An Coimisiún um Rialáil Fóntais
Commission for Regulation of Utilities

Compliance Assurance System

Part of the Safety Case Guidelines under the Petroleum Safety Framework

Information Paper

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The Exchange, Belgard Square North, Tallaght, Dublin 24, Ireland
T +353 1 4000 800 | F +353 1 4000 850 | www.cru.ie

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List of Abbreviations

Abbreviation	Meaning
ALARP	As Low As is Reasonably Practicable
BOP	Blow-out Preventer
CCR	Central Control Room
CoC	Certificate of Conformance
CRU	Commission for Regulation of Utilities
DCS	Distributed Control System
ICB	Independent Competent Body
ID	Identifier
IMO	International Maritime Organisation
IRB	Independent Review Body
ITR	Independent Thorough Review
NFPA	National Fire Protection Association
PED	Pressure Equipment Directive (97/23/EC)
PMR	Planned Maintenance Routine
PSV	Pressure Safety Valve
QRA	Quantified Risk Assessment
S(E)CE	Safety (and Environmental) Critical Element
S(E)MS	Safety (and Environmental) Management System
SSIV	Subsea Isolation Valve

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 Operation (ComOps)	An operation carried out from an installation with another installation or installations for purposes related to the other installation(s) which thereby materially affects the risks to the safety of persons or the protection of the environment on any or all of the installations;
Combined Operations Notification	A notification submitted to the CRU in accordance with the requirements of section 8 of the Safety Case Requirements for the purposes of gaining acceptance by the CRU to carry out the activities described therein.
Decommissioning Safety Case	A safety case submitted to the CRU for acceptance for the purpose of gaining a Decommissioning Safety Permit.
Decommissioning Safety Permit	A safety permit issued by the CRU under 13P of the Act which permits the decommissioning activity as set out in the associated Decommissioning Safety Case.
Design Notification	A notification submitted to the CRU in accordance with the requirements of section 6 of the Safety Case Requirements for the purpose of gaining acceptance by the CRU
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 CRU uses to regulate the activities of petroleum undertakings, Operators and Owners with respect to safety.

Term	*Definition or Meaning*
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 and competent organisation engaged by the petroleum undertaking, under the Compliance Assurance System, to execute a Facilities Verification, or Well Verification Scheme.
Independent Review Body	An independent and competent organisation engaged by the Operator or Owner to carry out an Independent Thorough Review.
Independent Thorough Review	A review carried out in accordance with section 4 of the Compliance Assurance System document either as a condition of a safety permit or as a result of a direction by the CRU.
Non-production Installation	The class of installation involved in carrying out offshore petroleum exploration or other designated petroleum activity or activities whilst stationed in the licensed area, but does not include installations involved in production of petroleum'
Non-production Safety Case	A safety case submitted to the CRU for acceptance for the purpose of gaining a Well Work Safety Permit.
Notified Body	The definition of a Notified Body is as per the Pressure Equipment Directive (97/23/EC) or the ATEX Workplace Directive (99/92/EC) as appropriate.
Operator	The entity appointed under section 13KA(1) to conduct designated petroleum activities including managing and controlling the functions of petroleum infrastructure (except Non-production Installations) in carrying out petroleum activities.
Owner	A person entitled to control the operation of a Non-production Installation.
Petroleum Safety (Petroleum Incident) Regulations	The Petroleum Safety (Petroleum Incident) Regulations 2016 (S.I. No. 166 of 2016).
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.

Term	*Definition or Meaning*
Production Safety Case	A safety case submitted to the CRU for acceptance for the purpose of gaining a Production Safety Permit.
Production Safety Permit	A safety permit issued by the CRU under 13P of the Act which permits the production activity as set out in the associated Production Safety Case.
Reportable Petroleum Incident	A Reportable Petroleum Incident is an event or occurrence that must be reported to the CRU as set out in the Act, Petroleum Safety (Petroleum Incident) Regulations and associated guidance.
Safety (and Environmental) 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.
Verification Scheme	Denotes the Facilities Verification Scheme and/or the Well Verification Scheme.
Well Verification Scheme	A Well Verification Scheme is a description of the work carried out by an Independent Competent Body(s) to verify whether an 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 is designated and requires a Well Work Safety Permit.
Well Work Safety Case	A safety case submitted to the CRU for acceptance for the purpose of gaining a Well Work Safety Permit.
Well Work Safety Permit	A safety permit issued by the CRU under 13P of the Act which permits the Well Work Activity as per the associated Well Work Safety Case and Non-production Safety Case.

Public Interest Statement

The Commission for Regulation of Utilities (CRU) is the safety regulator for upstream (offshore and onshore) petroleum exploration and extraction activities in Ireland.

The CRU's responsibility is to provide effective safety regulatory oversight and reduce the risk and potential consequences of major accidents onshore and offshore to a level that is as low as is reasonably practicable (ALARP).

The *Compliance Assurance System* document demonstrates how the CRU measures compliance of regulated entities, i.e. Operators, Owners and Petroleum Undertakings. This is done by outlining CRU's requirements for verification, safety performance reporting and Independent Thorough Reviews.

This is done through assessing Safety Cases, issuing Safety Permits, and monitoring compliance through an audit and inspection regime. The CRU may also carry out enforcement in instances of non-compliance with the Safety Case.

1 Introduction

1.1 The Petroleum Safety Framework

The Electricity Regulation Act 1999, as amended inter alia by the *Petroleum (Exploration and Extraction) Safety Act 2010* and the *Petroleum (Exploration and Extraction) Safety Act 2015* (the Act) gives the CRU responsibility for the safety regulation of petroleum exploration and extraction activities in Ireland. The Act requires the CRU to "establish and implement a risk-based Petroleum Safety Framework" (the 'Framework'). The Framework is the overall system established by the CRU to regulate the safety of petroleum activities[1], in particular designated petroleum activities.[2] The Framework established under the Act is a permitting regime, is goal-setting and risk-based, whereby Operators and Owners are required to reduce risks to a level that is ALARP.

Responsibility for the management and control of all hazards including major accident hazards rests with each Operator and Owner, with primary responsibility for the control of risks of a major accident associated with the carrying on of designated petroleum activities resting with the Operator. Each Operator and Owner must satisfy itself as to the adequacy of, and ensure implementation of, measures to reduce risks to safety to a level that is ALARP. The adequacy of measures must be demonstrated within the Operator's or Owner's safety case. Where the CRU accepts a safety case, it will issue a safety permit to the petroleum undertaking. Operators and Owners must comply with their accepted safety case and the associated safety permit, as well as their obligations under the Act. The *Compliance Assurance System* aligns with the wider *CRU Compliance and Enforcement Policy Statement*[3] and can be found on the publications section of the CRU website[4].

This *Compliance Assurance System* document forms part of the Framework (see Figure 1), and must be complied with by petroleum undertakings, Operators and Owners. The overall purpose of the *Compliance Assurance System* in the Framework is to measure and ensure compliance by petroleum undertakings, Operators and Owners with their duties under the Act, their safety case and safety permit (as appropriate) to design, construct, operate and maintain their activities in such a manner as to reduce any safety risk to persons to a level that is ALARP.

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[1] As defined in section 13A(2) of the Act.

[2] As defined in the *Petroleum Safety (Designation of Certain Classes of Petroleum Activity) Regulations 2013*.

[3] CRU Compliance and Enforcement Policy Statement CRU/19/134

[4] https://www.cru.ie/professional/safety/petroleum-safety-framework-2/

1.2 Purpose of the Compliance Assurance System

The *Compliance Assurance System* document sets out requirements on Operators and Owners to:

- Implement a Verification Scheme(s) using Independent Competent Bodies (ICBs);
- Report on safety performance indicators to the CRU on a quarterly basis; and
- Conduct Independent Thorough Reviews.

1.3 Structure and Interpretation

1.3.1 Structure of the Document

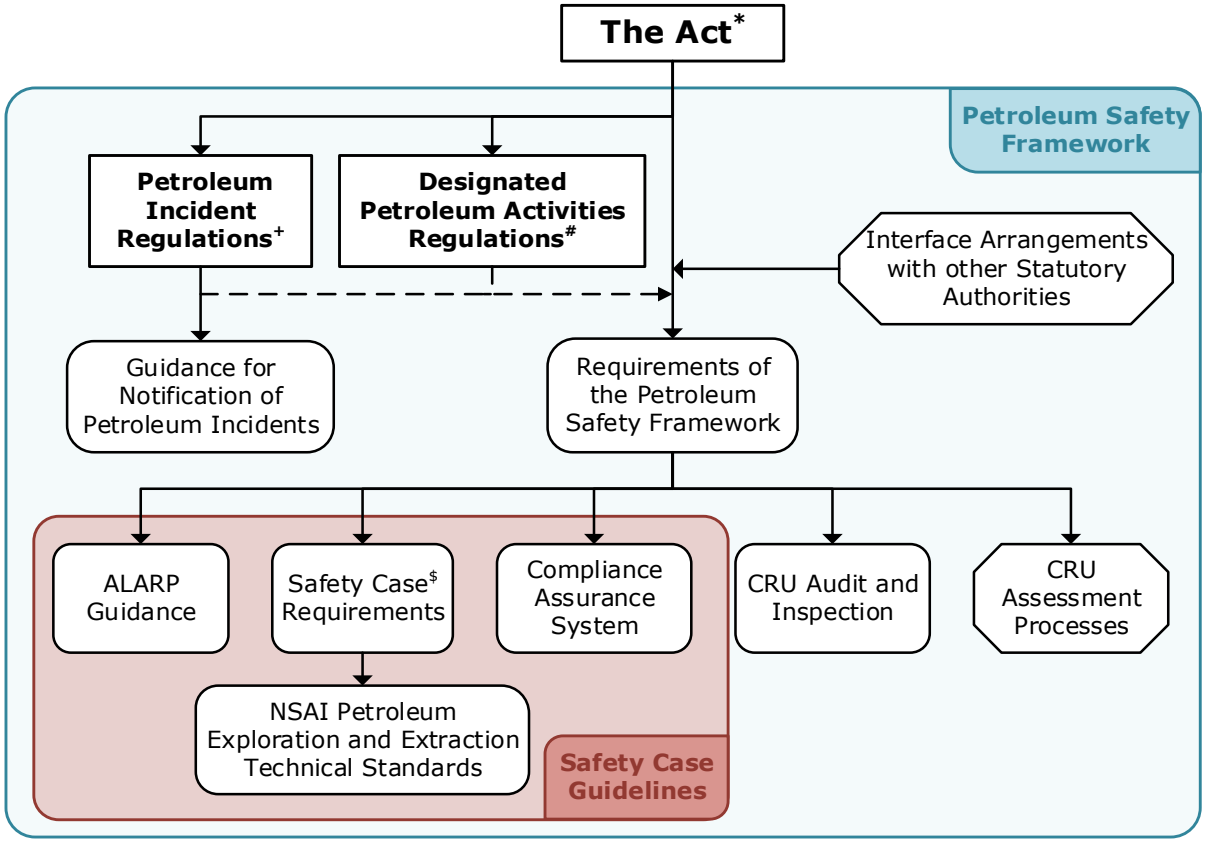
The Compliance Assurance System is comprised of three sections detailing the following requirements upon Operators and Owners:

- Verification (section 2);
- Safety Performance Reporting (section 2); and
- Independent Thorough Review (section 4).

1.3.2 Interpretation

In accordance with section 13B of the Act, nothing in the Act or within this document 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.

Examples of the application of this *Compliance Assurance System* are provided in example boxes, which are illustrative only and are included to aid understanding and are not prescriptive or exhaustive. They do however represent the CRU's understanding in relation to the subject matter of the example.



(*) The *Electricity Regulation Act 1999 as Amended by the PEES Act 2010 and PEES Act 2015*
(#) Petroleum Safety (Designation of Certain Classes of Petroleum Activity) Regulations 2013
(+) Petroleum Safety (Petroleum Incident) Regulations 2013
($) and notifications

Figure 1: Overview diagram of the Petroleum Safety Framework

2 Verification

Operators and Owners must have in place Verification Schemes for verifying the suitability and performance of Safety (and Environmental) Critical Elements[5] (S(E)CEs) and the maintenance of well integrity, by one or more organisations, termed Independent Competent Body(s) (ICBs). Verification is required for all petroleum infrastructure related to the carrying on of a designated petroleum activity, including offshore and onshore facilities, pipelines, wells and must be in place for all phases of the petroleum infrastructure's lifecycle.

Operators and Owners are required to appoint one or more ICBs, in accordance with the procedure set out in Section 2.1, to verify the initial (design) and continuing (operations) performance of the S(E)CEs and well integrity. In this regard a:

- Well Verification Scheme must be in place for all wells and all well work; and
- Facilities Verification Scheme must be in place for all petroleum infrastructure that relates to each safety permit and is outside the scope of a Well Verification Scheme.

The Well Verification Scheme covers everything on and within the pressure containment boundary of the well. This includes the downhole pressure-containing equipment and the pressure-containing equipment on top of the well such as blowout preventers (BOP) or Christmas trees, but excludes well control equipment downstream that can be isolated from the well by valves. A Facilities Verification Scheme covers all other S(E)CEs.

Verification is carried out by assessing and reviewing a cross-section of the Operator's or Owner's actions and processes used to define and maintain S(E)CEs and well integrity such that risks are verified to be ALARP. The verification must allow the ICB to judge if the S(E)CEs initially meet and will continue to meet their performance standards, and if well integrity is being and will be maintained.

A Verification Scheme must give a description of the work to be carried out by an ICB to verify whether the Operator or Owner meets suitable performance standards for S(E)CEs and maintains well integrity. It is the responsibility of the Operator or Owner to establish and ensure implementation of their Verification Scheme. The Verification Scheme must also be reviewed by the ICB.

Verification is in addition to the requirement of section 13M (5) of the Act that the safety case must include sufficient information to demonstrate that adequate arrangements have been

[5] The verification scheme for an onshore installation must describe the arrangement for verifying the suitability and performance of the facilities Safety Critical Elements. The verification scheme for an offshore installation must describe the arrangements for verifying the suitability and performance of the Operator's Safety (and Environmental) Critical Elements. The term Safety (and Environmental) Critical Elements is used throughout this document, but the environmental aspect only applies to offshore infrastructure.

established for monitoring, audit and for the making of reports on safety performance and compliance.

This section of the *Compliance Assurance System* sets out specific requirements for:

- Appointment of an ICB by an Operator or Owner (Section 2.1);
- Verification Scheme processes (Section 2.2);
- Verification Process (Section 2.3)
- Safety Case Content and verification timings (Section 2.4);
- Facilities Verification Scheme requirements (Section 2.5); and
- Well Verification Scheme requirements (Section 2.6).

2.1 Appointment of an ICB by an Operator or Owner

2.1.1 Competence and Independence

2.1.1.1 Submission to the CRU

The Operator or Owner must submit its choice of ICB(s) to the CRU for acceptance. A submission must be made for each ICB using the form on the CRU website in which the Operator or Owner must:

- Demonstrate how the entire Verification Scheme will be carried out by the ICB(s);
- For each ICB,
    - provide confirmation that the ICB is certified to ISO 9001, or provide a demonstration that the ICB operates a quality management system that meets the same goals (for all work under the Verification Scheme);
    - Describe how the ICB meets the independence requirements in Section 2.1.1.3; and
    - Describe any previous and current associations between the Operator or Owner and the ICB, any potential conflicts of interest and how such issues will be managed.

The CRU will accept[6] or refuse an ICB based on the evidence provided in the submission (Section 2.1.4 states when this needs to be done in relation to safety case, or notification submission). The CRU will inform the Operator or Owner of the outcome of their review of the ICB as soon as is practicable, but normally no later than four weeks after receipt of the submission.

Re-acceptance of an ICB is not required in relation to the submission of a material change to a safety case, as long as the Operator or Owner is satisfied that the material change is within the competency of the existing accepted ICB. Re-acceptance of an ICB is not required on

[6] The CRU's acceptance in no way relieves the Operator or Owner of any responsibility under the Act, or of its duty to ensure that verification is carried out by suitably independent and competent persons.

resubmission of a Non-production Safety Case with an Acknowledgement of Compliance, provided confirmation the ICB remains the same.

Section 2.1.1.2 gives additional ICB competency requirements. Whilst this information is not required in the submission to the CRU for ICB acceptance, the Operator or Owner must be able to demonstrate at any time that the ICB is continuing to meet these requirements.

The Operator or Owner may appoint more than one ICB to implement a Verification Scheme provided it can demonstrate that the entire content of the Verification Scheme is covered. Further details regarding multiple ICBs are given in Section 2.1.2.

The Operator or Owner may change the ICB, subject to the requirement that the proposed choice of ICBs must be submitted to the CRU for its prior review and acceptance (see Section 2.1.3).

2.1.1.2 Competence Requirements – Individuals and Competency System

Individuals: the ICB must have individuals available with suitable knowledge, experience and training to carry out the tasks allocated to them for the type of petroleum infrastructure being verified. They must have the competence to critically assess the Operator's or Owner's system for ensuring S(E)CEs are suitably designed and operated to meet performance standards that make the risk ALARP. This means that the ICB's verification work must be carried out by individuals who are competent in design assessments, maintenance systems and/or the actual carrying out of maintenance on the petroleum infrastructure such that over all the ICB's individuals, all of the technical areas are covered.

The range of competencies needed to cover the wells, well-related equipment and the S(E)CEs is extensive. It is expected that multiple technical specialists will be required by the ICB for verification, and that this will take due cognisance of the range of technical expertise the Operator or Owner requires for its operations.

Competency System**:** the ICB must ensure the competency of individuals through procedures to evaluate and manage competency. These procedures must include:

- Job descriptions that state minimum qualifications and minimum experience requirements;
- A definition of the required competence;
- Periodic assessments that evaluate continuing competence and identify on-going training requirements;
- Training records being made and maintained; and
- A procedure for the selection of persons with competency appropriate to the task. This could take the form of a competency matrix showing the aspects of the Verification Scheme that specific persons are competent to undertake.

2.1.1.3 Independence

The ICB's persons carrying out verification activities must:

- Be impartial and free from direct financial or operational pressures, which could affect their judgement;
- Not verify their own work;
- Not be employed directly by the petroleum undertaking, Operator or Owner (or any constituent member thereof), their parent companies or a company in the same group, and
- Not, if a person is working for a third-party company with a safety-related relationship with the petroleum undertaking, Operator or Owner; verify the work of that company.

2.1.2 Multiple ICBs

Verification may be carried out by more than one ICB provided the Operator or Owner ensures that the entire content of the Verification Scheme is completed. Where more than one ICB is appointed, the Operator's or Owner's Safety (and Environmental) Management System (S(E)MS) must document the interface and communications between all parties, together with clear roles and responsibilities.

2.1.3 Change of ICB

In order to change ICB, or add an ICB, a new ICB submission must be made to the CRU in accordance with Section 2.1.1. The Operator or Owner must ensure that the following are made available to the incoming ICB (as applicable to their scope of verification):

- The current status of all verification activities;
- The list of open anomalies with the actions and planned closure dates; and
- The list of current verification reservations.

The Operator or Owner must ensure the accuracy of all records and that continuity of verification activities is maintained through a change of ICB.

2.1.4 ICB Submission Timings

2.1.4.1 Design Notification

The ICB submission must be accepted before the Design Notification is submitted to the CRU. In practice this means it should be submitted four weeks before the expected submission of a Design Notification.

2.1.4.2 Well Work Safety Case

The ICB must be accepted by the CRU before the Well Work Safety Case is submitted. In practice this means it should be submitted four weeks before the expected submission of a Well Work Safety Case.

2.1.4.3 Other Safety Cases

For all other safety cases, the ICB must be accepted before the CRU can accept the safety case. The ICB submission can be at the same time as the safety case submission but should not be before the submission of the safety case itself.

2.2 Verification Scheme Processes

2.2.1 Overview of Schemes

2.2.1.1 Facilities Verification

An Operator's or Owner's Facilities Verification Scheme defines the work and process whereby the ICB verifies that the performance standards for the S(E)CEs are suitably defined and that the S(E)CEs operate to them throughout the lifecycle of the installation. For each performance criterion for each S(E)CE, the Facilities Verification Scheme must define the ICB's verification activities.

The Facilities Verification Scheme is comprised of the activities carried out by the ICB:

- To verify:
  - The suitability and completeness of the chosen S(E)CEs;
  - The suitability of the performance standards for the S(E)CEs;
  - That the S(E)CEs meet the performance standards from design through on-going operations to ensure risks to persons are ALARP;
- To raise and accept closure of anomalies; and
- To raise verification reservations.

As part of the above, the Facilities Verification Scheme must include review of procedures used to manage the performance of S(E)CEs including, but not limited to, procedures used to:

- Assess the safeguards that may be needed should an S(E)CE fail (often termed operational risk assessment);
- Determine under what conditions maintenance can be deferred; and
- Determine maintenance intervals (e.g. risk-based inspection).

Detailed requirements for the Facilities Verification Scheme are given in Section 2.5, and Appendix A gives an example list of verification activities for a S(E)CE.

2.2.1.2 Well Verification

An Operator's Well Verification Scheme defines the work and process whereby the ICB verifies that well integrity is maintained, the performance standards for well-related S(E)CEs are suitably defined and met over the lifecycle of the well. For each performance criterion and for well integrity, the Well Verification Scheme must define the verification activities that the ICB carries out. Topsides equipment on the production or Non-production Installation that relates to the well

should generally be covered by the Facilities Verification Scheme (see Section 2.2.1.3. for guidance on potential overlap of Verification Schemes).

The Well Verification Scheme is comprised of the activities carried out by the ICB:

- To verify:
  - That the well is designed, constructed and operated to achieve ongoing integrity
  - The suitability and completeness of the chosen well-related S(E)CEs;
  - The suitability of the performance standards for the well-related S(E)CEs;
  - That the well-related S(E)CEs meet the performance standards from design through on-going operations;
- To raise and accept closure of anomalies; and
- To raise verification reservations.

As part of the above, the Well Verification Scheme must include review of the procedures that are used to manage the performance of well-related S(E)CEs including, but not limited to, systems to:

- Assess the safeguards that may be needed should an S(E)CE fail (often called operational risk assessment);
- Determine under what conditions maintenance can be deferred;
- Determine maintenance intervals (e.g. risk-based inspection); and
- Provide for dispensation to deviate from a defined well policy, or part of a performance standard (e.g. non-operation of a downhole safety valve).

If a Well Work Activity is being carried out from a Non-production Installation, the Well Verification Scheme must include verification of the suitability of the specific combination of the well and Non-production Installation that is being used for the well work.

Detailed requirements for the Well Verification Scheme are given in Section 2.6.

2.2.1.3 Overlap of Verification Schemes

There may be an overlap between the Facilities and Well Verification Schemes. To avoid duplication, where appropriate, verification carried out for a Well Verification Scheme may be cited by the Operator as part of the Facilities Verification Scheme arrangements and vice versa, provided that there is no gap between them whereby, for example, a part of the well, or an S(E)CE is not covered by any Verification Scheme.

Example
For well work carried out from a Non-production Installation, an approach to the split between the Facilities and the Well Verification Schemes could include:

- The operation of the mud and BOP is part of the Facilities Verification Scheme;
- The fact that the mud design and BOP is appropriate for the well work being carried out is part of the Well Verification Scheme;
- Appropriateness of the BOP for the well is part of the Well Verification Scheme; and
- The casing design is part of the Well Verification Scheme.

The following should normally be covered by a Facilities Verification Scheme rather than a Well Verification Scheme:

- Well test flowline and downstream equipment (e.g. choke, heater, separator); and
- Rig gas handling equipment (e.g. diverter, mud gas separator, vent lines).

2.3 Verification Processes

2.3.1 Records of Verification

The Operator or Owner must ensure that there are arrangements in place for making and keeping verification records for the lifetime of the installation showing:

- The ICB's review of the S(E)CEs, performance standards, assurance routines and procedures and Verification Scheme (Section 2.3.3);
- The ICB's review of management of change request for SECE's;
- Verification activities carried out, such that it is clear what verification has been carried out on what equipment, documents, or records, regardless of the outcome (i.e. positive reporting of all verification activities, not just when an anomaly is raised);
- The ICB's verification anomalies, including a record of the:
    - Anomaly itself;
    - Planned date for closure of any anomaly;
    - ICB's acceptance of the closure of any anomaly; and
- The ICB's verification reservations.

2.3.2 Anomalies and Reservations

2.3.2.1 ICB and Operator or Owner Process

If, in carrying out the Verification Scheme, the ICB determines that the Operator or Owner is not in compliance with its performance standards and/or or associated procedures, or will or is not maintaining well integrity (the bulleted lists in the two sections above), the ICB must raise an anomaly, which is defined as follows:

An anomaly is a failure identified by the ICB of either the Operator's or Owner's system for maintaining well integrity, or the performance of an S(E)CE, or the associated assurance processes, or the Verification Scheme itself, at any point of the lifecycle.

The raising of anomalies does not prevent an ICB from alerting the Operator or Owner of any other issue needing remedial action, or any improvement that should be considered for implementation.

For any anomaly raised, the Operator or Owner and the ICB must endeavour to agree the required action and the time within which this action must be completed such that the S(E)CE

achieves the performance standard, well integrity is maintained, or the anomaly is otherwise satisfactorily closed-out. The Operator or Owner must obtain the ICB's agreement that the planned closure date for rectification of the anomaly is as soon as is reasonably practicable and this may take into account other temporary risk reduction measures that have been put in place. The ICB must assess whether the action taken by the Operator or Owner to correct or otherwise close-out the anomaly is suitable but is not responsible for completing the action. If, in executing the action, the Operator or Owner finds that substantially more work is required to rectify the anomaly, a new action and close-out date can be agreed with the ICB. The Operator or Owner is responsible for completing the action.

If the ICB and Operator or Owner cannot agree on a suitable date for the closure of an anomaly, or on whether an anomaly has been suitably closed-out, the ICB must raise a 'verification reservation' to the Operator or Owner, which is defined as:

A verification reservation is raised if the ICB and the Operator or Owner cannot agree on any part of a Verification Scheme, or on the timescale or action required for close-out of an anomaly.

All verification reservations raised must be notified to the CRU by the Operator or Owner within one week using the appropriate form on the CRU website. For clarity, the requirement to notify the CRU of a verification reservation is not satisfied by the safety performance reporting set out in Section 1.

2.3.2.2 CRU Process

On receipt of a verification reservation from an Operator or Owner, the CRU will identify and notify the action required, if any, by the Operator or Owner to close it. In deciding the appropriate action required, the CRU may carry out an inspection or investigation.

2.3.3 ICB Review of Verification Scheme

The ICB must review the Verification Scheme and the Operator's or Owner's S(E)CEs, performance standards and assurance processes if:

- They have not previously been in operation on the installation or well;
- A Non-production Installation coming into Irish jurisdiction; or
- The verification scheme has been revised for any reason, in which case only the modified parts need review.

The review must cover the suitability of the:

- Chosen set of S(E)CEs;
- Performance standards for these S(E)CEs;
- Assurance (including maintenance, and inspection) routines used by the Operator or Owner to ensure performance including their frequency;

- Assurance processes used in the management of S(E)CE performance (e.g. operational risk assessment and deferred maintenance); and
- Verification Scheme itself, which allows the ICB to make a judgement as to whether the Operator or Owner is following their own assurance processes for the S(E)CEs from design through to on-going operations.

Notwithstanding this, the ICB must also review the Verification Scheme as they work on it and raise anomalies in relation to it if it does not meet the requirements within this *Compliance Assurance System* or is otherwise unsuitable. This is especially important if there is a change in ICB.

If an ICB raises anomaly in relation to A-E above that the Operator or Owner does not accept, and the difference of opinion cannot be resolved, a verification reservation must be notified to the CRU.

2.3.4 Sample Size and Frequency of Verification

The verification activities that need to be carried out and their frequency will vary between S(E)CEs, between different equipment items that make up an S(E)CE, and the well. Verification is carried out by assessing and reviewing a cross-section, or sample of the Operator's or Owner's processes used to define and maintain S(E)CEs and well integrity such that risks are ALARP. Sampling means that:

- Each component of a set of identical components does not need to be verified; and
- A safety critical function does not necessarily require to be verified every year, or every time an Operator or Owner carries out maintenance on it.

The sample size and frequency of reviewing a function of a S(E)CE must be such that the ICB is carrying out sufficient verification over the installation to be satisfied that the S(E)CE meets initially and will continue to meet its performance standard, or well integrity is being and will be maintained.

The ICB should review management of change requests which impact SECEs, or changes that otherwise affect SECEs. The role of the ICB in the MoC process must be clearly set out.

For many S(E)CEs, there are a number of similar, or even identical, components in operation, e.g. gas detectors, pressure safety valves (PSVs) and petroleum-containing pipework. While the Operator's or Owner's assurance processes must cover all of these components on a regular basis, verification (during operations likely to be witnessing of tests and examination of maintenance records) only needs to be carried out on a sample of them at a frequency such that the ICB can be satisfied that the performance standard is met by individual components of the S(E)CE (e.g. PSVs - all must operate), or collectively (e.g. emergency lights - normally only a

proportion need to operate to meet the performance standard). The Operator or Owner should carry out reliability reviews once a suitable maintenance history is available to ensure that components are meeting the reliability element of the performance standard.

The frequency of verification of a particular function depends on the frequency of the Operator's or Owner's inspection and maintenance processes that provide assurance to the Operator or Owner that S(E)CEs are meeting their performance standards. It varies for different types of verification, as illustrated in the example below. The verification of most performance standards may be by a combination of maintenance record review and visual examination or witnessing of tests, but the allocation between these activities varies for different S(E)CEs.

Example

Pressure safety valves (PSVs) are normally inspected at intervals of between one and six years depending on the past performance and risk associated with non-operation of the PSV. On a production installation there are typically several hundred PSVs meaning that sufficient certainty can be gained that inspection tests are being carried out correctly, and inspection records reflect actual tests, without witnessing all of the tests (which may or may not be carried out on site). The operational part of the Facilities Verification Scheme for PSVs must include at least (numerical values replaced by xx and yy):

- Witness the minimum of xx PSV and yy% of all PSV lift tests (pop tests) each year including, if any exist, some that failed their previous test;
- Annual review of PSV deferred maintenance assessment for minimum of xx PSVs and yy% of total deferrals (or all deferrals if fewer than this exist); and
- Bi-annual review of the Operator's or Owner's assessment of PSV reliability.

For any verification activity where a sample of records or components is verified, the sample size needing to be covered must be defined and same sample must not be repeatedly verified.

Example

The Operator or Owner should consider the number of tests on components of an S(E)CE that are required to be witnessed to allow the ICB to decide on whether the test is being carried out correctly and that sufficient certainty can be gained that the recorded test results mirror the actual test results. For example:

- A high integrity pressure protection system, preventing the over-pressurisation of a separator, may require the ICB to witness tests of 100% of the system; and
- A fire and gas detection system with many detectors may require the ICB to witness only a proportion of the detector tests (i.e. less than 100% of them).

2.3.5 Non-ICB Activities

2.3.5.1 Vessel Classification

Work done to satisfy vessel classification for mobile, offshore installations under the auspices of the International Maritime Organisation (IMO) may be used to satisfy aspects of a Verification Scheme. The Operator or Owner must ensure that this work meets the requirements of the Verification Scheme, including suitable records being kept (see Section 2.3.1), and that the organisation carrying out the work meets all the ICB requirements (see Section 2.1). In this instance, the ICB and the Operator or Owner must agree that the classification organisation meets all of the ICB requirements, including independence from the Operator's and Owner's assurance activities, and this assessment may be subject to inspection by the CRU.

An example relating to vessel classification is given below.

Example
A Non-production Installation firewater pump test is witnessed by the vessel's classification society and found to meet all of the criteria in the performance standard. The Facilities Verification Scheme also requires an ICB to witness a firewater pump test. If the classification society meets the ICB requirements for this Verification Scheme, then its witnessing of the test will also satisfy this aspect of the Verification Scheme.
Note that this is only possible if the vessel classification activity covers all of the Verification Scheme requirements.

2.3.5.2 Notified Bodies

Under the Pressure Equipment Directive (PED) (97/23/EC) and ATEX Workplace Directive (99/92/EC), Notified Bodies check and review a manufacturer's processes such that the manufacturer is able to CE mark a product, which confirms that it meets the relevant directive. If the directive is the criteria in the performance standard of an S(E)CE, it is sufficient for the ICB to check the authenticity of the declaration of conformity for the equipment to confirm this aspect of the performance standard. The Operator or Owner and ICB must agree that this is a suitable approach to allow the ICB to meet the requirements of the Verification Scheme and make a judgement as to whether the Operator's or Owner's assurance processes meet the performance standard as intended.

Example
The criteria in the performance standard for pressure-containing equipment is to meet the Pressure Equipment Directive (97/23/EC). This can be verified by a review of the declaration of conformity (with the Notified Body's name and number) and a visual inspection of the CE marking. For some equipment items, the Verification Scheme may require additional verification of welding qualifications or witness of pressure strength tests to be carried out by the ICB.

2.3.5.3 Other Code Requirements

Performance standards may include the requirement for equipment to meet a particular code that is recognised as Good Practice. Verification of this aspect can be completed by reviewing and confirming the applicability of work undertaken by another third party that meets the ICB requirements in Section 2.1. The Operator or Owner and the ICB must agree that the other party meets the independence requirements for an ICB and, regarding competency, that they are accredited to recognised standards in Ireland (e.g. ISO 9001 and ISO 17020).

This party does not need to be accepted by the CRU but may be subject to audit and inspection if used in the verification process. This arrangement can only cover verification of adherence to a recognised code in Ireland and so is unlikely to cover all the requirements for a particular S(E)CE.

Two examples are given below where verification can and cannot be carried out by review of another party's work.

Example
The verification that emergency lighting meets a particular code as required by its performance standard can be made through review of documentation from another party (meeting the ICB requirements) that it meets the code.
Verification that the emergency lighting operates needs to be made by the ICB witnessing a test.

Example
The performance standard for a production tree states that it needs to be rated to 10,000psi. This can be verified by a valid third-party certification (from a third party that meets the ICB requirements) that states that the production tree is rated as such.
The wing valves in the same production tree need to close in 30s, which must be verified by witnessing of a test during the commissioning process.

2.4 Safety Case Content and Verification Timings

Verification Scheme(s) must be described or referenced in the safety case or notification in accordance with Table 1.

Safety Case or Notification	*Requirements for Description of the Verification Scheme in Safety case/Notification*	*Requirements for when a Verification Scheme should be in place*
Design Notification	***Facilities: Design and Construction*** *- A summary of the Facilities Verification Scheme that will be implemented during design.*	For a new installation, a Facilities Verification Scheme must be in place before a Design Notification is submitted and it must cover (see Section 2.5 for details) design, construction and commissioning (up to the point at which an accepted Production Safety Case is required).
Production Safety Case	***Facilities and Wells: Operations*** *- A summary of the Facilities and Well Verification Schemes and the list of performance standards must be included in the safety case.* ***Facilities and Wells: Design and Construction*** *The safety case must state that design and construction Facilities and Well Verification have been completed and summarise the work done to achieve this. If this cannot be completed before submission of the safety case, it will be made a condition of the safety permit.*	The Facilities Verification Scheme for production (see Section 2.5.3) must cover all the S(E)CEs for the installation (excluding wells covered under a Well Verification Scheme but including commissioning activities). A Well Verification Scheme must be in operation for all wells in a Production Safety Case (see Section 2.6.3 for details). These requirements also apply to mobile installations that are brought into Ireland for production and they also require design verification to have been completed. The Facilities Verification Scheme for production must be in place before a Production Safety Permit is issued.
Non-production Safety Case	***Facilities: Operations*** *- summarise the Facilities Verification Scheme and list the performance standards in the safety case.* ***Facilities: Design and Construction*** *- The safety case must state that a process that meets the same aims as design and construction verification has been completed as detailed in Section 2.5 and summarise the work done. If for reasons of practicality this verification work cannot be completed for when the safety case is submitted, it will be subject to an Additional Information Request, which may impact the timescale for safety case assessment and acceptance.*	The activities defined in A-E of section 2.3.3 must be completed before safety case acceptance. An operational Facilities Verification Scheme for the Non-production Installation, following the guidance in Section 2.5.3, must be in operation before operations commence.
Combined Operations Notification	***Facilities: Operation*** *- A summary of any changes to the Facilities Verification Scheme for the production or Non-production Installation.*	Before Combined Operations commence.

Safety Case or Notification	*Requirements for Description of the Verification Scheme in Safety case/Notification*	*Requirements for when a Verification Scheme should be in place*
Well Work Safety Case	***Wells: Design*** *- The safety case must include a statement of completion and summary of work carried out to complete the design part of the Well Verification Scheme. See below for further information on material change.* *A summary of the Well Verification Scheme for the Well Work Activity must be included in the safety case together with a list of the performance standards.*	Verification of the design of the well (including how it will be drilled), in accordance with the requirements in Section 2.6.1, must be completed prior to submission of a Well Work Safety Case and from this point until well abandonment, a Well Verification Scheme must be in operation regardless of the safety permit that the well is being operated under. A suspended well remains subject to verification under a Well Verification Scheme (see Section 2.6.4). The requirements of the Well Verification Scheme for a Well Work Activity that covers abandonment are given in Section 2.6.5. The combination of the Facilities Verification Scheme for the (non)-Production Installation and the Well Verification Scheme must cover all the S(E)CEs relating to the Well Work Activities.
Decom-missioning Safety Case	***Facilities and Wells: Operations*** *- A summary of the Facilities and Well Verification Schemes must be included in the safety case together with a list of the performance standards.*	A Verification Scheme must be in place for decommissioning and prior to the issuance of a Decommissioning Safety Permit. They must cover relevant operational aspects and take account of any changes from the verification activities that were carried out during production. A Design Notification may be required prior to the submission of Decommission Safety Case. The Verification Scheme requirements for a Design Notification are set out above.

Table 1: Verification Scheme documentation requirements for safety cases and notifications

Verification must be carried out for all material changes on production and Non-production Installations and for well work activities.

If a material change to a Well Work Safety Case is needed to prevent the unplanned escape of fluids (i.e. operation outside of the defined envelope of operations in the Well Work Safety Case for critical safety reasons), the requirement for the ICB to verify this must not prevent the timely implementation of proposed changes where necessary.

2.5 Facilities Verification Scheme Requirements

An ICB for Facilities Verification must be accepted before the Design Notification is submitted[7]. The ICB must verify that the design will maintain risks at a level that is ALARP, that performance standards for the S(E)CEs are suitable to reduce the risk to ALARP and that the S(E)CEs will be capable of meeting their performance standards when commissioned and on an on-going basis.

The requirements for the Facilities Verification Scheme during design, construction (including commissioning up until the point when an approved Production Safety Case is required), and Production[8] are given below.

2.5.1 Design

Design covers the process of determining what will be constructed and how it will be operated.

The ICB must verify that the *ALARP Guidance* has been followed with respect to the decisions that have been made as to the choice of S(E)CEs, their performance standards and ALARP consideration of safety critical risk reduction measures. The verification need not repeat the work done by the designer, but it must be in sufficient detail for the ICB to be satisfied that the design will meet these requirements. To do this, the ICB must review a suitable sample of the documentation, calculations etc. that are part of an ALARP demonstration or justification for the chosen performance standards and not merely rely on the reputation, or past experience of the organisation that has carried out the analysis.

Example
If a tie-back to an offshore installation does not have a subsea isolation valve (SSIV) on the pipeline, the ICB should review the ALARP assessment for this decision and check any risk calculations used in it. If there is an SSIV and it is given a performance standard for maximum allowable time to close, the ICB should verify this time, but it is less likely that this needs to include a review of calculations since reasonable changes in closure time are likely to be less critical than whether a SSIV exists at all.

Example
Petroleum containing pressure vessels are safety critical and, for a sample of the pressure vessels, calculations for the strength would need to be checked such that sufficient certainty in the correctness of them all can be gained. Use of a suitable software package may mean that less checking is needed to gain sufficient certainty. In some instance this may involve repeating calculations.

[7] Unless the Design Notification relates to a material change and the approved ICB has independence and competence to verify the work involved with the material change.

[8] The split into these areas is given to aid the description of the requirements but does not mean that the Verification Scheme must be split in the same way.

2.5.2 Construction

2.5.2.1 Overview

Before a Production Safety Case is accepted, the ICB must have verified that each S(E)CE meets its performance standard. This verification may be by a combination of document review (e.g. testing records, technical deviations, close-out packs, etc.) and witnessing (e.g. commissioning tests to demonstrate that performance standards are met). The combination of review, witnessing and examination must be such that the ICB can gain confidence that the S(E)CEs are meeting their performance standard initially. Two examples of the mix of activities that provide this confidence are given below.

Example
Additional emergency lighting is being provided for a new module on an offshore platform. In this case, the verification activities must include at least:

- Thorough review of procurement records showing that the lights meet the code required in the performance standard;
- Confirmation, following installation, that the emergency lights operate for the required time on loss of normal power; and
- Witnessing, following installation, the lighting levels defined in the performance standard are achieved.

2.5.2.2 Timing

Verification must not be left until the end of the construction process so as to provide for the possibility of resolving anomalies satisfactorily before operation and to discourage any tendency to accept the degraded situation that led to the anomaly being raised. Verification must be carried out throughout the construction process from the end of design through to the acceptance of the Production Safety Case, including the commissioning of S(E)CEs where possible and prior to completion of the construction phase. Verification is likely to be carried out in stages, but the full verification scope must ensure that all the performance criteria defined in the performance standard are verified.

Example
Gas detector locations and their response times (as required by the performance standard) must be verified by witnessing a suitable test once installed in location.

Example
Verification of a new riser emergency shutdown valve must include witnessing of:

- Pressure test of the valve at its place of fabrication to determine whether its passing rate meets the performance standard; and

- Test of the time taken for the valve to close once installed on site to determine whether it meets its performance standard.

In order that the ICB identifies anomalies as early as possible, some verification may be carried out at the procurement stage, such as review of a suitable sample of procurement documents (e.g. procurement orders, datasheets and delivery notes, etc). This may prevent an anomaly from being identified during the commissioning stage when it is more difficult to rectify.

2.5.3 Production (Operations)

A Facilities Verification Scheme during the production (or operations for a Non-production safety Case) phase must include all of the following:

- Witnessing of tests;
- Visual examination;
- Review of maintenance and inspection records; and
- Review of related assurance procedures (e.g. deferral, operational risk assessment).

Guidance in relation to these methods is given below.

2.5.3.1 Witnessing of Tests

Where S(E)CEs have an active performance standard (e.g. activation of deluge, detection of flammable gas, etc.) the ICB must witness a sample of the Operator's or Owner's testing of the S(E)CEs. The purpose of witnessing a test is to verify that it is being carried out correctly and that the results recorded are accurately reflected in the maintenance management system so as to provide sufficient certainty in the operation of the maintenance management system.

Example
The active performance standards that require the ICB to be physically present to witness tests include, but are not limited to:
- Emergency shutdown valve closure time and leakage rate;
- Fire water pump starting methods and flow rate; and
- Gas detector response time and alarm levels.

2.5.3.2 Visual Examination

Where S(E)CEs have a passive performance standard (e.g. dimensions, quantity, condition, etc) the ICB must visually examine a sample of the S(E)CEs.

Example
Passive performance standards that require the ICB to visually examine the S(E)CE include, but are not limited to:
- Escape routes;
- Emergency exit doors;

- Blast walls; and
- Passive fire protection.

2.5.3.3 Review of Maintenance and Inspection Records

As part of the verification process, the ICB must review maintenance and inspection records to confirm that the assurance process is robust and that scheduled maintenance and inspection has been completed on time and in accordance with documented procedures.

As part of checking the records, the ICB must verify that the scheduled maintenance will reveal any failure mode of the S(E)CE such that remedial action can be taken by the Operator or Owner. The ICB must also review the frequency of a particular maintenance activity to ensure that it is appropriate, considering the:

- Historical failure rate of the equipment; and
- Accounting for the level of redundancy, the risk resulting from failure.

As part of the review of maintenance and inspection records, the ICB must review the application of any procedures that are used to defer maintenance.

The ICB must review that the maintenance and inspection records refer to the as-found condition of the equipment and identify any remedial action that was required to reinstate S(E)CEs or well integrity to meet the required performance standards.

Review of maintenance records must also be carried out in order to verify whether reliability criteria within the performance standards are being met. This is likely to be done on a sample basis (see Section 2.3.4 for further details).

2.5.3.4 Review of Operational Deviations

The ICB must verify that risk assessments used to justify continued operation with a failed S(E)CE (often termed operational risk assessment or deviation) are suitable and consider:

- The risks associated with the failure of the S(E)CE;
- Deviations or dispensations from the Operator's or Owner's policies or procedures; and
- How the risk remains ALARP, considering any additional risk reduction measures that are implemented.

In verifying this, the ICB must also review whether the Operator's or Owner's procedures to manage S(E)CE failures and associated deviations or dispensations are adequate.

2.5.4 Decommissioning

A Verification Scheme must be in place for decommissioning prior to the issuance of a Decommissioning Safety Permit. The Verification Scheme(s) must take account of any changes from the verification activities that were carried out during production. These changes may require the submission of a Design Notification, which will also require a Facilities Verification Scheme as set out in Section 2.4

Records must be retained after decommissioning, according to the requirements in Section 2.3.1.

2.6 Well Verification Scheme Requirements

The requirements for the Well Verification Scheme apply to all wells offshore, including those wells that have been suspended.

The Well Verification Scheme is to review whether the operation of the well, or, for a Well Work Activity, the well design, the Well Work Activity itself and the use of any pressure control equipment, prevent uncontrolled escape of fluids from the well and ensure that risks are ALARP. It must include review of the well programme, relevant policies and procedures (and any dispensations) used by the Operator and its contractors as far as they affect the well integrity and operation of well-related S(E)CEs.

The depth of verification depends on the criticality of the operation and its hazards. For example, more detailed examination should be done if:

- the operation is new or seldom undertaken by the well Operator (e.g. first Christmas tree change-out);
- the well conditions increase hazards (e.g. high-pressure reservoir);
- the planned operations increase hazards (e.g. pressured hydrocarbons at surface); or
- there are unusual management arrangements (e.g. coil tubing crew on well service vessel).

If, through CRU agreement, a Well Work Safety Case covers more than one well (for well work on multiple wells in the same field during the same campaign - see section 6.3.2.1 of the *Safety Case Requirements*), then the corresponding Well Work Verification must sample enough of the well work over the wells covered to give the ICB sufficient confidence that S(E)CEs will operate and well integrity will be maintained for all wells.

The requirements for Well Verification Schemes during design, Well Work Activity, production, suspension and abandonment are given below (this split is used for convenience and is not mandatory).

2.6.1 Design

The ICB must verify the well design including the design of the drilling process for the Well Work Activity. This verification must be by review of design documents (e.g. well engineering drawings, equipment specifications, calculations, datasheets, etc.) and may include checking some design calculations. The well and drilling process will be designed within a certain envelope within which the Operator has assessed the risk to be ALARP. Verification must cover the range of possibilities within the defined envelope and must confirm that well integrity will be maintained and the S(E)CEs will meet the performance standards such that hazards are managed, and risks are ALARP.

Specification of suitable well-related S(E)CEs and their performance standards will depend on the well and the well work planned.

Verification must cover all aspects of the well design pertaining to its integrity and S(E)CEs, including a review of at least:

- The assessment and prediction of subsurface conditions to ensure that all relevant information has been considered;
- The casing and cement design and specification including placement, slurry design, planned tops;
- The proposed mud properties to ensure that they are suitable to achieve well control;
- Direct pressure and temperature measurement and/or use of predictive methods to verify anticipated geological conditions;
- Pressure testing methods for demonstrating integrity, including their suitability & frequency;
- Adequate well barriers being in place at all times;
- The design and specification of pressure control equipment, considering anticipated subsurface pressure and temperature conditions; and
- How well abandonment will be achieved.

A balance needs to be struck between providing the ICB with all the necessary information at an early stage, and not involving them in decision-making in order to maintain independence.

2.6.2 Well Work Activities (Well Construction)

The ICB must verify that the Well Work Activity is carried out in accordance with the design and the well programme by review of a suitable sample of documents (especially a daily well report or similar), and must include verification that:

- The material/equipment that is to be placed in the well (e.g. casing) meets the design requirements; this may be carried out by an external party as outlined in Section 2.3.5.2 and the requirements of that section also apply here;
- The pressure containment boundary is as per the design through consideration of the
  - Fluid (mud) column in the well;
  - Testing of the well casing and cement;

- Actual subsurface conditions (e.g. leak-off test, formation integrity test, pore pressure measurements);
- Suitability of the temporary well control equipment e.g.
  - Wireline BOP, lubricator, stuffing box and controls;
  - Snubbing Unit BOP, grippers and controls;
  - Coiled tubing unit BOP, stuffing box and controls;
  - Landing string, subsea test tree and controls;
  - Surface test tree, valves and controls;
  - Rotating control device, operating choke and controls for managed pressure drilling, or underbalanced drilling;
  - Subsea wireline riser system;
  - Subsea workover riser system;

- Well control procedures (including periodic BOP testing and emergency drills to secure a well) during the Well Work Activity are appropriate; and
- Formal handover has occurred that signifies the end of the Well Work Activity and confirms well integrity and the operation of S(E)CEs to the performance standards.

The Operator should ensure that the safety critical steps identified for verification are cross referenced and reported on in the daily drilling reports.

2.6.3 Production (Operation and Maintenance)

The ICB must verify the Operator's process for ensuring that the S(E)CEs meet their performance standards and that well integrity is maintained at all times through implementation of a suitable well integrity management system. This must cover all wells, including those that are suspended, and verification of routine operation and maintenance activities for wells that do not fall under the definition of Well Work Activity. This verification must cover at least review of:

- Inspection and preventative maintenance of the wellhead and Christmas Tree,
- Condition monitoring, inspection and maintenance of the well completion;
- Condition monitoring such as annulus pressure monitoring, or downhole temperature and pressure monitoring and may also include well entry for production logging;
- Changes to the well including minor modifications such as wellhead, or Xmas Tree fittings;
- Inspection and testing of safety critical valves (e.g. subsurface safety valves, gas lift valves, production master valves); and
- Deviations from normal operations.

Verification may be by document review or witnessing of tests. The Well Verification Scheme may include witnessing of the operation of safety critical valves (see Section 2.5 for how this may also be covered by a Facilities Verification Scheme).

2.6.4 Suspension

The ICB must verify the Operator's process for monitoring the integrity of any well that is suspended. This verification may be by a review of a suitable sample of documents (e.g. well suspension procedures, review of inspection records or examination of periodic video records).

2.6.5 Abandonment

For the process of abandoning a well, the same verification requirements apply as for any other Well Work Activity.

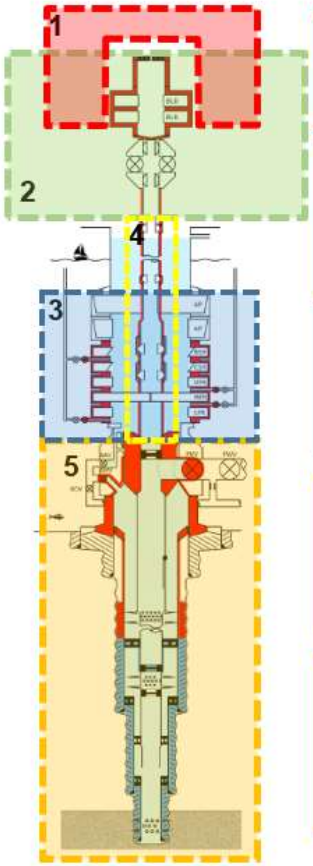
In addition, the ICB must verify that the well has been suitably sealed so as to permanently maintain its pressure boundary by a review of a suitable sample of documents (e.g. abandonment procedures and records and pressure test results). The ICB must verify that the process for re-pressurisation of all the formations to virgin pressure, potential changes in fluid composition in the wellbore and the deterioration of well over time have been considered.

Once a well has been permanently plugged and abandoned it will not be subject to verification.

2.6.6 Verification of 3rd Party Equipment

S(E)CEs for a well and all S(E)CEs connected to the well must be defined and included in a verification scheme. Any third-party equipment (e.g. Subsea test trees, well test string, wireline, coiled tubing, E-line packages), which are identified as S(E)CEs, and not covered in the Non-production Facility Verification Scheme will need to be verified prior to use. The ICB must verify the design (including type approval), construction, testing and ongoing maintenance to ensure that the equipment is fit for purpose. This should include material traceability. Review of a vendor certification of conformance (CoC) does not constitute independent verification. If the accepted wells ICB does not have the required competence to carry out these requirements, a separate ICB may be needed to cover them. It needs to be clear which verification scheme each S(E)CE is under.

Well Work S(E)CEs Verification Scheme Identification



1. Surface Rig Installed Well Control S(E)CEs
HP pipe work, choke, Accumulator etc.,

2. Surface Third Party, Well Control S(E)CEs,
Surface test tree, wireline BOPs, Well Test Package

3. Subsea Rig Well Control S(E)CEs
BOPs, Subsea Accumulators, Marine, riser

4. Subsea Third Party Well Control S(E)CEs,
Landing string, Subsea Test Tree.

5. Subsea well construction/ containment S(E)CEs
Xmas tree tubing, SSSV, Packers, Casing, drilling fluids

Referenced within Non-production Safety Case.	Referenced within Well Work Safety Case.
1. Surface well control S(E)CEs identified in the Non-production Safety Case. **Design, availability, reliability, operability - NPSCVS**	1. Rig S(E)CEs that do not form part of the pressure containment envelope of the well are not verified in either the TPEVS or WVS
2. Third party well control S(E)CEs that are installed on rig and referenced in the Non-production Safety Case (e.g. Well test package from choke) **Design, availability, reliability, operability - NPSCVS**	2. Surface third party well control S(E)CEs referenced within the Well Work Safety Case (i.e. surface test tree, W/L, C/T, E-Line packages, Flowline) **Design, availability, reliability – TPEVS Operability - WVS**
3. Subsea well control S(E)CEs identified in the Non-production Safety Case **Design, availability, reliability – NPSCVS**	3. Subsea well control S(E)CEs identified in the Non-production Safety Case **Operability - WVS**
4. Subsea Third Party Well/pressure Control S(E)CEs will not be covered in the Non-production Safety Case and therefore will not be included the NPSCVS	4. Subsea third party well/pressure control S(E)CEs referenced within the Well Work Safety Case i.e. well test string &subsea test tree **Design, availability, reliability – TPEVS Operability - WVS**
5. Subsea well construction equipment will not be covered in the Non-production Safety Case and therefore will not be included the NPSCVS	5. Subsea well construction and containment S(E)CEs referenced within the Well work Safety Case **Design, availability, reliability, operability - WVS**

NPSCVS = Non-production Safety Case Verification Scheme
WVS = Well Verification Scheme
TPEVS = Third Party Equipment Verification Scheme (may form part of the WVS if the well verifier has the required competencies)

Figure 2: Well Verification Schemes

3 Safety Performance Reporting

Operators and Owners must monitor and report on safety performance.[9] This is in addition to the petroleum incident reporting required under the Act.[10] This safety performance reporting provides the CRU with data on each Operator's and Owner's safety performance on an on-going basis. The CRU uses the data to monitor trends, recognise Good Practice and identify areas for audit and inspection. Safety performance reporting assists the CRU in monitoring compliance by Operators and Owners with their obligations under the Act and the Framework, and their compliance with the accepted safety case and the associated safety permit.

Operators carrying on designated petroleum activities, and Owners while in Irish jurisdiction, must measure and report safety performance indicators as detailed below to the CRU every quarter following the issue of a safety permit. The CRU may also include additional indicators as specific requirements of a safety permit.

3.1 Safety Performance Indicators

Leading and lagging safety performance indicators to be reported to the CRU:

- **Leading safety performance indicators** are produced from active monitoring of risk reduction measures to ensure their continued effectiveness; and
- **Lagging safety performance indicators** relate to incidents as defined in the Petroleum Safety (Petroleum Incident) Regulations and Guidance for Notification of Incidents.

Table 2[11] and Table 3 give the safety performance indicators that must be reported to the CRU. For events or occurrences for which notification to the CRU is required under the Petroleum Safety (Petroleum Incident) Regulations,[12] the associated petroleum incident report reference number(s) must be provided in the safety performance report. An incident must be recorded against all relevant safety performance indicators, e.g. a serious injury caused by a worker falling overboard from an offshore Facility would be tallied under safety performance indicators H1 and M.

Table 4 shows the supporting data that must be reported to the CRU to enable analysis of data from different Operators and Owners.

In Table 2 a distinction is made between a worker and a non-worker. Persons carrying on an activity in relation to the operation or activities of the Operator or Owner are workers. Any other

[9] Section 13L(3)(f) of the Act.

[10] Section 13A(1) of the Act and the *Petroleum Safety (Petroleum Incident) Regulations*.

[11] See the CRU *Guidance for Notification of Incidents* for additional guidance on these indicators.

[12] Submitting safety performance indicators relating to petroleum incidents does not constitute notification to the CRU under the *Petroleum Safety (Petroleum Incident) Regulations*.

person (such as visitors to the site that are not engaged in a petroleum activity or members of the public) is classed as a non-worker.

Section 3.2 describes how the reporting is to be carried out.

ID	Safety Performance Indicator
A1	Number of unintentional releases of ignited gas or petroleum liquid
A2	Number of unintentional releases of not ignited natural gas or evaporated associated gas if mass released ≥ 1kg
A3	Number of unintentional releases of not ignited petroleum liquid if mass released ≥ 60 kg
A4	Number of unintentional releases or escapes of any non-petroleum hazardous substance
B1	Number of blowouts
B2	Number of activations of a blowout prevention or diverter system to control flow of well-fluids
B3	Number of instances of a mechanical failure of any part of a well, whose purpose is to prevent or limit the effect of the unintentional release of fluids from a well or a reservoir being drawn on by a well, or whose failure would cause or contribute to such a release
B4	Number of instances of failure to maintain a planned minimum separation distance between two or more wells
C1	Number of instances of an S(E)CE not meeting its performance standard, requiring Immediate Remedial Action
C2	Number of instances of an S(E)CE not meeting its performance standard, not reportable under C1
C3	Number of activations of an S(E)CE except where testing and/or maintenance is being carried out.
D	Number of instances where Immediate Remedial Action was required as a result of significant loss of structural integrity or loss of station keeping in relation to a mobile installation
E1	Number of potential vessel collisions with any petroleum infrastructure
E2	Number of vessel collisions with any petroleum infrastructure
F1	Number of potential helicopter accidents within the safety zone
F2	Number of helicopter accidents within the safety zone
G1	Number of worker fatalities resulting from a designated petroleum activity
G2	Number of non-worker fatalities resulting from a designated petroleum activity
H1	Number of serious injuries to workers resulting from a designated petroleum activity
H2	Number of serious injuries to non-workers resulting from a designated petroleum activity

ID	Safety Performance Indicator
H3	Number of injuries to workers where: • the person could not perform all of their normal work activities for more than 3 consecutive days, not including the day of the incident; or • treatment at a hospital is required as an inpatient or outpatient
I	Number of work-related evacuations of personnel
J	Number of major environmental incidents
K	Number of uncontrolled fires or explosions
L	Number of instances of a stand-by vessel not being within its defined geographical area, irrespective of whether the absence was due to prevailing weather or climate conditions.
M	Number of instances of a person falling into the sea
N	Number of occurrences of mustering on onshore or offshore petroleum infrastructure, other than for planned drills
O	Number of occurrences of detection of hydrogen sulphide in the course of operations at a well or in samples of well-fluids from a well where the presence of hydrogen sulphide in the reservoir being drawn on by the well was not anticipated
P	Number of occurrences of the collapse, overturning, or failure of any load-bearing part of any lift, hoist, crane, or derrick
Q	Number of instances damage to property the Ownership of which is held by a person other than the petroleum undertaking Operator or Owner, or a contractor thereof, concerned
R	Number of occurrences of the dropping of an object that could have resulted in a major accident.
S	Number of instances of a collision by a vehicle, crane or aircraft with any petroleum infrastructure

Table 2: Lagging safety performance indicators

ID	Safety Performance Indicator	Guidance
LO	Percentage of calendar year's verification activities completed to date	This metric will rise through the year. The percentage is measured by reference to activities, not man-hours.
L1	Number of anomalies raised by ICB(s) in the quarter	Details of the anomalies raised are not required to be reported.
L2	Number of verification anomalies that are not closed-out by the planned due date at the end of the quarter	
L3	Number of verification reservations raised by the Operator or Owner in the quarter	
L4	Number of S(E)CEs with overdue preventative maintenance at the end of the quarter	For L4, S(E)CEs are counted in terms of discrete items, e.g. if 10 gas detectors have not had planned maintenance completed, 10 is reported.
L5	Number of S(E)CE maintenance hours required to clear any backlog in safety performance indicator L4	
L6	Number of live operational risk assessments at the end of the quarter	Operational risk assessments refer to risk assessments in place due to any impairment, loss or non-availability of an SCE or an abnormal situation.
L7	Number of planned emergency drills not carried out within the quarter	

Table 3: Leading safety performance indicators

Description
Total man-hours worked on designated petroleum activities during the quarter
Number of beds on fixed installations
Number of beds on mobile installations
Number of hours (per instance referred to in part L) of a stand-by vessel not being within its geographical area

Table 4: Supporting data

3.2 Format and Frequency of Reporting

Operators and Owners must submit a Safety Performance Reporting Submission Form to the CRU in electronic and hard copy format[13]. The report must include a summary narrative on the safety performance indicators for the period covered, for example, giving reasons for the parameter being higher, lower, or similar to previous reporting periods. The reporting parameters must be given in relation to each safety permit.

With the exception of well work, Operators are required to report the safety performance indicators to the CRU on a quarterly basis within six weeks of the quarter ending, as in Table 5. Reporting of this data to the CRU in these timeframes will be a condition of all safety permits.

Reporting Quarter	Latest Submission Date
1st January – 31st March	14th May
1st April – 30th June	14th August
1st July – 30th September	14th November
1st October – 31st December	14th February

Table 5: Safety performance indicator reporting deadlines

For well work activities, Operators and Owners are required to report on safety performance indicators to the CRU within 2 weeks of cessation of the Well Work Activity, or at a date specified by the CRU.

Operator and Owners must ensure that the systems in place for gathering the data for the safety performance indicators are robust. Operators and Owners must retain data relevant to the safety performance indicators. The CRU may confirm the accuracy of the performance reporting data provided by an Operator or Owner through audit and/or inspection[14].

[13] The appropriate form is provided on the CRU website.

[14] See CRU Audit and Inspection System document

4 Independent Thorough Review

Operators and Owners must review their safety case(s) in specific circumstances, as described in section 13N (2) of the Act, as follows:

a) At least every five years;
b) Whenever such a review is necessary because of new facts or to take account of new technical knowledge about safety matters;
c) Whenever such a review is necessary arising from (i) reports relating to audits (ii) reports on safety performance and compliance;
d) In circumstances where the Operator or Owner considers it appropriate to do so;
e) Where the CRU issues a notice in writing to an Operator or Owner requiring it to do so; or
f) Where a change is made to the safety management system which could significantly affect the ability of the Operator or Owner to comply with its duty to reduce the risks to ALARP.

Where the review of the safety case is required to meet the obligation to carry out a five-yearly review (a), or in circumstances where the CRU has directed the review (e), an Operator or Owner must direct an Independent Thorough Review (ITR) by an organisation termed an Independent Review Body (IRB), according to the requirements of this section of the *Compliance Assurance System*. The IRB must be accepted by the CRU before the review commences.

The safety case is a working document and so must represent current operations at all times. The purpose of an Independent Thorough Review is to confirm that the:

- Safety case continues to demonstrate that the risk from major hazards have been reduced to ALARP, in the light of changes in Good Practice, improvements in technology or other advances (e.g. new facts or to take account of new technical knowledge);
- The Safety (and Environmental) Management System is being implemented as it is described in the safety case; and
- Verification processes are being implemented as described in the safety case and the verification scheme.

Although the ITR will necessarily consider past performance, fundamentally it is a forward-looking process, in which the Operator or Owner processes are reviewed to ensure they are being applied as described in the safety case, and to identify any improvements required to the petroleum infrastructure or S(E)MS for the risk to remain ALARP.

The intention of the review is not to find issues that would be identified by the Operator, Owner, or the ICB during the course of their normal business, but to review whether the risk as described in the safety case will be ALARP for the next five years given modifications and gradual changes that have occurred on the installation or in the wider industry over the preceding five years.

4.1 Independent Thorough Review Process

4.1.1 Timing

The Operator or Owner is responsible for the completion of the ITR. For a review instigated by the five-yearly process, the review report must be submitted within five years of the last review being submitted to the CRU. The example box below illustrates a typical schedule for an Operator or Owner to complete such a five-yearly review. For an ITR directed by the CRU, the timescale in which it must be competed will be specified.

Example

For an ITR of a Production Safety Case, the review may progress as follows:

- 0-1 months; The Operator confirms that their process for an ITR meets the requirements of this guidance and they are ready to carry it out;
- 1–2 months: The Operator selects the IRB and submits their choice to the CRU;
- 2–5 months: The ITR takes place and the list of findings is prepared and action close-out dates agreed with the IRB (during this time some actions may be closed-out and, if relevant, may be included in the ITR report as recent improvements); and
- 6 months: The ITR report is prepared and submitted to the CRU. The safety case is updated following the review and subject to the material change process as necessary.

4.1.2 Appointment of an IRB by an Operator or Owner

4.1.2.1 Submission to the CRU

The ITR must be carried out by an organisation, or a number of organisations that are competent and independent. Such a body is termed an Independent Review Body (IRB). The IRB(s)[15] must have persons, who between them, meet the IRB requirements.

Before commencing an ITR, the Operator or Owner must submit information relating to their choice of IRB to the CRU for acceptance[16] using the appropriate form on the CRU website. The CRU will accept the IRB on the basis of the evidence provided in the submission. The CRU will inform the Operator or Owner whether acceptance is given as soon as is practicable, but in any event no later than four weeks after receipt of the submission.

In the submission, the Operator or Owner must:

- For all work that is to be carried out in the ITR demonstrate competence by:
  - Confirmation that the IRB is certified to ISO 9001 for that work, or

[15] Note that the singular IRB is used in the remainder of this document, but this does not disallow the possibility of the Operator or Owner to use more than one IRB to cover the required review scope.

[16] The CRU's acceptance in no way relieves the Operator or Owner of any responsibility under the Act, or of its responsibility to ensure that the Independent Thorough Review is carried out by suitable independent and competent persons.

    - Provision of a demonstration that the IRB operates a quality management system that meets the same goals as ISO9001 for that same work;
- Describe how the independence of the IRB meets the requirements in Section 4.1.2.2;
- Describe any previous and current associations between the Operator or Owner and the IRB, any potential conflicts of interest and outline how such issues are managed; and
- If more than one IRB is used, how they cover the required review scope between them.

The CRU will accept the IRB for review of the specified safety case if they meet these criteria.

4.1.2.2 Independence

The IRB's persons carrying out the review activities must:

- Be impartial and free from direct financial or operational pressures, which could affect their judgement;
- Not review their own work;
- Not be employed directly by the petroleum undertaking, Operator or Owner (or any constituent member thereof), its parent company or a company in the same group;
- Not, if a person is working for an ICB for the installation being reviewed, review the work of that organisation; and
- Not, if a person is working for a third-party company with a safety related relationship with the petroleum undertaking, Operator or Owner; verify the work of that company.

4.1.3 Findings and Reservations

4.1.3.1 IRB and Operator or Owner Process

In carrying out the ITR, the IRB identifies *findings*[17], which are defined as:

A *finding* is a failure identified by the IRB of either the Operator's or Owner's systems or operations with respect to the safety case and associated documents, or the absence of a risk reduction measure that must be considered, and then potentially implemented, for the risk to remain ALARP.

Where a finding is raised, a response by the Operator or Owner is required, and action must be considered, and potentially taken by them to close the finding.

Identification of findings are the main focus of the ITR. For any finding raised, the Operator or Owner and IRB must agree the action required to close out the finding, which will be by:

- Completion of a suitable change to a hardware or procedural system or similar; or

[17] This should not prevent an IRB from bringing to the attention of the Operator or Owner any issue that they identify and consider needs remedial action or is an improvement that should be considered for implementation as soon as possible.

- An assessment to determine whether an additional risk reduction measure identified in the finding is needed for the risk to remain ALARP.

The Operator or Owner must obtain the IRB's agreement on the planned action for each finding and their closure date, which must be as soon as is reasonably practicable. The Operator or Owner is responsible for completing the work identified in the action.

Where a finding is closed-out by the Operator or Owner carrying out an assessment, an action may result (i.e. a change made to a hardware, procedural system or similar). If the result of the technical assessment is not known when the ITR is concluded, then the timescale for completion of this action does not need to be agreed by the IRB.

If the IRB and the Operator or Owner cannot agree on a date for an action to close a finding, or on whether the action, or finding is suitable, the IRB must raise a *review reservation*, which is defined as:

A *review reservation* is raised if the IRB and the Operator or Owner cannot reach agreement on the validity of a finding, or on the timescale or action required for close-out of a finding.

Review reservations are included within the ITR report, which is sent to the CRU. The CRU process for dealing with review reservations is given in Section 0.

An example of the possible workflow is given below with two possible close-out scenarios and a review reservation scenario.

Example
Finding: The gas detection layout was defined before line-of-sight gas detector technology became developed enough to be used reliably. It is not known if the risk of fire and explosion is ALARP as there are no line-of-sight detectors on the Facility.
Close-Out: The Operator and IRB agree that the finding should be closed-out (barring any remedial work) within X months of the completion of the ITR.
- *Close-out Scenario A:* The Operator carries out a gas detector layout assessment taking account of all available technologies and the need to meet current Good Practice and for the risk to be ALARP. It shows that the current arrangement is ALARP as additional line-of-sight gas detectors provide little benefit.
- *Close-out Scenario B:* The Operator carries a gas detector layout assessment and determines that additional detectors are needed. These are installed X months later and are the subject of a CRU inspection.

Review Reservation: The Operator and IRB disagree on the date for the finding to be closed-out. This is raised as a review reservation in the ITR report.

4.1.3.2 CRU Process

On receipt of an ITR report containing a review reservation from an Operator or Owner, the CRU will identify and notify the action required, if any, by the Operator or Owner to be able to close the review reservation. The CRU may undertake an inspection in relation to the review reservation.

4.1.4 Content of the Independent Thorough Review Report

The ITR report, which is submitted to the CRU by the Operator or Owner using the appropriate form on the CRU website, must contain the following:

- The names those who led the ITR and all those involved in it, or who carried it out;
- How the review was carried out and how it meets the requirements given in Section 4.2;
- The dates during which the review took place;
- Details of workforce involvement, including consultation with safety representatives;
- A demonstration of the robustness and independence of the review;
- Findings for which the action to close them is:
  - Unknown due to an ongoing assessment to determine this (an assessment summary is required); and
  - Not yet complete (details of the action itself as required).

All the findings, and all the risk reduction measures considered, but found not to be reasonably practicable to implement, or closed-out during the review, do not need to be included. However, these should be recorded and retained by the Operator or Owner as the CRU may inspect these at a later date. Any review reservations raised by the IRB must also be included.

The report must also summarise any revisions made, or intended to be made, to the safety case as a result of the review.

If a material change is made to the safety case as a result of the review, then the safety case must be resubmitted to the CRU for acceptance as per any other material change.

4.2 Technical Requirements

4.2.1 General

The intention of the review is not to find issues that would be identified by the Operator or Owner, or the ICB during the course of their normal business, but to review whether the risk as described in the safety case will be ALARP given changes or incidents that have occurred over the preceding five years and may occur over the next five years.

Example
The ITR is not intended to record individual failures such as the failure of an emergency light, but to identify systemic failures in either the ICB's verification, the Operator's assurance activities, or to identify that new, better lighting technology exists and should be considered.

The Operator or Owner is responsible for ensuring that the ITR is thorough and it must include, but may not be limited to review of:

- Basic facts and assumptions;
- The management system specifically including:
  - Its operation;
  - Management of change;
  - Whether lessons are being learnt from incidents and abnormal or unexpected events;
- S(E)CEs and their performance;
- Verification;
- The management of ageing assets; and
- The ALARP demonstration including
  - How changes in technology, Good Practice etc. have been accounted for.

Requirements in each of these areas are given below.

4.2.2 Review of Basic Facts and Assumptions

The basic facts and assumptions that drive the management of major hazards on the installation must be reviewed. Many of these will not have changed in the previous five years and many will not change in the next five, but those that are more dynamic must be reviewed such as:

- Reservoir composition including its potential souring;
- Cyclical use of equipment leading to greater fatigue or other causes of failure;
- Sea-bed conditions affecting the jacket, or other equipment as relevant; and
- For onshore sites, any encroachment of buildings.

These areas may also link to ageing assets (see Section 4.2.6) and management of change (see Section 4.2.3.2).

4.2.3 Review of the Management System

4.2.3.1 Operation of the Safety (and Environmental) Management System

The S(E)MS must be reviewed to confirm it remains suitable, including a review of actual practices onshore and offshore by visiting the operational site(s) to:

- Check alignment with the safety case text and referenced supporting documents; and
- Determine whether improvement can be made to the processes.

The S(E)MS review must cover aspects of each part of the Plan, Do, Check and Act model and consider human factors as necessary. Examples of how this can be achieved are given below

(two aspects can be carried out for each: whether the actuality meets what is described in the safety case and whether the arrangements are sufficient):

- Plan:
  - Whether the organisation structure, individual accountabilities and responsibilities, allow adequate focus on major hazards;
  - Staffing levels, working hours, shift and crew handovers and arrangements for deputies. This includes confirming that significant extra hours are not worked, that safety critical information is correctly conveyed during handovers and that arrangements for deputising key persons are clear to those involved;
  - Communication and workforce involvement in safety, e.g. meetings, toolbox talks, safety awareness initiatives, safety surveys, safety notices etc; and
  - Competence management, e.g. reviewing company information to confirm that persons carrying out safety critical work are and have been assessed as competent.
- Do:
  - Safe control of operations including that tasks are scheduled and completed by competent persons; and
  - Operational/task risk assessments i.e. review of records and practices for compliance with applicable procedures and guidance.
- Check:
  - Analysis of the scope, quality and thoroughness of audits and reviews of the S(E)MS, including their planning, implementation, tracking and closure of actions.
- Act:
  - Review of whether actions taken on foot of incidents, audits, or others means are appropriate and have been completed and especially how these have led to improvement of the S(E)MS.

4.2.3.2 Management of Change

A suitable sample of the changes made to the petroleum infrastructure in the past five years must be reviewed to ensure that a robust process for management of change is being implemented and that these changes are reflected in the safety case as necessary especially when S(E)CEs are affected.

4.2.3.3 Incidents

The ITR must cover a representative sample of incidents since the last review, covering at least some higher risk incidents, in order to establish that:

- Lessons have been learnt as appropriate to the incidents that have occurred;
- The incident's severity classification was appropriate;
- The immediate cause was identified robustly;
- Root cause analysis was carried out where required;
- Actions prescribed as a consequence of the incident are comprehensive, appropriate and completed according to agreed close-out date;
- Multiple incidents and underlying trends are being monitored; and
- Confirmation that lessons learnt are effectively communicated to the workforce.

4.2.4 Review of S(E)CEs

The review must consider the suitability of the performance standards for a suitable sample of S(E)CEs and whether the performance of these S(E)CEs is being monitored and maintained. Changes to Good Practice in relation to S(E)CEs is also relevant – see Section 4.2.7.

A selection of current or historic Operational Risk Assessments (ORAs) used to define suitable temporary risk reduction measures while a S(E)CE is temporarily compromised or over-ridden should be reviewed against Good Practice.

4.2.5 Review of Verification

The operation of the Facilities and Well Verification Schemes must be reviewed against the CRU requirements for verification.

Example
Potential weaknesses that may exist in a verification scheme that should be identified in an ITR such as:

- Extension of closure dates that have not been formally agreed;
- Excessive extension of anomaly closure dates without due cause;
- Lack of a method of ensuring different samples are verified each time;
- Lack of a range of maintenance routines reviewed;
- Lack of verification of procedures associated with S(E)CEs; and
- ICB acceptance of situations where an anomaly should have been raised.

In addition, closure of a selection of the ICB's verification anomalies should be reviewed with evidence sought for positive close-out.

4.2.6 Review of the Management of Petroleum Infrastructure Ageing

Petroleum infrastructure ageing must be considered (where appropriate) as part of an ITR, including obsolescence and life extension issues for at least structural integrity, petroleum containment, controls and instrumentation, and other S(E)CEs that may suffer degraded performance due to ageing. The review must consider whether:

- There are robust structural, pipeline and process integrity management systems in place that account for ageing and possible life extension;
- Suitable fabric maintenance of process equipment and the structures is being carried out;
- Integrity management efforts are not solely being concentrated on current and near future threats, as petroleum infrastructure needs long term plans to address ageing and life extension if it is to operate for an extended period; and
- Ageing and life extension are explicitly addressed in the safety case.

4.2.7 Review of the ALARP Demonstration

The ITR must include a review of the ALARP demonstration in the safety case (see section 9 and 10 of the *Safety Case Requirements*, and the *ALARP Guidance)*. The review must include assessment of whether the following are still current and assessed using current Good Practice:

- Techniques used to identify hazards and determine risks;
- Hazards and risk reduction measures;
- QRA to ensure that the risk is accurately represented, including:
  - The data used in the QRA to represent operating conditions of the petroleum infrastructure and that used in calculating the risk, such as historical failure data;
  - A comparison of the leak data with the Operator's or Owner's experience; and
  - Assumptions are documented and justified.
- Risk reduction measures previously not deemed reasonably practicable to implement.

4.2.7.1 Good Practice

A key part of the ALARP demonstration for any safety aspect is adherence to Good Practice, which changes over time. The ITR must consider the Operator's or Owner's process to consider whether changes in Good Practice need to be implemented for the risk to remain ALARP. This review does not need to cover all S(E)CEs, or aspect of the management system, but needs to cover a representative sample to give assurance as to whether this process if operating.

This could be achieved through interviews with technical authorities and other relevant persons or in a workshop ensuring that all aspects of process safety – plant, people and process – are covered.

4.2.8 Workforce Involvement

The workforce, including safety representatives, must be consulted and involved in the ITR to allow them to identify further risk reduction measures, or improvements.

The Operator or Owner, in conjunction with the IRB, must decide how the workforce will be involved in the ITR. Ways of achieving this include ALARP workshops, interviews or discussions of working practices at the Facility. It is important that open discussions take place between persons from the IRB and the workforce.

Appendix A. Example Operational Performance Standard and Facilities Verification Scheme

Note that in the example below some numerical criteria have been replaced by XXX.

S(E)CE: 001 FIREWATER PUMPS							
GOAL To provide firewater for fire protection systems.							
Extent of System			**Interfaces**				
• Firewater pumps • Firewater Pump Enclosures • Diesel Day Tanks			• Fire and Gas System • Emergency Shutdown System • Firewater Ringmain • Foam Systems				
FUNCTIONALITY							
ID	**Performance Criteria**	**Basis for Performance Criteria**	**Assurance of Performance Criteria**	**Verification**			
				Activity	**Phase**	**Sample Size**	**Frequency**
F1	Three x 100% capacity firewater pumps each fed from a dedicated diesel tank Each fire pump to deliver a minimum acceptance flow of xxxxm^3/hour at xxx barg	Basis of Design for firewater (including ALARP Demonstration) Hydraulic analysis report for firewater system NFPA 20 Centrifugal Fire Pumps Fire Protection Philosophy.	Design and testing during commissioning Subsequent modifications to the firewater hydraulic analysis or firewater pumps and ancillary equipment will be subject to the Change Control Procedures.	F1.1 Review design and modification records to confirm initial suitability and management of change procedure has been followed, including update of assurance and verification activities associated with modifications.	Design	100%	Initial suitability and on modification
			Planned maintenance activities for the firewater pumps are scheduled in MMS and are carried out in accordance with: PMRs FP1234-8	F1.2 Witness performance test of fire water pumps.	Operational	1 Firewater pump	12 m
				F1.3 Review firewater pump safety critical maintenance for previous 12 months	Operational	100%	12 m

F2	Firewater pumps to be capable of being started by all of the following means: All firepumps: have two independent means manually from the local control panel. Duty firewater pump Automatically via the DCS in accordance with cause and effects. If firewater ringmain pressure falls below xxx barg. Standby firewater pump Automatically on failure to start the duty firewater pump.	NFPA 20 Centrifugal Fire Pumps	Left blank in example				
F3	Each firewater pump to be provided with at least xx hours diesel fuel capacity at full load	Basis of Design for firewater (including ALARP Demonstration) Fire Protection Philosophy.	Left blank in example				
F4	Firepump status to be monitored and indicated/annunciated in CCR	NFPA 20 Centrifugal Fire Pumps Control Philosophy	Left blank in example				
F5	All firewater pumps to be configured to be allowed to run to destruction	Basis of Design for firewater (including ALARP Demonstration)	Left blank in example				

AVAILABILITY							
ID	**Performance Criteria**	**References**	**Assurance**	**Verification**			
				Activity	**Phase**	**Sample Size**	**Frequency**
A1	At least 2 Firewater pumps to be available at all times	n/a	PMRs as F1 to F7 above Operational risk assessments for any reduced availability of firewater pumps	R1.1 Review Operational Risk Assessments to determine whether unavailability of any firewater pump is managed	Operational	100%	12 m
RELIABILITY							
ID	**Performance Criteria**	**References**	**Assurance**	**Verification**			
				Activity	**Phase**	**Sample Size**	**Frequency**
R1	The delivery of fire water is to be assessed to be in excess of XX% reliable.	Firewater system reliability study	Review maintenance records to determine reliability of the firewater pumps PMRs 1,2,3,4,5,6	R1.1 Review of the firewater pumps reliability assessment to determine if undertaken correctly.	Operational	100%	12 m
SURVIVABILITY							
ID	**Performance Criteria**	**References**	**Assurance**	**Verification**			
				Activity	**Phase**	**Sample Size**	**Frequency**
S1	Location of firewater pumps to minimise the potential for damage due to impacts, dropped objects, explosion and environmental conditions.	Passive Fire Protection Layout Drawings. Fire and Explosion Risk Analysis Dropped Objects Study -	Assurance by design and Management of Change.	S1.1 Review design documents to ensure each firewater pump and day tank are protected from dropped objects, explosion overpressures and environmental conditions by location.	Design	100%	Initial suitability and on modification