describe the system of classifying and categorising incidents that has been adopted so that a suitable response is demonstrated, using persons at the appropriate level of seniority and with the necessary expertise. Investigations need to be thorough enough to establish both the immediate and underlying cause(s). A phased approach should be adopted with the on-site investigation being carried out to collect evidence, followed by the collection of off-site evidence and the laboratory analysis of components and materials removed and finally an interpretation of the findings to establish the cause.

The safety case must demonstrate that investigations provide an adequate basis for determining the level of risk and are commensurate with the severity of the potential consequences and not just the actual consequences.

12.4.4 Non-conformities and Corrective Actions

The safety case will document procedures for dealing with actual and potential non-conformities with the SMS and for taking corrective and preventive actions. The procedures should define requirements for:

- Evaluating the need for actions to prevent non-conformities and implementing appropriate actions designed to avoid their occurrence;
- Identifying and correcting non-conformities and taking action to mitigate their safety consequences;
- Investigating non-conformities, determining their causes and taking action to avoid their recurrence;
- Recording and communicating the results of corrective actions and preventive actions taken; and
- Reviewing the effectiveness of corrective actions and preventive actions taken.

12.4.5 Review

Review is the process of assessing the adequacy of the operator's or owner's S(E)MS performance and making decisions on actions required to correct deficiencies.

The safety case should demonstrate how the operator or owner learns from all relevant experience and applies the lessons learned throughout the company, other operators or owners and the oil and gas industry. Systematic reviews of performance, based on data from monitoring and audits of the S(E)MS, should be carried out.

Senior management should ensure the S(E)MS is reviewed at planned intervals to ensure its continuing suitability, adequacy and effectiveness. Reviews should include assessing opportunities for improvement and the need for changes to the S(E)MS, including the safety policy and objectives.

Input to reviews should include:

- Results of internal audits and evaluations of compliance with legal and other requirements;
- The results of worker participation and consultation;
- Relevant communications from third parties;
- The safety performance of the operator or owner ;
- The extent to which safety objectives have been met;
- The status of incident investigations, corrective and preventive actions;
- Follow-up actions from previous reviews;
- Changing circumstances, including developments in legal and other requirements related to safety; and
- Recommendations for improvement.

The outputs from the reviews should be consistent with the operator's or owner's commitment to continual improvement and should include any decisions and actions related to possible improvements. Relevant outputs from the review should be made available for internal and external communication and consultation as appropriate.

12.5 Act

A safety case must demonstrate how the operator or owner implements a scheme of continuous improvement. This requires a structured process to evaluate the feedback it gathers through the monitoring and audit activity to identify and implement measures to improve the S(E)MS and better comply with the CMAPP.

Continuous improvement is not about improving compliance with existing procedures, which should be a direct output from monitoring and audit. Rather it concerns doing things differently, and may involve amending procedures, plans or the organisation structure to achieve the aim.

12.6 Confidential Reporting

Operators and Owners should describe the procedures in place to communicate details of the national arrangements for the mechanisms:

a) for confidential reporting of safety and environmental concerns relating to offshore oil and gas operations from any source; and
b) for investigation of such reports while maintaining the anonymity of the individuals concerned

to their employees and contractors connected with the operation and their employees, and to ensure that reference to confidential reporting is included in relevant training and notices.

13 Emergency Response (Safety)

A Safety Case must demonstrate that the internal emergency response plan prepared and implemented by the operator or owner shall, in conjunction with the installation S(E)CEs and S(E)MS, secure a good prospect of personal safety and survival of those people who may be exposed to the effects of a major accident. The internal emergency response plan must take into account the major hazards associated with the proposed activity as identified in the Safety Case. The demonstration that the emergency response plan is adequate should include the information required by sections 13.1 to 13.3.

13.1 Organisation

A safety case must provide a description of the emergency response organisation showing the roles and responsibilities of its team members at site and off-site.

It must include the following information:

- names and positions of persons authorised to initiate emergency response procedures and the person directing the internal emergency response; and
- name or position of the person with responsibility for liaising with the authority or authorities responsible for the external emergency response plan.

It should specifically show how the following is achieved:

- Parts of the organisation at different locations communicate effectively;
- Command by competent persons is maintained throughout an emergency; and
- Sufficient suitably competent persons are on the installation to carry out emergency duties and to operate relevant equipment.

13.2 Plans and Procedures

An overview of the emergency response plan should be provided demonstrating that:

- It reflects the identified threats arising from the installation and its operation. The plan to respond to major accident hazards should be scenario based, and reflect the identified major accidents.
- It includes the actions which should be taken to control each accident scenario and to limit its consequences.
- It describes the coordination of recovery arrangements for persons on the petroleum infrastructure affected by a major accident hazard.
- It identifies any dependency on human intervention at any stage and how these persons are trained and known to be competent.
- All aspects of it are realistic and workable.
- It is an integral part of the overall S(E)MS as a control measure subject to the same checks as all other control measures including processes for testing, review (especially after emergency response drills), training and informing persons of its operation.

- It ensures effective coordination and communicates among the operator's or owner's response on the Facility and the support provided from onshore.
- If the plan relies on support from third parties, the safety case should demonstrate how those inputs are coordinated. Named third parties may include marine and aviation emergency services, and other operators and owners present in the vicinity.

The description should justify assumptions regarding actions required, timing, effectiveness of detection methods and decision-making processes and the range of emergencies that could occur. The emergency plan must be robust and take into account the conditions that may prevail in a real emergency which often make it difficult to achieve ideal responses.

The safety case must demonstrate that off-site emergency response plans are in place clearly explaining the role of relevant authorities, emergency responders, coordinators and others required for the emergency response, so that cooperation is ensured in all emergencies. Off-site emergency response plans should ensure appropriate arrangements are in place for alerting, coordinating necessary external resources and providing suitable information and advice to external persons and organisations that may be affected by the emergency.

13.2.1 Specific Emergency Response Requirements

13.2.1.1 MAH Leading to MEI

The safety case must demonstrate appropriate arrangements for the maintenance of control systems to prevent damage to the installation and the environment in the event that all personnel are evacuated.

13.2.1.2 Pipelines

For petroleum infrastructure that is connected to or one or more pipelines, the safety case will summarise procedures for shutting down or isolating, in the event of emergency, each of those pipelines so as to stop the flow of petroleum into the petroleum infrastructure through the pipeline. In particular, the procedures should include:

- Effective means of controlling and operating all relevant emergency shutdown valves for the pipeline; and
- A fail-safe system of isolating the pipeline.

13.2.1.3 Blowout during Well Work

For any installation with wells, or carrying out a Well Work Activity, the emergency response plan must:

- Provide for the possibility of a full-bore blowout event; and
- Describe the means of identifying early indicators (such as a kick) of a potential blowout and demonstrate that arrangements are in place to prevent the full development of a blowout and the actions to be taken in order to ensure safe

command and control of the plant and persons from the time of the early indications through to dealing with the consequences of a full bore blowout should it occur.

13.2.1.4 National Framework for Major Emergency Management

The safety case must demonstrate how the operator or owner complies with the Framework for Major Emergency Management.[15]

13.3 Training and Exercises

The operator or owner should ensure their safety case demonstrates:

- Every person on the petroleum infrastructure is provided with adequate instruction and training in the appropriate action to take in an emergency and can consult written information on the use of emergency plant; and
- The induction given to every person provides appropriate information on the procedure for evacuation, the significance of emergency signals, the location of relevant life-saving equipment and the action they are required to take in response to emergency signals and alarms.
- The emergency response training for personnel on the Facility is adequate. This will include the offshore survival training which is a pre-requisite to travelling to the Facility, the induction provided on arrival on the Facility, and the training provided to people with specific emergency response functions. There is adequate provision for emergency drill exercises by persons on the petroleum infrastructure. In particular, those exercises must ensure that those persons have an adequate degree of knowledge, preparedness and confidence concerning the relevant emergency procedures.
- Competence of the off-site emergency response team, including the provision of adequate staffing at all times, the training and competence of personnel, and by exercises.

The safety case should demonstrate that the following have been addressed:

- That the programme of drills covers the range of hazards that may be encountered;
- Processes for evaluating the success of drills and exercises and the management of subsequent corrective and preventative actions; and
- Involvement of external parties not at the petroleum infrastructure (e.g. external emergency services, logistics providers, onshore management).

For offshore petroleum infrastructure, emergency response exercises will involve the operators of standby vessels, marine and aviation emergency services as well as other emergency services which may have a role in shore-based aspects of an emergency.

[15] See http://www.mem.ie

14 Emergency Response (Offshore Major Environmental Incident)

14.1 General

Contrary to the remainder of this document, the CER do not suggest a particular structure for this part of the safety case recognising that its requirements are similar to the requirements of other statutory agencies. In particular, the requirements here are expected to be a subset of the Oil Spill Contingency Plan (OSCP) that has to be approved by the IRCG in compliance with the Sea Pollution Act 1991, as amended. It is suggested that an adequate description of the OSCP is submitted as part of the safety case. The content of the full OSCP should include the requirements set out below and should ensure that the information is consistent with other information in the safety case.

The scope of this element of the internal emergency response plan must take into account all major hazards that may lead to an MEI.

14.2 Emergency Response Organisation

14.2.1 Roles, Responsibilities and Initiation

The safety case must include key roles and responsibilities of the onshore response team and subcontractors including the:

- Position of the person responsible for:
  - Initiating and directing the internal emergency response;
  - Activating the response of the Pollution Response Contractor; and
  - Activating the capping device, or emergency relief well as appropriate.

The safety case must summarise the activation process and interface arrangements relating to any associated response organisation/contractor employed.

The safety case must include a description of how response tier levels are identified and escalated. Tier Level response must be consistent with the Framework for Major Emergency Management[15]. Where response arrangements transfer from one person to another, the mechanism and management for this must be described (e.g. where an installation operator Tier 1 response transfers or escalates to the well operators Tier 2/3 response).

14.2.2 Competency, Training and Exercises

The safety case must detail emergency response training requirements and how key personnel are known to be competent.

The safety case must detail Oil Pollution Response exercise requirements such as planned drills based on major accident scenarios. An agreed schedule of exercises will be carried out with the IRCG.

14.3 Offshore Environmental Setting

The safety case must detail the direction, location and distance to nearest:

- Irish waters landfall;
- Irish waters Protected Area;
- Median line; and
- Sensitive Areas or any area protected by domestic or international legislation.

The safety case must describe the offshore receiving environment that is vulnerable to the potential effects of a major environmental incident[16].

The current status and sensitivities of the offshore receiving environment should be clearly described and indicated on an appropriate map or diagram and include:

- Marine environment (seabirds, fisheries, marine mammals);
- Coastal (wetlands, estuarine, nearshore and onshore environment);
- Seabed and subsoil conditions composition and identification of any contamination and presence of any historical drill cutting;
- Potential sensitive habitats or species (EU habitats Directive, Annex 1) ;
- Special Area of Conservation (SAC),Marine Protected Area (MPA),SSi etc; and
- Meteorology and Oceanography data.

Many environmental sensitivities are subject to an annual cycle and the safety case must demonstrate that highly sensitive periods has been identified and taken into account, including:

- Seabird vulnerability over the year;
- Fishery sensitivities spawning and nursery grounds spanning a calendar year within the appropriate ICES square;
- Cetacean sensitivities spanning a calendar year in the surrounding area; and
- Protected areas which may be impacted in the event of a worst case release.

Strategic Environmental Assessment (SEA) data can be referenced where relevant to provide high level information regarding the surrounding environment, but should be supplemented by site specific data. It must identify and take into account all the existing activities and contamination.

14.4 Oil Spill Modelling and Effectiveness

The oil spill modelling and effectiveness assessments must include any potential trans-boundary impacts.

[16] 'major environmental incident' is defined in section 13A of the Act as '*…an incident which results, or is likely to result, in significant adverse effects on the environment in accordance with the Environmental Liability Regulations.*

14.4.1 Effectiveness

The safety case must contain an assessment of the effects of MEIs and an assessment of the oil spill response effectiveness, which is defined as:

> *The effectiveness of spill response systems in responding to an oil spill, on the basis of an analysis of the frequency, duration, and timing of environmental conditions that would preclude a response. The assessment of oil spill response effectiveness is to be expressed as a percentage of time that such conditions are not present and is to include a description of the operating limitations placed on the installations concerned as a result of that assessment.*

An estimate of the oil spill response effectiveness is required, including consideration of the following environmental conditions:

- weather, including wind, visibility, precipitation and temperature;
- sea states, tides and currents;
- presence of ice and debris;
- hours of daylight; and
- other known environmental conditions that might influence the efficiency of the response equipment or the overall effectiveness of a response effort.

To do this, the safety case must include appropriate modelling.

14.4.2 Worst Case Scenario

The safety case must detail which major accident scenario will result in the estimated worst case release of oil scenario and its derivation.

The description of the scenario should include the:

- Oil inventories (relevant wells, pipelines, diesel storage and crude storage)
- Oil characteristics including the:
    - ITOPF Grouping;
    - Specific Gravity;
    - Viscosity;
    - Wax Content;
    - Asphaltene Content;
    - Pour Point;
    - Release rate; and
    - Method used.

14.4.3 Real Time Modelling

The safety case must state how real time spill modelling will be sourced.

Operators must establish the quantity of any oil released to sea. The safety case must detail how such quantifications will be undertaken acknowledging that there are a number of methods to achieve this:

- Measured, e.g. quantities are determined based on level indication, tank drop, tank volume, metering etc.

- Calculated, e.g. quantities are determined based upon a known flow rate to sea for a known duration, an estimated flow rate and duration, or calculated from known quantities and known concentrations.
- Bonn Agreement Oil Appearance Code (BAOAC) estimations of oil on the sea, e.g. quantities are determined based upon observations of sheen size and appearance on the sea surface. A maximum and minimum figure shall be provided where BAOAC are utilised in order to allow a suitable assessment of potential pollution.

The movement of any visible pollution must also be tracked and methods used to undertake this must be detailed within the safety case.

14.5 Emergency Response Plan

14.5.1 Strategy

The safety case must identify appropriate strategies to facilitate a prompt and effective response to a pollution event, including details of how and when they would be employed. As a minimum the list of strategies below must be considered and justification provided if any of them are not utilised:

- Monitoring and Surveillance (from installation, vessel, aircraft, satellite);
- Dispersion (natural or chemically/mechanically assisted);
- Containment and Recovery (booming and mechanical recovery); and
- Source Control (well capping and relief well operations).

If controlled burning is identified as a potential response option justification to support this must be provided.

14.5.2 Implementation Plan

The safety case should summarise the plan for implementation of the chosen strategy. The emergency response plan should reflect the identified threats arising from the installation and its operation[17].

The description of the plan must include a description of the arrangements to limit environmental risk and how warnings are to be given and the actions persons are expected to take on receipt of a warning.

14.5.2.1 Third Party Support

The safety case must detail any arrangements in place with specialist oil spill response contractor. Details must include the following:

- Name and contact details of the oil spill response contractor; and
- Response capabilities of the contractor.

14.5.2.2 Inventory of Response Equipment

The safety case must describe the inventory of pollution response equipment available and cover the inventory of emergency response equipment pertinent to the operations which

[17] Also see Section 11 of this document.

includes details of ownership, storage locations, and transport arrangements to deployment site, mode of deployment and the measures in place to ensure that the response equipment and procedures are maintained in an operable condition This should reference the organisation that is managing this aspect.

Where the Operators have additional response equipment available e.g. location specific equipment, the OSCP must provide details and describe the capability of the equipment.

14.5.2.3 Response Timing

For all response resources identified the OSCP must detail the time taken to deploy the resource on location. If the worst case spill modelling indicates that the oil pollution is likely to beach, the safety case must provide confirmation that appropriate spill response resources can be mobilised to any beaching location in Ireland in sufficient time to allow response measures to be implemented and minimise the impact of any pollution.

14.5.2.4 Other Parties

Where necessary, the safety case must provide conformation that a Shoreline Protection Plan has been created and that the Local Authority has been consulted on this plan.

14.5.3 Mitigation Measures

14.5.3.1 Relief Well

The drilling of a relief well will be identified as a response option, the following must be detailed:

- Any specific MODU configuration required to drill the relief well (e.g. HP/HT, deep water etc.); and
- Provide details if the limited availability of a suitably configured MODU may cause delays to the relief well operations

An estimate of the time required to complete the relief well operation must be included from the day the relief well operation is decided upon to the day the well is killed.

14.5.3.2 Well Capping

A well capping device will be identified as a source control option, the following must be detailed:

- Details of the capping device(s) deemed suitable for use;
- Confirmation that the suitability of the capping device(s) has been fully assessed and is compatible with the well infrastructure and is certified for the anticipated well pressures; and
- Identification and contact details of the specialist contractor(s) providing the device(s).

An estimate of the time required to complete the well capping operation must be included from the day the capping operation is decided upon to the day the well successfully capped.

14.5.3.3 Dispersants

The use of dispersants is not permitted except in the case of saving of life. All other uses must be authorised by the IRCG – (Apply for permit from the IRCG).

If dispersant use is identified as part of an oil spill response strategy, the following must be detailed:

- Details of any dispersant held on the Standby Vessel (SBV) or other response vessels which could be utilised:
- Type of dispersant (as per MMO approved list);
- Quantity (m^3 / tonnes);
- Confirmation that the reservoir oils are amenable to dispersant treatment; and
- Suitable assurance that the dispersants used are included within the MMO list of approved dispersants.

If the SBV is replaced, provision must be made to maintain the dispersant response capability as detailed within the safety case. If there is no provision for a SBV or dispersant this should be justified.