REPORT TO

PETROLEUMSTILSYNET
PETROLEUM SAFETY AUTHORITY NORWAY

Specialist support – SIM audits

Structural Integrity Barrier Management

Capability Maturity Model

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1 Summary

This document presents a tool for assessing the competence of an organisation in Structural Integrity Management required to ensure the safety of an offshore installation.

The tool is intended to be used either by the regulator or an external auditor, but can equally well be used for self-assessment; it can be used in its entirety or elements of it can be used to assess particular departments or functions.

The requirement for structural integrity is a regulatory requirement in its own right, but is also required to ensure the integrity of certain safety barriers required to prevent accidental events. As such the model described in this document can be used as part of the barrier integrity assessment of a barrier management audit.

2 Introduction

2.1 Barriers

Norwegian regulations and standards require consideration of barriers for the prevention, control and mitigation of accidents on offshore installations [1, 2, 3]. The use of this philosophy requires that possible accidents are considered and a number of barriers be put in place to ensure that the possible accidents are never realised.

Barriers are hardware and procedures that, acting together, prevent, control, or mitigate the consequences of accidental situations. As an example related to gas leaks, each of the design, inspection and maintenance of pipework, vessels, gas detectors, electrical equipment, shutdown valves, depressurisation valves, deluge systems, cause-and-effect logic, blast walls and evacuation are all included as barriers.

Barriers can take many forms, but in general each barrier is there to prevent, control or mitigate an accidental event. Many of the barriers will be structural, such as the strength and stability of the installation; passive fire protection, use of explosion resistant (blast) walls.

2.2 Management of Structural Integrity

The structural, and for floating structures, ballast control systems, are also barriers against weather and accidental loading and consequently design, inspection, maintenance and repair of the structuaral and marine systems are included in the barrier management requirements.

3 Capability Maturity Modelling

A Capability Maturity Model (CMM) concentrates on three key issues, which are:

1. the processes the CMM model identifies as present in a successful organisation;
2. the components which influence the quality of relevant activities;
3. how organisational performance scores are established.

A CMM is structured on a five-tier system called Maturity Levels, ranging from the initial or learner level to best practice. An important aspect of this CMM approach is that it enables organisations to establish their current level of maturity for each of the particular characteristics, and to identify what steps are necessary to enable the organisation to progress to a higher level, building on their strengths and improving on their weaknesses.

A CMM model has previously been developed for PSA for the management of structural integrity in offshore installations within a barrier framework, based on the five maturity levels for a set of processes associated with structural integrity. Previous work identified seven main processes associated with the management of structural integrity.

The five maturity levels are identified in various ways, these are described in this report as Optimal (maturity level 5 – the best), Continuous Improvement, Formal / Implemented, Reactive / Repetitive, and ad-hoc (maturity level 1 – the lowest). Continuous attainment of level 5 is very difficult and is not a realistic ambition, and level 3 is the level implicitly required by Norwegian regulations. In general oil companies operating in the Norwegian sector should be operating at level 3 with intent of operating at level 4.

4 Generic maturity level descriptions

The generic level descriptions have been divided into the categories Management, Organization, Communication, Learning, Competence, and Continuous improvement and are as described below:

Optimal (5)	
Management	Adaptive and pro-active. Changes initiated in order to avoid incidents. Procedures exist, but unexpected circumstances determine the solution to the problem and procedures adapted (following systematic review) where appropriate. Flexible in relation to any unique situation they are in.
Organization	Changes initiated in order to avoid incidents. Leads efforts to enable direct observation, overlapping knowledge, tasks and responsibilities
Communication	Able and proactive in exchanging information, providing feedback, and reconsidering the decisions made by self or others. Working with the possibility of direct observation, overlapping knowledge, tasks and responsibilities.
Learning	Double loop learning. Organizational learning.
Competence	Knowledge spread wide. Initiate R & D Test new technology for better safety. Respects the practical and academic expertise within and outside the organisation.
Continuous improvement	Highly integrated. Enhances processes. Best-in-class in benchmarking.
Continuous improvement (4)	
Management	Continuously revised based on learning
Organization	Periodic review of efficacy of organization
Communication	Good information flow. Involves the entire organization and subcontractors as appropriate

Learning	Good learning processes that clearly enhances the activity. Collective learning
Competence	Monitor R & D on related areas and implement new techniques / technology
Continuous improvement	Measuring Parameters actively used to enhance the activity (experience, data, R & D, etc.)
Formal / Implemented (3)	
Management	Procedures and processes documented and auditable. Necessary management elements are implemented
Organization	Systematic approach to activities and allocation of resources
Communication	Information flow in accordance with procedures. A little inflexible in relation to individual situations.
Learning	Defined learning. Collective learning
Competence	Good skills and resilience in the organization. Good and controlled experience.
Continuous improvement	Data is collected and used, but lack of trending and feedback to the organisation.
Reactive / repetitive (2)	
Management	Partial - implicit or missing implementation. Has experience and execution of work based on this.
Organization	Mechanical actions without deeper understanding.
Communication	Information flow based on need / demand.
Learning	Based on past experience, individuals observation of failure. Primarily individual learning.
Competence	Some overlap of knowledge and experience transfer
Continuous improvement	Little data on the results available
No formal approach (1)	
Management	NA or bad planning / lack of definition or not implemented
Organization	Unable to understand organizational challenges. Little organization of roles and responsibilities
Communication	By exception
Learning	Reacts only to events. Individual learning.
Competence	Individuals help one another. No formalised training or assessment.
Continuous improvement	No method to measure safety or no systematic data collection.

5 Terminology

Within this document the following terms are used with the defined meanings:

Structural Integrity Management (SIM) Philosophy	the management intent for ensuring a structure's integrity is maintained at a satisfactory level including a condition monitoring strategy and any necessary management of loads, repairs and strengthening.
Context	Within this report, and within the current revision of Norsok N-005, the term Context is used to define various parameters that relate to the assessment of the integrity of the installation. The context is wide ranging and includes the following: • Production and well data; • Current standards and regulations; • Weight limitation and configuration; • Subsidence and freeboard; • Level and distance tolerances; • Visiting ship size and configurations; • Passing traffic routes; • Metrological and oceanographic design basis; • Marine growth amount; • Seabed acceptance criteria: Scour, debris, burial, etc. • Dynamic response; • Damping of motion response (structural, hydrodynamic, geotechnical); • Geophysical design basis; • Personnel limitations; • Knowledge and technology; • Acceptance criteria for structural degradation; • Accessibility for inspection; • Fatigue factors used in design and assessment and consequent and the inspection; • Basis for structural analysis (FLS; ULS; ALS; SLS, redundancy); • Drawings and condition (damage); • Design life;
Condition Monitoring Strategy	the intent for understanding the condition of a structure, the condition monitoring strategy includes the derivation of an inspection programme together with the tools, skills to undertake the inspection programme and which also includes any other methods for understanding the condition of the structure, for example, measuring the response of the structure

Inspection Programme	the detailed programme for inspecting individual parts of the structure at various levels of detail; the inspection of a part of a structure gives an indication of its condition at that particular time.

6 Background – Previous work on SIM CMM & proposed modifications

6.1 Background

In previous studies for PSA (undertaken via Cranfield University [4], Poseidon International Ltd [5], and Ocean Structures Ltd [6, but involving the same personnel) a capability maturity model (CMM) has been developed for structural integrity, to be used by PSA for audit of Norwegian oil and gas organisations.

6.2 Reorganisation of model to match barrier management requirements

The following Figure 1 has been prepared to show how specific Structural Integrity Maintenance activities relate to the barrier management requirements for overall installation maintenance. As such the model should be recognizable to Norwegian Offshore operators.

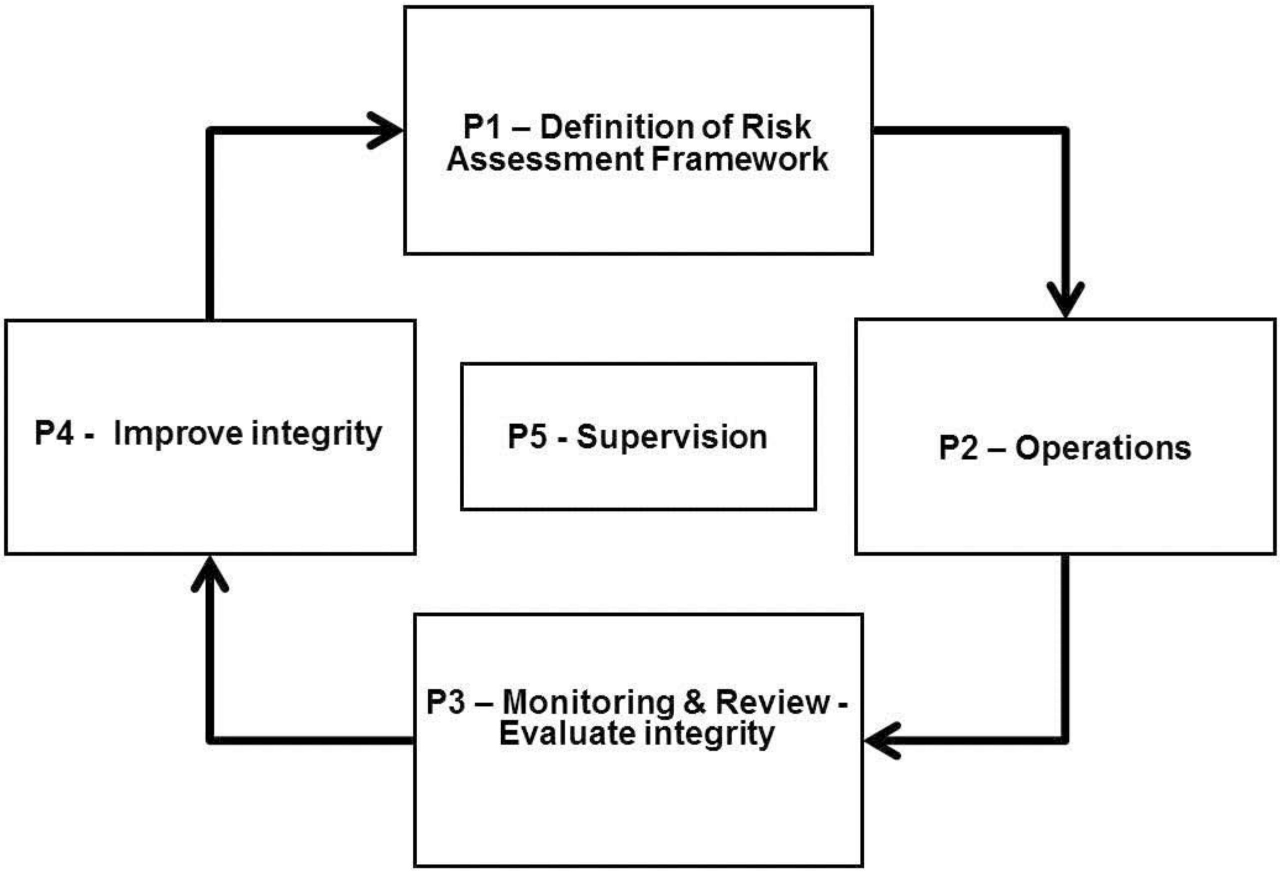


Figure 1 – Top level processes for barrier management

Figure 2 develops the top level processes into sub-processes in order that descriptions can be derived for each sub-process, however with this level of differentiation it is not possible to provide concise maturity descriptions, hence certain sub-processes are subdivided as shown in Figure 3.

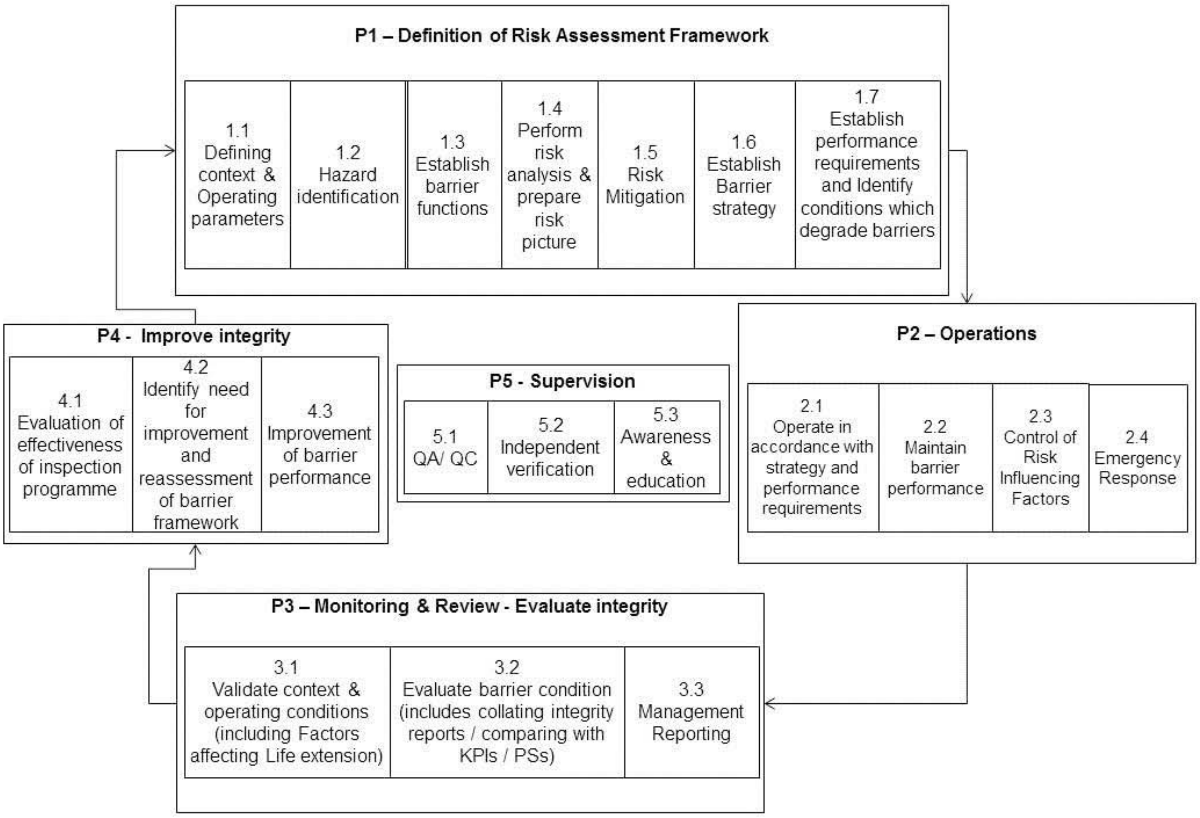


Figure 2 – Main sub-processes for structural integrity barrier management

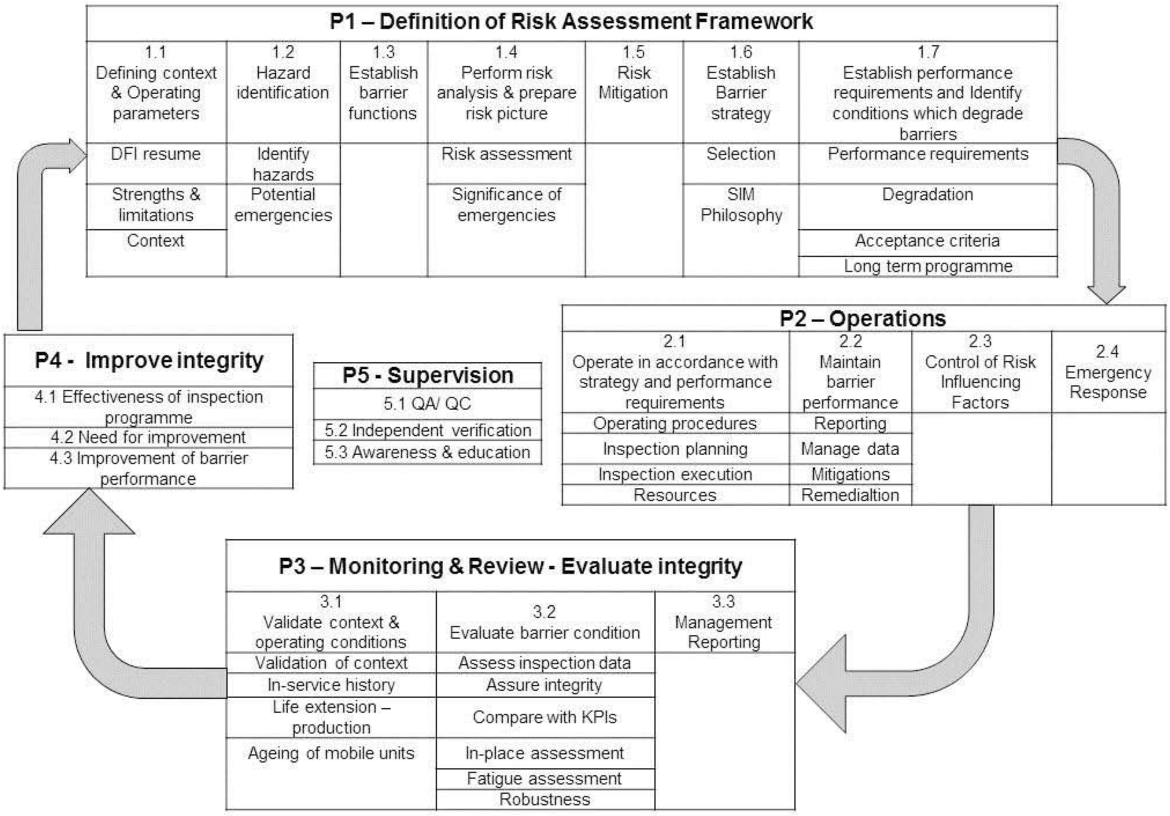


Figure 3 – Complete Capability Maturity Model for Managing Structural Integrity

7 Preparation of Information Pack for use in audits

PSA have requested the preparation of an information pack that can be sent to organisations prior to audit to provide some background on the maturity model and how it can be applied for assessing capability in structural integrity management. The main elements in the pack are:

- Title slide
- Assumptions about Capability Maturity Modelling
- Brief description of the five levels of maturity
- Outline of the development of previous capability maturity models
- Core processes in current Barrier maturity model
- Application of the barrier model
- Core processes in current Structural Integrity Barrier Capability Maturity Model
- Application of the models
- Brief description of core processes and sub-processes
- Brief description of supporting processes
- Improvement steps
- Conclusions

The details of the Pack are given in Annex A.

8 Generic improvement steps

A set of generic improvement steps have been developed, these enable an organization to move to a higher maturity level. These can apply to any activity. These are described in Annex 2.

9 Development of maturity descriptions processes

A number of sub-processes are included to enable more definitive assessment of an organisation's capability in each of the main activities associated with each key process. A total of 42 sub-processes with maturity descriptions are included, as shown below.

P1 – Definition of Risk Assessment Framework	
1.1 Defining context & Operating parameters	To identify the context and operating parameters affecting the installation and its risks
1.1.1 Develop DFI resume	Establishment and development of data and information required for the design, fabrication and Installation (DFI) résumé.

1.1.2 Understand structure's strengths & limitations	Development of an understanding of the particular strengths and limitations of an individual installation, taking account of the structure type, fabrication and in-service history and repairs, particular vulnerabilities that may be relate to structure type, installation function, equipment features external environment etc.
1.1.3 Definition of the context	Compilation of latest data to define the context including: Production and well data Current standards and regulations Weight limitation and configuration Subsidence and freeboard Level and distance tolerances Visiting ship size and configurations Passing traffic routes Metrological and oceanographic design basis Marine growth amount acceptance criteria for Seabed: Scour, debris, burial, etc. Dynamic response Damping of motion response (structural, hydrodynamic, geotechnical) Geophysical design basis Personnel limitations Knowledge and technology Acceptance criteria with regards to structural degradation… Accessibility for inspection Fatigue factors used in design and the inspection required based on the those choices Basis for structural analysis (FLS; ULS; ALS; SLS, redundancy) Drawings and condition (damage) Design life
1.2 Hazard identification	To identify potential hazards that could affect the safety and performance of the installation, particularly its integrity
1.2.1 Identification of internal and external hazards	To determine and categorise hazards relating to the installation relating to both the installations function and operation (internal, e.g. presence of hydrocarbons and high pressure fluids) and to its location (external, e.g. passing marine traffic, metocean factors). Use of risk identification techniques, e.g. HazIds, comparison with other installations.
1.2.2 Awareness of potential emergency situations	Development of an understanding of how the various hazards applicable to different types of installation and of particular and uncommon hazards can lead to the development of emergency situations applicable to the installation being considered.

1.3 Establish barrier functions	To establish barriers and their functions that manage a specific sequence of events leading to or arising from hazards identified from process 1.2.
1.4 Perform risk analysis & prepare risk picture	To undertake a risk analysis based on the hazards identified in process 1.2 and the barrier functions established in process 1.3
1.4.1 Risk assessment methodology	Use of risk assessment techniques based on identified hazards and potential consequences.
1.4.2 Understand significance of potential emergency situations	Analysis of potential emergency situations to determine significance of different scenarios to establish possible consequences and mitigation measures.
1.5 Risk Mitigation	To define requirements for the mitigation of risks identified in 1.4
1.6 Establish Barrier strategy	To set up and implement a strategy to manage barriers, in particular how multiple barriers to an incident are possible and the selection and prioritization of the selected barriers
1.6.1 Barrier selection and prioritization	From the barrier functions identified (see 1.3) select and prioritize appropriate barriers to manage the risks
1.6.2 Develop and update SIM Philosophy	Development of a SIM philosophy document which includes in-service inspection, evaluation, assessment and reporting.
1.7 Establish performance requirements and identify conditions which degrade barriers	To define requirements for performance of barriers defined in Process 1.3 To identify conditions, including ageing which could reduce the performance of barriers
1.7.1 Performance requirements for barriers	Preparation of performance requirements, including defining the Key Performance Indicators (KPIs), for all barriers
1.7.2 Barrier degradation mechanisms	Identify mechanisms for possible degradation of all barriers and use to derive inspection and maintenance requirements.
1.7.3 Definition of high level acceptance criteria	Definition of a set of criteria for managing structural integrity, to be applied to other processes, particularly Process 2.
1.7.4 Define Long term inspection programme	Definition of long-term platform-specific inspection programmes based on the agreed SIM strategy and incorporating platform history and characteristics together with the effects of ageing.
P2 – Operations	
2.1 Operate in accordance with strategy and performance requirements	To set up, implement and operate a programme to manage barriers to mitigate the risks identified in process 1.4.
2.1.1 Operating procedures	To prepare, maintain and execute procedures for the routine operation of the installation that relate to both the function of the installation, the hazards identified and necessary barriers and their potential degradation
2.1.2 Inspection planning	Planning of platform specific topsides and sub-sea inspection programmes, including specific requirements related to ageing.

2.1.3 Inspection execution	Management and execution of the in-service inspection programmes.
2.1.4 Allocation & management of resources	Estimation and approval of resources (money, personnel, logistics, infrastructure, production requirements) to meet the SIM philosophy. Creation of the organisation accordingly and define responsibilities.
2.2 Maintain barrier performance	To execute the maintenance of the barriers including Technical, Organizational & Operational aspects of Barrier Integrity Management
2.2.1 Reporting on maintenance and inspections	Establishment and execution of procedures for recording, evaluating and reporting of maintenance and inspection results
2.2.2 Manage inspection and integrity data	Collection and recording of data from the inspection programmes.
2.2.3 Determine repair and mitigation measures	Determination of required repair and mitigation measures to maintain structural integrity based on feedback from the inspection programme and from the assessment of ageing.
2.2.4 Plan and undertake remedial actions	Planning and execution of the remedial actions identified above.
2.3 Control of Risk Influencing Factors	Assessment, management and mitigation of factors that can reduce the effectiveness of inspection and maintenance operations (e.g. poor or difficult access)
2.4 Emergency Response	To ensure that the installation and its personnel are capable of reaction to emergency situations.
2.4.1 – Emergency Preparedness	Development of the emergency preparedness plan for each installation including the recognition of an emergency situation developing and the organisational and technical response to that situation in order to protect human and environmental resources and assets.
2.4.2 – Emergency Response Training and exercises	To undertake emergency exercises covering the full range of possible emergency situations over a suitable period of time and the learning of lessons from those exercises.
P3 - Monitoring & Review - Evaluate integrity	
3.1 Validate context & operating conditions (including Factors affecting Life extension)	To validate the context & operating conditions of the installation based on data from the maintenance management model, including factors affecting Life extension)
3.1.1 Validation of context	To review and identify any changes to parameters of the context including operating conditions and external factors
3.1.2 In-service history	Maintenance of and recording, in a readily recoverable form, data and information relating to the service life of the facility. Identification of trends include modifications, repairs and other anomalies, potentially reducing performance of barriers and integrity.

3.1.3 Manage life extension approval process – production installations only	Establishment of the platform condition at the end of the original intended life and the determination of the acceptability of extending the planned service life, including review of loadings, assessment of resistance and application of acceptance criteria for production platforms that do not fall under classification society requirements.
3.1.4 Particular issues for ageing of mobile units – Classed installations only	Establishment the condition of a classed installation at the end of the original intended life and the determination of the acceptability of extending the planned service life, including consideration of environmental conditions in various locations in which it has operated, in-service and out-of-service times, periodic survey results, review of loadings, assessment of resistance and application of acceptance criteria
3.2 Evaluate barrier condition (includes collating integrity reports / comparing with KPIs / PSs)	To evaluate the barrier condition, including collation of integrity reports and comparison with pre-defined Key Performance Indicators that relate directly to barrier integrity (e.g. strength, durability, reliability and condition). To provide assurance of the integrity of the installation based on data from the inspection programme including comparison with acceptance criteria and required lifetime
3.2.1 Evaluate, analyse and assess inspection data	Assessment of data from the inspection programmes, identifying any deviations from requirements, assessing trends potentially due to ageing and determining requirements for repair/mitigation.
3.2.2 Assure integrity	Assurance of the integrity of the installation based on data from the inspection programme including comparison with acceptance criteria and required lifetime.
3.2.3 Compare with KPIs	Quantitative measurement of the performance and capability of the installation by comparison with a set of pre-defined key performance measures that relate directly to integrity (strength, durability and condition, etc.) with pre-defined acceptance criteria for those KPIs.
3.2.4 In-place structural assessment	Comparison of the static or quasi static strength and stability of the installation (resistance) with the applied loadings (actions)
3.2.5 Fatigue assessment	Comparison of the fatigue strength of the installation with the total required life and the varying loadings
3.2.6 Assessment of robustness (redundancy, tolerance to damage)	Evaluation of the tolerance of the structure to variations in the physical arrangement of the structure and to variations in the applied loadings
3.3 Management Reporting	To assess the adequacy of the reporting to asset and organisation management the condition of the installation's barriers and the need for future maintenance expenditure and the on-going effects of ageing
P4 - Improve integrity and barriers	
4.1 Evaluation of effectiveness of inspection programme	Evaluation of the effectiveness of the inspection programme for reporting and input to future development of the inspection strategy.

4.2 Identify need for improvement and reassessment of barrier framework	To identify the need for improvement and reassessment of the barrier framework. To report any need for improvements to management for incorporation into Process 1.
4.3 Improvement of barrier performance	To identify the need for improvements to barrier performance by comparing KPIs or Performance Standards against actual performance. To undertake improvements to barriers and barrier performance where appropriate.
P5 - Supervision	
5.1 QA/ QC	To demonstrate QA/QC practices in barrier management, including selection and verification of contractors, validation of techniques and tools and handling of non-conformances.
5.2 Independent verification	To manage the use of independent verification of programmes and assessments associated with barrier management.
5.3 Awareness & education	To create awareness of hazards and risks in managing barriers and to provide teaching to disseminate knowledge of them to a wider community.

It is recommended that self-evaluation and auditing is conducted at the sub-process level with the overall process maturity level being based on all the sub-process maturities, using either of a mean, a median or a minimum value.

Descriptors for five maturity levels for each of the processes and sub-processes have been prepared and are contained in Annex C.

10 Recommendations & conclusions

- The SIBM CMM Model has been created based on Structural Integrity Models, feedback from audits and from experience gained from Audit.
- This structural integrity barrier management model fulfils the structural integrity maintenance aspects of the barrier management model (note – other activities are required for the non-structural barriers).
- The model now includes five core processes. Maturity descriptions have been developed for the 42 consequent processes and sub-processes. These enable maturity levels to be identified for a range of activities associated with structural integrity management. The use of sub-processes is particularly useful when a problem (e.g. low score) is found with the maturity level for a key process. Applying sub-processes can help identify the problem area.
- An introductory information pack has been prepared which will enhance the capability for those considering applying the model to increase their understanding of the maturity approach.
- It is recommended that the updated model is applied to further audits and any limitations taken into account by further modifications to the maturity descriptions.

11 References

[1] ISO 31000:2009, Risk management -- Principles and guidelines

[2] ISO 13702:1999, Petroleum and natural gas industries -- Control and mitigation of fires and explosions on offshore production installations -- Requirements and guidelines

[3] NORSOK Condition Monitoring of Loadbearing Structures, N-005

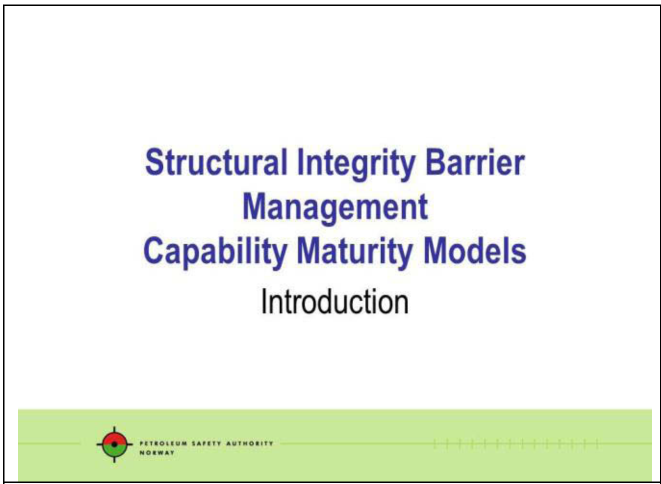
[4] Cranfield University, Development of a Structural Integrity Management Capability Maturity Model, September 2004

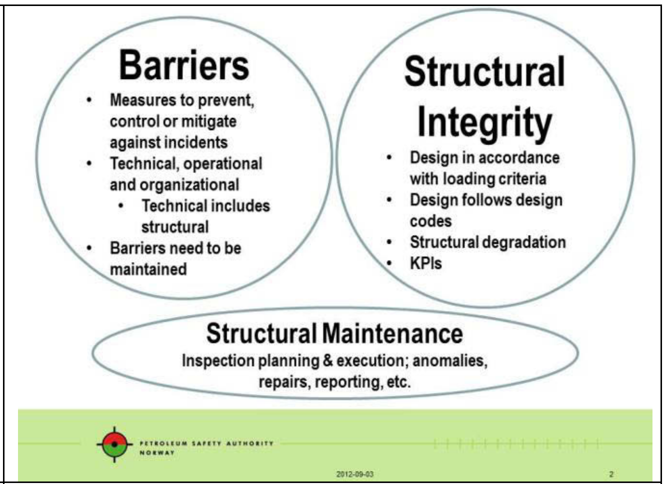
[5] Poseidon Group AS, Revised Structural Integrity Management Capability Maturity Model incorporating sub-processes for life extension, POS-DK07-138-R01

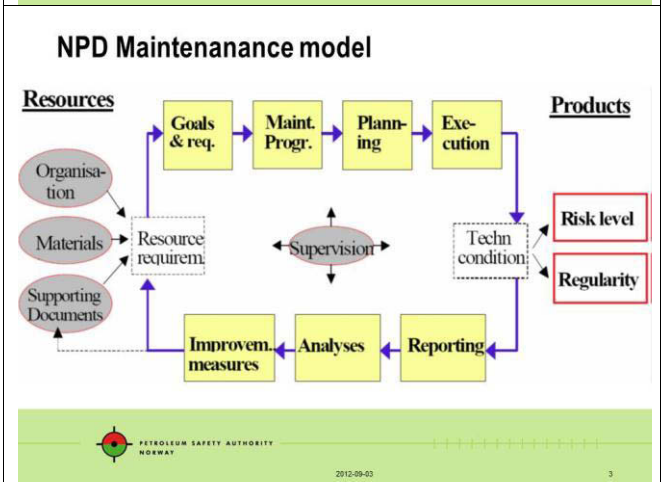
[6] Ocean Structures Limited, Revised Structural Integrity Management Capability Maturity Model reflecting NPD maintenance model, OSL-818-R01, May 2010

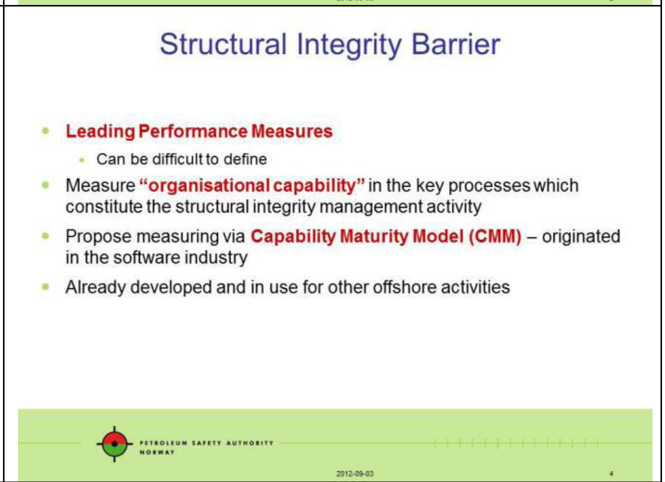
Annex A Information Package

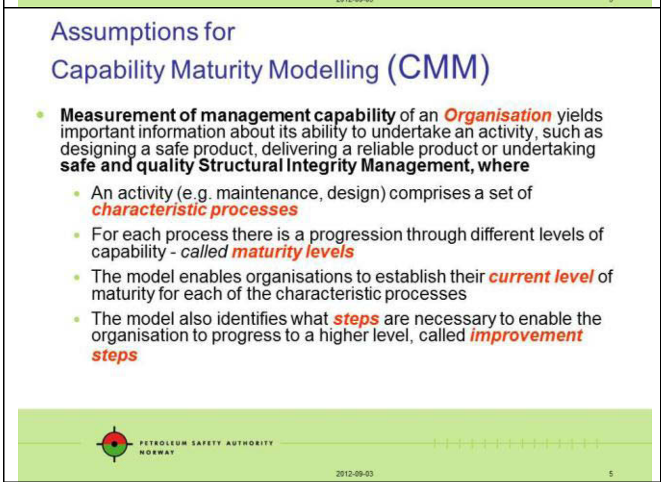
The 26 PowerPoint slides below provide a brief introduction to the capability maturity model and its application to barrier management and structural maintenance management.

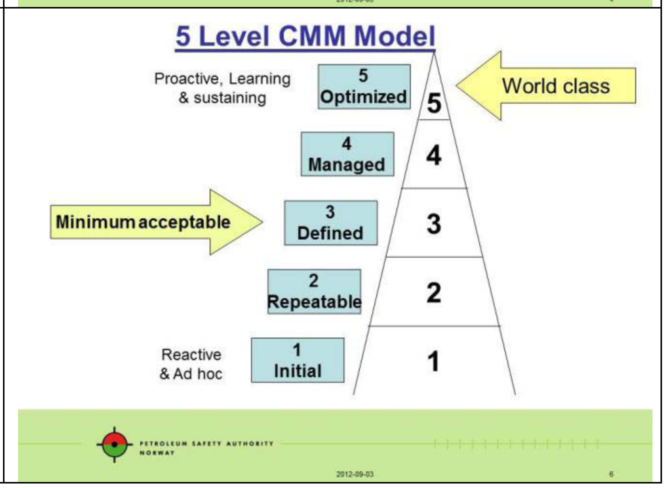












5 Levels of Maturity

Increasing maturity

- **Optimised** - organization is 'best practice', capable of learning and adapting itself. It not only uses experience to correct any problems, but also to change the nature of the way it operates.
- **Managed** - organization can control what it does. It lays down requirements and ensures these are met through feedback.
- **Defined** - organization has documented what it does and how it goes about it.
- **Repeatable** – a organization can either repeat what it has done before, but not necessarily define what it does do; or an individual or group of individuals have developed a process for their own use, but it is not fully documented.
- **Initial** - Lowest level, learner, ad hoc, defined by absence of qualities in higher levels.

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Development of Capability Maturity Models

Original Model

US Software industry (military)

Offshore Models

1. **Offshore Design Safety (DCMM)** (for HSE)
2. **Sub-sea Reliability (RCMM)** (for BP)
3. **Offshore Structural Integrity** (for PSA)
4. **Offshore Asset Maintenance (C4M) (for Energy Institute** (BP, Shell, Petrofac, HSE, Talisman)
5. **Ageing effects on Safety Critical Equipment** (for Energy Institute)

Other

Risk Management in Water Industries (for group of water companies)

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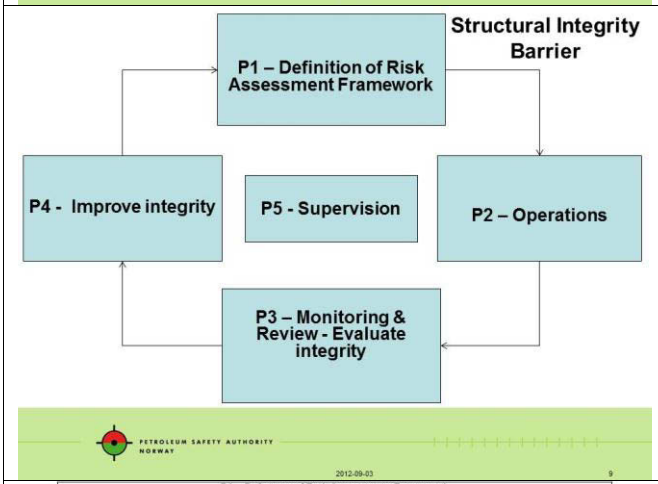

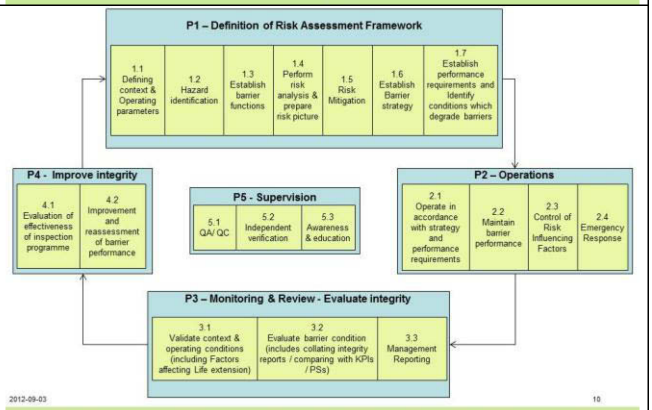

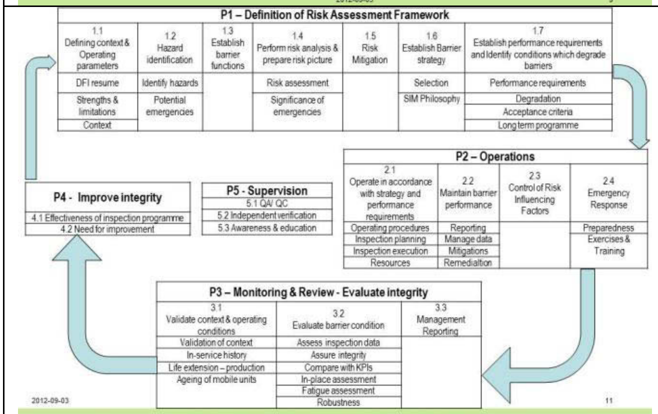

Process	Description
P1	**Definition of Risk Assessment Framework** By identifying the context and operating parameters applicable to a particular installation determine the appropriate barriers and their performance requirements to ensure safe operation
P2	**Operations** To implement and operate the structural barriers defined in P1 such that the effectiveness is ensured, maintained and demonstrated.
P3	**Monitoring & Review - Evaluate integrity** To monitor the parameters that affect the structural barriers to ensure that the barriers are appropriate and that their condition and the integrity of the installation is assured; to ensure that management have the necessary understanding of the integrity of those barriers.
P4	**Improve integrity** To identify when structural barriers need to be improved or when the barrier framework needs to be reassessed
P5	**Supervision** To ensure that QA/QC and independent verification of the structural barrier framework is operating and effective and to promote awareness to the hazards; risks and management of barriers through the organization.

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Process	Description
P1	**Definition of Risk Assessment Framework**
	• To identify and define the context and operating parameters affecting the installation, its strengths and weaknesses
	• To identify potential hazards that could affect the safety and performance of the installation, particularly its integrity
	• To establish barriers and their functions that manage a specific sequence of events leading to or arising from hazards identified from process 1.2.
	• To undertake a risk analysis based on the hazards identified in process 1.2 and the barrier functions established in process 1.3
	• To undertake a assessment of possible risk mitigation measures that reduce the requirements for barriers
	• To establish a strategy for how the barriers are used
	• To define requirements for performance of defined barriers and factors influencing risk • To define initiators for emergency response situations arising from various hazards applicable to different types of installation • To identify conditions, including ageing which could reduce the performance of barriers

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Process	Description
P2	**Operate structural barriers**
	• To set up, implement and operate a programme to manage structural barriers to mitigate the risks identified in process 1.4.
	• To execute the maintenance of the barriers including Technical, Organizational & Operational aspects of Barrier Integrity Management
	• To assess and control factors that affect the likelihood of incidents or inhibit the operation of barriers
	• Development of the emergency preparedness plan for each installation including the recognition of an emergency situation developing and the organisational and technical response to that situation in order to protect human and environmental resources and assets. • To undertake emergency exercises covering the full range of possible emergency situations over a suitable period of time and the learning of lessons from those exercises.

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Process	Description
P3	**Monitoring & Review - Evaluate integrity**
	• To validate the context & operating conditions of the installation based on data from the maintenance management model, including factors affecting Life extension)
	• To evaluate the barrier condition, including collation of integrity reports and comparison with pre-defined Key Performance Indicators that relate directly to barrier integrity (e.g. strength, durability, reliability and condition). • To provide assurance of the integrity of the installation based on data from the inspection programme including comparison with acceptance criteria and required lifetime • To establish the platform condition and the acceptability of extending the planned service life, including review of loadings, assessment of resistance and application of acceptance criteria
	• To assess the adequacy of the reporting to asset and organisation management of the condition of the installation's barriers and the need for future maintenance expenditure and the on-going effects of ageing

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Process	Description
P4	**Improvement**.
	• To identify the need for improvement and reassessment of the barrier framework. • To report any need for improvements to management for incorporation into Process 1
	• To identify the need for improvements to barrier performance by comparing KPIs or Performance Standards against actual performance
P5	**Supervision**.
	• To demonstrate QA/QC practices in barrier management, including selection and verification of contractors, validation of techniques and tools and handling of non-conformances
	• To manage the use of independent verification of programmes and assessments associated with barrier management.
	• To create awareness of hazards and risks in managing barriers and to provide teaching to disseminate knowledge of them to a wider community.

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Application of Structural Integrity Barrier Capability Maturity model

Can be used for audit or self assessment etc

- Identify **Installation**
- Identify **main organizations** involved in Structural Integrity Barrier management (e.g. duty holder, support organisations, maintenance contractors)
- Select **interviewees** (preferably different levels in the organization)
- Carry out **interviews**
- Collate information on **maturity levels** for different processes
- Feedback information as a set of maturity levels
- Consider **improvement steps**

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Improvement Steps

"Steps necessary for an organisation to progress to a higher maturity level"

- Steps described to enable an organisation to move from:
  - level 1 ⇒ level 2,
  - level 2 ⇒ level 3,
  - level 3 ⇒ level 4,
  - level 4 ⇒ level 5

  in each of the core processes

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Possible Structural Key Performance Indicators: Extreme Weather

- **KPI** - probability of wave impact (lack of air gap) on the topsides structure or equipment
- The ability of a structure to resist extreme loads can be measured by member utilization checks, also proposed as a KPI
- Two related KPIs
  - **Redundancy** is a valuable asset in terms of managing damage to the structure from either extreme weather or fatigue. It can be measured in terms of a reserve strength ratio (RSR).
  - **Damaged strength ratio**, which measures the ability of a structure to resist small changes in damage.

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Possible Structural Key Performance Indicators: Fatigue

- **Design Life** is a typical design requirement for fatigue.
- **Proposed KPIs**
  - The number of welded connections in the structure with fatigue lives less than their "design life", taking into account modern Design Fatigue Factors, SCFs and platform specific FEAs.
  - The number of cracks identified during in-service inspections.
  - The number of uninspectable components with fatigue lives less than the design life.
  - The reliability of the inspection method,
  - The amount of outstanding work on both inspection and repair at the time of the assessment.

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Possible Structural Key Performance Indicators: Corrosion

- **Underwater**:
  - The number of CP readings outside an acceptable range (which could be related to an International standard e.g. ISO 19902)
  - Percentage usage of anodes (maximum usage and average usage) related to design life.
- **Splash zone**: deterioration of the splash zone corrosion allowance
- **Topsides**: the condition of the painting / coatings of topsides steelwork (e.g. percentage requiring remedial action).

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Possible Key Performance Indicators:

- **Geological/geotechnical hazards**: limited but scour and subsidence can be measured.
- **Ship impact**: the impact absorbance capacity for both elastic and plastic (low energy and high energy impacts).
- **Some hazards** – difficult to develop meaningful KPIs
  - Piled foundations
  - Fire and Blast
  - Dropped objects
- **Maintenance** is key operational process – difficult to define relevant KPI
- **20 KPIs** for management of structural integrity

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Aspects of KPIs

- KPIs may be dependent on each other.
  - For example the KPIs concerning reserve strength ratio and damaged strength ratio are very relevant to KPIs associated with fatigue and structural capacity.
- Barriers in themselves may be dependent on each other.
  - For example structural strength will be influenced by a reduction in the fatigue capacity barrier or the deck clearance barrier. Hence, also the indicators (KPIs) of these barriers will be dependent.
- **Acceptance criteria** for KPIs important – either in a case for life extension or for an audit.
- Some acceptance criteria developed – e.g. RSR of 1.85 for a traditional framed steel jacket.
- Probability levels for exceedance of air gap also included in current standards

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Reference documents - Regulations

The Activities Regulations	Sections: 42, 43, 44, 45, 46, 47, 64, 67
The Information Duty Regulations	Sections: 5, 6
The Management Regulations	Sections: 2, 3, 6, 11, 12, 13, 14, 15, 18, 21, 22,
The Framework Regulations	Sections: 11, 15,
The Facilities Regulations	Sections: 6, 7
ISO 13702, Fire and explosion, Mitigation and control	
ISO 19900, General requirements for offshore structures	
ISO 19902, Fixed steel offshore structures	
ISO 31000, Risk management — Principles and guidelines	
NORSOK N-005, Condition Monitoring Of Loadbearing Structures	
NORSOK N-006, Assessment of structural integrity for existing offshore load-bearing structures	

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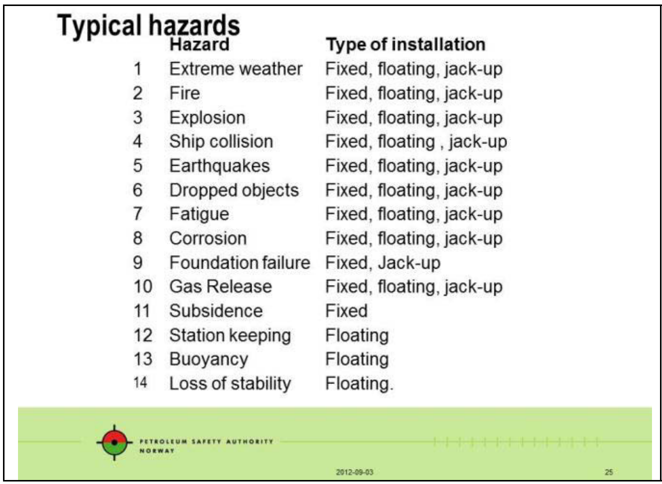
Typical hazards
Hazard Type of installation
1 Extreme weather Fixed, floating, jack-up
2 Fire Fixed, floating, jack-up
3 Explosion Fixed, floating, jack-up
4 Ship collision Fixed, floating , jack-up
5 Earthquakes Fixed, floating, jack-up
6 Dropped objects Fixed, floating, jack-up
7 Fatigue Fixed, floating, jack-up
8 Corrosion Fixed, floating, jack-up
9 Foundation failure Fixed, Jack-up
10 Gas Release Fixed, floating, jack-up
11 Subsidence Fixed
12 Station keeping Floating
13 Buoyancy Floating
14 Loss of stability Floating.
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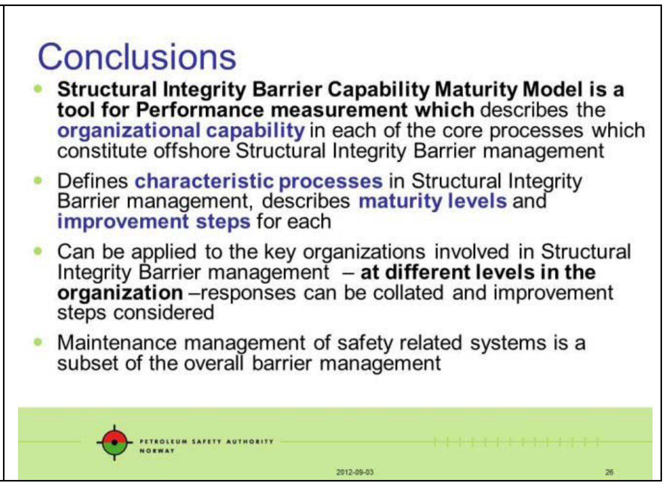
Conclusions
Structural Integrity Barrier Capability Maturity Model is a tool for Performance measurement which describes the organizational capability in each of the core processes which constitute offshore Structural Integrity Barrier management
Defines characteristic processes in Structural Integrity Barrier management, describes maturity levels and improvement steps for each
Can be applied to the key organizations involved in Structural Integrity Barrier management – at different levels in the organization –responses can be collated and improvement steps considered
Maintenance management of safety related systems is a subset of the overall barrier management
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Annex B Generic Improvement Steps

The four improvement steps listed below can be applied to any activity.

- Level 1 to 2

  Develop managerial awareness of need to carry out the activity based on previous practices and be aware that there may be legislative requirements to be met

  Put in place some basic procedures based on the collation of previous experience associated with the activity

- Level 2 to 3

  Develop processes to demonstrate the activity and ensure that these are defined within the project network.

  Develop activity capability by accessing specialist expertise (acquire staff, train existing staff to have the expertise or sub-contract specialist consultant)

  Develop/have in place a mechanism for issuing outcomes from the activity to the team responsible for the activity

- Level 3 to 4

  Incorporate stakeholders' needs into activity functions and deliverables and ensure these influence project management decisions.

  Develop mechanism for continuously assimilate stakeholder interests into upgrading of activity performance

  Put in place expertise and time for corporate management to plan the activity into company activities and projects

  Implement management systems to track and close-out actions arising from the activity

  Confirm that feedback from the activity is used to improve project deliverables, e.g. through use of continuous improvement plans

- Level 4 to 5

  Optimize corporate management team to deliver best company practice in the activity including the input from all stakeholders and interested parties

  Disseminate feedback from external organizations including regulators to corporate units to add to the continuous improvement in the activity

  Allocate resources to achieve implementation of "best practice" in the activity (including the reorganization of departments and personnel or acquisition of or access to a specialist group)

  Processes for the activity are optimized and based on best available with appropriate tools and resources in place.

  Experience on a global basis is used to improve the activity

Annex C Maturity descriptions for-processes

<table>
<tr><th colspan="2">Process P1.1.1 – Manage DFI resume & condition summary</th></tr>
<tr><td colspan="2">Establishment and development of data and information required for the design, fabrication and Installation (DFI) résumé.</td></tr>
<tr><td colspan="2">Key Questions:
• How well does the organisation establish and develop data and the information required for the design, fabrication and Installation (DFI) résumé?</td></tr>
<tr><td>Regulatory requirements:
• The Activities Regulations §45-50
• Guideline regarding §50</td><td>Standards:
• NORSOK N-005, section 4.4.3</td></tr>
<tr><td>Description of Maturity Level</td><td>Examples / Evidence</td></tr>
<tr><td>1 No DFI résumé in place</td><td>No consistent understanding on where design data and fabrication data (e.g. material certificates) can be found</td></tr>
<tr><td>2 DFI résumé historical and not collated into a useful format</td><td>As built information stored in Archived boxes, possibly at a remote location, but not well indexed.</td></tr>
<tr><td>3 DFI résumé is documented and available when required for input to other processes</td><td>Personnel know how to find specific data from the original DFI résumé, for example design briefs are readily available and material certificates can be found and linked to their location in the structure.</td></tr>
<tr><td>4 DFI résumé is updated as new information arises.
Availability of DFI résumé to other processes improved, based on feedback, using good practice information technology</td><td>The information required for checking structural integrity can be readily found, preferably an index gives not only original design data but also recent updates – e.g. analysis briefs and reports from the most recent analyses undertaken on the structure.</td></tr>
<tr><td>5 DFI résumé follows best worldwide practice, making full use of archived data and new information acquired to provide a complete résumé</td><td>An on-line system allows the appropriate personnel to access all original design and fabrication data from their desks together with links to the most recent reports in each category. E.g. of metocean criteria is search both the original and the most recent assessment of the criteria will be found.</td></tr>
</table>

Process P1.1.2 – Understand structure's strengths & limitations	
Development of an understanding of the particular strengths and limitations of an individual installation, taking account of the structure type, fabrication and in-service history and repairs, particular vulnerabilities that may be related to structure type, installation function, equipment features external environment etc.	
Key Questions: • How well does the organisation develop its understanding of the particular strengths and limitations of an individual installation, taking account of the structure type, fabrication and in-service history and repairs, particular vulnerabilities that may be relate to structure type, installation function, equipment features external environment etc.? • Man hours spent on SIM – due to lack of resources – or due to competing activities?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No understanding of structural performance No understanding of ageing processes, causes or effects	Unable to produce reports or summaries of analyses.
2 Limited understanding of strengths and limitation mainly on previous experience but limited in terms of reflecting features of particular structure types. Resource allocations not updated to allow for inspection and mitigation for ageing effects	Reports from analyses of the structure are available, but have not been summarised in a form readily understood by personnel.
3 Structural performance documented, including any particular limitations and vulnerabilities. Causes and possible effects of deterioration are documented, SIM strategy reflects the structural performance and resource allocation includes allowance for additional inspection and mitigation if appropriate. (e.g. deterioration on other installations)	Summary document shows the highest stress and highest fatigue sensitivities of the structure. Ideally the summary document will also discuss any particular weaknesses of the structural form (e.g. floating structures, minimum structures which should have higher safety factors to maintain reliability)
4 Structural performance updated based on experience, any changes in expected loadings, the condition of installation and any life extension requirements. Asset personnel trained to understand the structural performance including any particular limitations, vulnerabilities and the causes, effects and recognition of ageing.	Reports can be produced showing how latest changes in condition and context have been incorporated into the structural assessment and results. The reports should be less than 5 years old unless it can be shown that there is no change in condition or in context.
5 Determination of structural performance, vulnerabilities and weaknesses and ageing causes and effects makes use of world-wide corporate and industry knowledge. Training developed to increase the knowledge of structural understanding and shared globally.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP offshore structures committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P1.1.3 – Definition of the context	
The context is "Premises, parameters and decision criteria to be taken into account in the management of barriers / structures and marine systems" This process relates to the compilation of data to define the context including: • Production and well data; • Current standards and regulations; • Weight limitation and configuration; • Subsidence and freeboard; • Level and distance tolerances; • Visiting ship size and configurations; • Passing traffic routes; • Metrological and oceanographic design basis; • Marine growth amount; • Seabed acceptance criteria: Scour, debris, burial, etc. • Dynamic response; • Damping of motion response (structural, hydrodynamic, geotechnical); • Geophysical design basis; • Personnel limitations; • Knowledge and technology; • Acceptance criteria for structural degradation; • Accessibility for inspection; • Fatigue factors used in design and assessment and consequent and the inspection; • Basis for structural analysis (FLS; ULS; ALS; SLS, redundancy); • Drawings and condition (damage); • Design life;	
Key Questions: • How well does the organisation compile data to define the context?	
Regulatory requirements: • Management regulation §5 on Barriers	**Standards:** • ISO 13702 and PSA "Barrierenotat"
Description of Maturity Level	**Examples / Evidence**
1 Context assumed to be unchanged since original design – i.e. design assumptions assumed to be valid	Organisation cannot provide any evidence of review of criteria since operations commenced.
2 Some context criteria collated, but incomplete. Context not widely accessible.	A document or a series of documents can be produced showing some criteria, but evidence may be limited as to how and when the criteria were last reviewed and updated.
3 Context has been collated – i.e. available on paper or in electronic form and details all aspects of the context and is readily available to all interested personnel including asset management and offshore.	Documentary evidence of systematic review and update of criteria contained in a safety manual, operations manual or accessible from an intranet portal.
4 Formalised procedures exist and followed for the periodic and systematic review and updating of all criteria defining the context. Management made aware of significance of any variations in the context.	Documented procedure can be produced containing scope and frequency of reviews and updates together with dated context complying with the procedure.
5 Organisation has procedures and practices in place to modify and predict changes in context and to manage changes where practicable to account for limitations in the integrity of the barrier functions.	Evidence can be produced showing how changes in context relate to barrier integrity limitations and how the context has been managed if appropriate and practicable.

Process P1.2.1 – Identification of internal and external hazards	
To determine and categorise hazards relating to both function and operation of the installation (internal, e.g. presence of hydrocarbons and high pressure fluids) and to its location (external, e.g. passing marine traffic, metocean factors). Use of risk identification techniques, e.g. HazIds, comparison with other installations.	
Key Questions: • How well does the organisation determine and categorise hazards relating to the installation relating to both the installations function and operation (internal, e.g. presence of hydrocarbons and high pressure fluids) and to its location (external, e.g. passing marine traffic, metocean factors)? • How well does the organisation use risk identification techniques, e.g. Hazards, comparison with other installations?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Generic hazard listings are used which are not specific to the installation and in which their significance to the installation has not been assessed.	Difficulty in defining a comprehensive hazards listing for specific installations.
2 Some limited exercises (HAZIDs and HAZOPs) have been undertaken to initially identify hazards and have differentiated between internal hazards due to the presence of the installation (and to some extent controllable) and external hazards (largely uncontrollable). The exercises have not necessarily used the best discipline expertise but will have involved safety personnel and offshore personnel.	HAZID reports can be produced for the installation.
3 Organisation has a procedure for undertaking systematic hazard identification for each installation which is followed, and specifies how the participants are selected (i.e. in terms of position, expertise and experience) and the frequency of updates. Updates are undertaken on a frequent basis and significant changes notified to management.	Procedure and reports compliant with the procedures can be produced.
4 The procedures for the preparation and review of hazards are periodically reviewed and modified where necessary to ensure that changes in the organisation are reflected. Participants are selected to ensure the most experienced and expert resources within the organisation with consultants to ensure all hazards are properly captured.	Minutes or records of a review of the changes to procedures can be produced – this could include explanations within a revision list for a document. Minutes will include the roles of the participants to show they have suitable experience.
5 Organisation learns from data from other assets and from contractors involved in other assets to ensure learnings from work done elsewhere is incorporated, particularly where similar regulatory regimes operate or where incidents have led to root cause analyses	Organisation will be able to produce analyses of incident reports across the industry and across the world, and show how these have been reviewed with respect to specific installations.

Process P1.2.2 – Awareness of potential emergency situations	
Development of an understanding of how the various hazards applicable to different types of installation and of particular and uncommon hazards can lead to the development of emergency situations applicable to the installation being considered.	
Key Questions: • How well does the organisation develop an understanding of how the various hazards applicable to different types of installation and of particular and uncommon hazards can lead to the development of emergency situations applicable to the installation being considered? • What are the emergency situations considered for the particular installation? • How were these emergency situations derived? • Have hazards related to the degradation of the structure and related to watertightness and stability been explicitly addressed? • Has the derivation of these emergency situations documented?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Generic emergency situations are used which are not specific to the installation and in which their significance to the installation has not been assessed.	Difficulty in describing how the emergency situations used in the emergency preparedness documents has been prepared.
2 Emergency situations have been assessed based on the hazards identified in P1.2.1 with consideration of their likelihood and magnitude and the potential consequence for the installation being considered.	Someone will be able to describe how the emergency situations were derived for the particular installation being considered.
3 Procedures detail the methodology for the assessment of the hazards to determine whether they can develop into emergency situations. For internal hazards each system and subsystem will have been considered using a series of keywords such as overpressure, under-pressure, corrosion, leak, fire.	Some form of evidence – internal notes or minutes of internal meetings – can be produced showing by whom and how the emergency situations were derived, and showing some degree of formality in the process.
4 Discussions have been held and data exchanged, with owners and operators of similar facilities to identify particular scenarios, which may be less obvious, which can apply. Literature on accidents and incidents on similar types of installation have been studied to ensure that all scenarios have been captured.	Staff will be able to describe the discussions they have held with owners and operators of similar installations in which weak points have been discussed. Staff will also be familiar with the causes of incidents on similar types of installation and be able to show how these have been addressed.
5 Organisation actively engages with operators of similar facilities and partakes in open discussions on hazards and potential emergencies for mutual benefit to ensure that all possibilities are captured and included in emergency planning.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety and engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P1.3 – Establish barrier functions	
To establish barriers and their functions that manage a specific sequence of events leading to or arising from hazards identified from process 1.2.	
Key Questions: • How well does the organisation establish barriers and their functions that manage a specific sequence of events leading to or arising from hazards identified from process 1.2?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Establishment of barriers and their functions are absent or undertaken on an ad hoc basis only.	Staff may have difficulty describing what barriers are, particularly for non-physical (e.g. organisational) barriers
2 Establishment of barriers and their functions based on previous practice or not fully documented and barrier functions established by a limited number of personnel in the organisation.	Barriers can be described but the link between the particular installation and the selected barriers will not be understood except by perhaps 1 or 2 people.
3 Systematic procedures are in place, documented and followed for determining appropriate barriers for each hazard, for example by the use of “bow-tie” and / or “Swiss cheese” models. Procedures require consideration of redundancy of barriers (i.e. different types of barriers) to prevent incidents and barriers to mitigate against the consequences of incidents.	Documentation can be produced describing the relationship between the hazards and the selected barriers. These will relate to the specific installation, or at least it will be shown that the barriers are applicable.
4 Feedback obtained from within the organisation and from contractors relating to the adequacy of barriers is used to determine if the barrier and their functions should be modified or improved.	Evidence can be produced showing that reports describing the relationship between the hazards and the selected barriers have been subject to an “Inter-discipline check including offshore and primary contractors.
5 Industry wide experience used to inform the establishment of barriers and their functions in order to achieve best practice.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety and engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P1.4.1 – Risk assessment methodology

Use of risk assessment techniques based on identified hazards and potential consequences

Key Questions:

- How well does the organisation use risk assessment techniques based on identified hazards and potential consequences?

Regulatory requirements:	**Standards:**
• T.B.D.	• T.B.D.

	Description of Maturity Level	**Examples / Evidence**
1	Risk assessment is arbitrary with no clear link between probabilities of occurrence, magnitude of consequences and resulting risks	Difficulty in describing the risk assessment process.
2	Installation's overall risk assessment has been undertaken and reported but no clear demonstration about how the data for the risk assessment has been collated. Risk assessments are undertaken on individual tasks as part of permit to work systems.	A risk assessment can be produced for the overall operation of the installation, but the sources of data for the assessment (probabilities of occurrence) will be unclear. At the platform level the permit to work system will show that risks of particular activities have been considered.
3	Risk assessment is systematic and both procedures and results are documented. Probabilities of occurrence and magnitudes of consequences are rationally derived and risks levels determined logically. Risks are categorised on the basis of their overall risk as well as on probabilities and on consequences. Knowledge of the highest risks is widespread throughout the asset management and steps are being undertaken to reduce all unacceptable risks. Risk assessments on individual tasks are collated as assessed by operations supervisors / superintendents as part of permit to work system.	A clear documentation trail can be produced showing how both probabilities of occurrence, of detection, of mitigation reliability and of consequences. The risk analysis will be detailed in a report with back-up calculations available. Personnel both offshore and onshore will be aware of the work and will have had the opportunity to review and comment upon it.
4	The risk assessment procedures and calculations are periodically reviewed and where appropriate revised on the basis of experience from within the asset and within the organisation. The results of risk assessments and the higher risks are shared throughout the organisation enabling good practice to develop and be used throughout. Results of research and development of risk assessment are reviewed and incorporated into those assessments for each installation.	Documentary evidence can be produced showing that the varies risks, probabilities and consequences have been reviewed within the last say 5 years, with any significant changes highlighted to management and offshore personnel.
5	Organisation aims to be best practice and is involved with identification of areas where research and development can improve the understanding and reduction of risks including both probabilities and consequences. Organisation contributes resources to such R&D and proactively shares knowledge and experience with the industry.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety and engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer. Organisation will be able to show that they take a leading part in R&D such as chairing joint industry initiatives and providing test facilities.

<table>
<tr><td colspan="2">Process P1.4.2 – Understand significance of potential emergency situations</td></tr>
<tr><td colspan="2">Analysis of potential emergency situations to determine significance of different scenarios to establish possible consequences and mitigation measures.</td></tr>
<tr><td colspan="2">Key Questions:
• How well does the organisation analyse potential emergency situations to determine significance of different scenarios to establish possible consequences and mitigation measures?</td></tr>
<tr><td>Regulatory requirements:
• T.B.D.</td><td>Standards:
• T.B.D.</td></tr>
<tr><td>Description of Maturity Level</td><td>Examples / Evidence</td></tr>
<tr><td>1 No clear understanding of emergency situations that could arise in the context of the installation being considered.</td><td>Difficulty in describing why the emergency situations addressed in the emergency response manual have been selected.</td></tr>
<tr><td>2 Although particular individuals understand the selection of emergency situations covered in the emergency procedures, there is an absence of a methodological determination of the development of emergency situations.</td><td>One or two individuals can describe how the emergency situations have been derived but not necessarily show a linkage between installation specific features and potential situations.</td></tr>
<tr><td>3 Procedures are in place and followed for the systematic assessment of hazards, what-if assessments, and HAZOPs to understand how emergency situations can arise, the results are used as a basis for both the development of a barrier strategy and of the emergency procedures
Particular attention has been paid to the type of installation (e.g. floating, reliant on pressure control for integrity) in determining hazards and their contribution to potential emergency situations.
Discipline expertise is applied to the consideration of potential emergency situations.</td><td>The derivation of the emergency situations will be documented with a clear progression from hazards and installation features to the selection of emergency situations described in the Emergency Response manual.
There will be clear differences between the emergency situations considered for different types of installation and their relative likelihood.</td></tr>
<tr><td>4 Change control procedures include steps for assessing any implications for the development of emergency situations.
All installations (worldwide) on which accidents or near-misses have occurred are analysed for similarities and the barriers and emergency procedures amended where appropriate.</td><td>The change control procedures will describe how proposed changes (both hardware and organizational) are assessed for how they might affect the occurrence or escalation of emergency situations.</td></tr>
<tr><td>5 Organisation is actively involved in industry initiatives and committees (e.g. OLF, OGP) involved with promoting safety and discussing accidents and near misses.
Formalized procedures are in place to ensure the dissemination of knowledge gained from outside into the individual assets and installation teams.</td><td>Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety and engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.</td></tr>
</table>

Process P1.5 – Risk Mitigation	
To define requirements for the mitigation of risks identified in 1.4	
Key Questions: • How well does the organisation define requirements for the mitigation of risks identified in 1.2.1?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Risk assessment results accepted with no logical attempt to manage the risks	Some personnel have an idea of the risk picture (relative risks) which is generic – i.e. they are not able to describe why their risk picture is different from that on other installations.
2 Highest risks have been assessed and limited measures undertaken to reduce or limit those risks, however no consistent approach or evidence of reduction of targeting the risk mitigation on the highest risks.	Some personnel are able to describe the overall risk picture for the installation in terms of hazard and locations of the hazards, the risk picture is specific to the installation being considered and will not be generic.
3 A systematic and formalised procedure has been followed to evaluate risk mitigation measures. Priority has been placed on reducing the highest controllable risks and both probabilities and consequences have been addressed. Prevention of escalation has been considered. Cost benefit analysis has been used to choose between reducing differing risks The risk assessments have been used as a tool for educating installation personnel and in preparing the emergency manuals.	Documentary evidence is available of the selection of risk mitigations measures that have been undertaken (i.e. safety related projects). The evidence will be able to show that the expenditure of funds on safety related projects is directly related to the benefits in terms of risk reductions; however "no-brainer" and low cost improvements can have been implemented with the same level of rigour.
4 Periodic reviews are undertaken of available risk mitigation measures including reviewing new techniques and products available for risk management (e.g. gas detection and blast protection). Additional risk mitigation is undertaken where benefits are identified. Information is shared throughout the industry on risk mitigation measures and approaches and fed back to assets and installations systematically.	When risk level reviews are periodically undertaken and documented they will be accompanied by reviews of the benefits of introducing additional risk reduction measures.
5 External expertise is sought and employed to minimise risk levels in cost effective ways. Organisation uses its knowledge of risk levels and mitigation measures to lead and resource research and test new technology into reducing risks.	Organisation will be able to demonstrate how they select and use external expert assistance in the review of risks and risk reducing measures.

Process P1.6.1 – Barrier selection and prioritization	
From the barrier functions identified (see P1.3) the risk analysis (P1.4) and the implementation of risk mitigation measures (P1.5) select and prioritize appropriate barriers to manage the risks	
Key Questions: • How well does the organisation select and prioritise appropriate barriers to manage the risks, noting the barrier functions identified (see 1.3) and the risk analysis (1.4) and the implementation of risk mitigation measures?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Barriers provided implicitly and explicitly during the design of the installation, no systematic attention given to barriers beyond routine maintenance.	No clear understanding of how barriers have been selected – lack of understanding of the question.
2 There is a linkage between the required barrier function and the provision of a barrier to provide that function (e.g. The prevention of rupture of a gas pipe (the function) and the provision of pipe supports to prevent rupture (the barrier). The linkage is not formally derived and may not always be clear.	Personnel will be able to describe the barriers in place and how they mitigate against the hazards, but the process will not necessarily be documented.
3 Procedures are in place and followed for the systematic interpretation of the risk analysis. Specific barriers have been selected or identified to prevent or mitigate against particular hazardous situations. Barriers have been selected to include a mix of passive barriers and active barriers as appropriate. The function of the barriers has been documented and communicated to the platform management and offshore personnel, who understand the concepts of barriers and what constitutes a barrier – all barriers are identified.	Documentary evidence will be available showing the linkage between the barrier functions required and how they are achieved. It is likely that this document will also describe the performance requirements for the barriers.
4 Periodic review of the selection of barriers is undertaken in accordance with a formalised procedure. Results of research and development and product testing are monitored to determine whether alternative barriers could be effective. Organisation has good internal communications which lead to a common approach to barrier selection.	Recent documents (within 5 years and accompanying any major changes) will show how any changes to the risk analysis is followed through to ensure that no additional barriers are required.
5 Organisation makes best use of internal resources and external contractors for the selection of barriers to manage risks Organisation participates in research and development of potential new barriers, e.g. improved techniques and more reliable active systems.	Organisation will be able to demonstrate how the select and use external expert assistance in the determination of barriers and their performance requirements. Organisation will be able to show that they take a leading part in R&D such as chairing joint industry initiatives and providing test facilities.

Process P1.6.2 – Develop and update SIM Strategy	
Development of a SIM document which includes in-service inspection, evaluation, assessment and reporting.	
Key Questions: • How well does the organisation develop its SIM document which includes in-service inspection, evaluation, assessment and reporting?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No SIM or condition monitoring strategy in place	No evidence of a strategy to ensure structural integrity
2 No management level consideration of installation specific SIM requirements, strategy based on available preceding practice only.	Although a structural integrity inspection programme exists it is unclear as to if, when or how it has been reviewed or modified during the installations life.
3 SIM Strategy is documented and has been based on installation condition.	A report can be produced which links structural integrity assessments (e.g. analyses of the current condition) with the inspection requirements – how often and to what degree different components should be inspected.
4 SIM Strategy updated regularly to reflect any changes in expected loadings, the condition of installation and any life extension requirements. The specific SIM Strategy is routinely reviewed and modified based on feedback from SIM teams and corporate organization and experience from other operators, contractors and the regulator. Training introduced to support development of strategy.	Evidence can be produced showing how the SIM strategy has been changed as the result of more recent assessments of the context and any indications of the condition of the structure. The reports should have been reviewed within the last 5 years and areas in which “problems” have been found should be subjected to higher inspection requirements. The evidence could be in the form of different issues of a SIM strategy report such that changes can be seen.
5 SIM and condition monitoring strategy developed taking global practice into account and disseminated throughout the organisation Improved training developed for key staff and the supply chain to support strategy development Management is proactive in identifying improvements to strategy, based on own experience, risk reduction requirements and experience of other parts of the industry Organization is active in developing and improving tools for SIM (both engineering and inspection) with sufficient resources available	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer. Organisation will be able to demonstrate how the select and use external expert assistance in the determination of barriers and their performance requirements. Organisation will be able to show that they take a leading part in R&D such as chairing joint industry initiatives and providing test facilities.

Process P1.7.1 – Performance requirements for barriers	
Preparation of performance requirements, including defining the Key Performance Indicators (KPIs), for all barriers	
Key Questions: • How well does the organisation prepare its performance requirements, including definition of the Key Performance Indicators (KPIs), for all barriers?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Definition of barrier performance absent or undertaken on an ad hoc basis only.	Lack of performance requirements and acceptance criteria for barriers
2 Definition of barrier performance based on previous practice or not fully documented and barrier performance and emergency situations defined by a limited number of personnel in the organisation.	Performance requirements and / or acceptance criteria are defined; it is acceptable for these to be included within the maintenance management system. No evidence that requirements have been reviewed or modified during operational life of installation.
3 Formal written procedures are in place for defining performance of all barriers, the performance requirements reflect the hazard and are realistic for the type of barrier, its location and maintainability. The procedures are operated and documented throughout the company. KPIs are formally defined, requirements prepared and documented for each barrier.	The organisation will be able to state what the KPIs for the installation are and these will include KPIs for the structure. Procedures for determining performance requirements can be produced together with evidence that the requirements have been based on the possible hazards, and that they are realistically achievable. This can be achieved by the performance requirements have been reviewed and agreed by both engineering and offshore operations / maintenance personnel.
4 Condition of barriers is periodically reviewed together with information on the performance of similar barriers in emergency conditions elsewhere. Barrier performance requirements are revised if shown to be necessary based on experience from these reviews. Any available research and development data is reviewed and incorporated into the performance requirements.	Reports and / or minutes of meetings can be produced showing that the performance requirements have been reviewed within the last 5 years and that any difficulties in maintain the performance has been address by modifying the performance requirements, modifying other barriers as appropriate.
5 Industry wide experience used to inform the definition of barrier performance to achieve best practice.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety and engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

<table>
<tr><td colspan="2">Process P1.7.2 – Barrier degradation mechanisms</td></tr>
<tr><td colspan="2">Identify mechanisms for possible degradation of all barriers and use to derive inspection and maintenance requirements.</td></tr>
<tr><td colspan="2">Key Questions:
• How well does the organisation identify mechanisms for possible degradation of all barriers?</td></tr>
<tr><td>Regulatory requirements:
• T.B.D.</td><td>Standards:
• T.B.D.</td></tr>
<tr><td>Description of Maturity Level</td><td>Examples / Evidence</td></tr>
<tr><td>1 Identification of conditions which degrade barriers absent or undertaken on an ad hoc basis only.</td><td>No evidence that degradation of barrier performance has been considered.</td></tr>
<tr><td>2 Identification of conditions which degrade barriers based on previous practice or not fully documented and the conditions leading to barrier degradation identified by a limited number of personnel in the organisation.</td><td>Personnel can discuss degradation methods for different types of barrier (including organisational – non adherence to procedures); and how these are address in the maintenance regimes.</td></tr>
<tr><td>3 Formal written procedures in place and followed to systematically identify conditions which could degrade barriers (e.g. corrosion of structural elements, blockage of active fire water systems, poisoning of gas detectors).
Identified degradation mechanisms are used to define barrier inspection and maintenance requirements.</td><td>Reports from systematic assessments of barrier degradation mechanisms can be produced – such as output from Hazid style workshops.</td></tr>
<tr><td>4 Feedback from routine inspection and maintenance of barriers is used to update the understanding of the degradation mechanisms and to modify the inspection and maintenance programme.
Research and development monitored to incorporate new understanding of barrier degradation.</td><td>Minutes of internal meetings, or internal notes, from within the previous 5 years will be available showing that maintenance results have been reviewed and recommending changes where necessary – changes could be by modifying performance requirements, changing frequency of maintenance operations or changing the barriers themselves.</td></tr>
<tr><td>5 Organisation actively involved in the initiation and resourcing of R&D into barrier reliability and degradation in order to achieve best practice.
Expertise used from throughout the organisation and from external experts in the field.</td><td>Organisation will be able to demonstrate how the select and use external expert assistance in the determination of barriers and their performance requirements.
Organisation will be able to show that they take a leading part in R&D such as chairing joint industry initiatives and providing test facilities.</td></tr>
</table>

Process P1.7.3 – Definition of high level acceptance criteria	
Definition of a set of criteria for managing structural integrity, to be applied to other processes, particularly Process 6.	
Key Questions: • How well does the organisation define a set of criteria for managing structural integrity, to be applied to other processes, particularly Process P1.6	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No acceptance criteria in place	No evidence available to show that acceptance criteria have been considered – or even that the concept is understood.
2 Acceptance criteria based on fabrication inspection criteria, or on previous asset specific acceptance criteria	Acceptance criteria for structure is based in applying acceptance criteria for newly built steel – i.e. acceptable defect sizes for reporting in the fabrication yard are being applied to subsea weld inspection.
3 Acceptance criteria are documented, they may be specific to the location within the structure, but can be out of date. High level acceptance criteria defined in terms of performance requirements (i.e. acceptance levels for Key Performance Indicators (KPIs)).	Acceptance criteria have been developed which relate to the criticality of different components, i.e. fatigue sensitive components have more onerous defect limits than say non critical redundant structure.
4 Acceptance criteria are regularly updated based on any changes in expected loadings, the condition of installation and any life extension requirements. Training introduced to support development of acceptance criteria	Recent reports (within 5 years) demonstrate that that any changes to the context and from the operational experience of the structure have been used to update the acceptance criteria.
5 Acceptance criteria optimised by exchange of experience and utilisation of best available global practices. Improved training developed for key staff on derivation and understanding of acceptance criteria	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P1.7.4 – Define Long term inspection programme	
Definition of long-term platform-specific inspection programmes based on the agreed SIM strategy and incorporating platform history and characteristics together with the effects of ageing. This sub-process derives from 2.1 below	
Key Questions: • How well does the organisation define its long-term platform-specific inspection programmes based on the agreed SIM strategy and incorporating platform history and characteristics together with the effects of ageing?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No long term programme in place – each year's programme ad hoc	No defined long term inspection programme.
2 Long term programme based on annual repeat of the same programme.	Documented annual inspection programme that is the same from year-to-year
3 Long-term programme, based on the SIM Strategy, is documented. It can include different inspection requirements in different years to enable the planned overall inspection workscope to be undertaken in a timely manner while balancing resources.	The long term inspection programme is in a formal report and shows the inspection to be carried out over a particular time scale (e.g. 5 years). The long term programme can be in the same document as the SIM Strategy report. It need not specify timings for particular inspections unless then are on a high frequency (e.g. must be inspected annual or after any significant loading event).
4 Long-term programme reviewed regularly and modified when necessary to take account of structural condition, performance requirements, ageing and life extension.	The long term inspection programme will have been reviewed within the previous 5 years and will have been modified to account for any changes in context and in performance. The current and the previous long term programmes could be compared to check for changes, which can then be queried.
5 Global experience and feedback from similar installations is regularly obtained and used in review and modification of long term programme.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P2.1.1 – Operating procedures	
To prepare, maintain and execute procedures for the routine operation of the installation that relate to both the function of the installation, the hazards identified and necessary barriers and their potential degradation	
Key Questions: • Can the procedures be provided or displayed and described?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Lack of systematic operating procedures and maintenance to ensure effectiveness of barriers.	No evidence of procedures that address maintenance of barriers.
2 There is a methodology for Inspection and maintenance of barriers at a basic level, usually with the requirements detailed in a computerised scheduling system.	Operator can demonstrate the existence and use of a maintenance scheduling system that includes barriers maintenance.
3 Procedures documented and followed for the planning and scheduling of maintenance and inspection of barriers. Derivation of maintenance and inspection regime (frequency and extent of activities) rationally derived and documented.	Operator can produce a document that explains the selected maintenance for each barrier (or perhaps for group of barriers if they have similar functional requirements).
4 Inspection and maintenance activities and frequencies are periodically reviewed to reflect experience of degradation of barriers. Procedures documented and followed for routine inspection and assessment of appropriate hazards to ensure continuing applicability of the barriers. R&D into inspection and maintenance techniques reviewed to determine benefits of changes to schedules and scopes.	Operator can produce reports (less than 5 years old) describing their experience with particular barriers and how their maintenance and inspection regime has been modified on the basis of that experience.
5 Organization shares knowledge throughout the company and with other operators on scheduling, maintenance and inspection of barriers. Takes the lead in promoting and resourcing R&D and product development for barrier inspection and maintenance.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer. Operator will be able to discuss current R&D work on particular barriers and their involvement with it.

Process P2.1.2 – Inspection planning	
Planning of platform specific topsides and sub-sea inspection programmes, including specific requirements related to ageing	
Key Questions: • How well does the organisation plan its platform specific topsides and sub-sea inspection programmes, including specific requirements related to ageing?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No operator involvement in planning inspections	No Operator's staff (employees) are able to discuss details or requirements of the inspection programme.
2 Planning delegated to offshore contactor without operator technical input (from Process 1.7) based on previous practice Inspection planning follows previous practice without input from or into long-term programme	Operator's staff are aware of the general inspection philosophy but the programme has been delegated to the offshore inspection contractor with little input from analyses of the installation or consideration of the context.
3 Procedures in place for translation of long term programme into annual workscopes taking account of operational requirements and resource constraints Procedures and verification in place for approval and appointment of inspectors with respect to competence, expertise and qualifications	Documentary evidence shows how the long term inspection programme has been divided into annual workscopes – the evidence and can be of the form of a description or workscope for the planning activity or a collation of the SIM schedule showing that the complete long term programme has been addressed. Operator will have specific competence requirements for inspectors documented (perhaps in an ITT or contract) and will be able to produce copies of the inspectors certificates.
4 Procedures for translation of long term programme into annual workscopes updated to take account of changes to the long-term programme and experience from previous inspection campaigns	As above, but the evidence should post-date the latest revision of the long term programme, and show that anomalies in inspection results have resulted in modifications to the inspection requirements (i.e. the finding of an anomaly has resulted in an increased inspection requirement for similar details.
5 Annual workscopes based on optimised long-term programme taking account of global experience. Organisation of annual workscope reviewed and modified to optimize the quality of structural inspections, costs and operational implications. Worldwide experience used to assist selection of tools and techniques to achieve SIM requirements	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer. Operator will be able to discuss how they select inspection techniques based on world wide experience and verification of manufacturers' and contractors' claims.

Process P2.1.3 – Inspection execution	
Management and execution of the in-service inspection programmes.	
Key Questions: • How well does the organisation manage and execute its in-service inspection programmes?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Unplanned and ad hoc	No evidence of proactive management of the inspection programme.
2 Execution based on previous practice or reliant on individuals.	Management and execution of the inspection is treated as a "same again" process with no review of how to better achieve the inspection for improved quality or economy.
3 Procedures for execution of inspection workscopes define extent and tools for each inspection and resources needed Operator involved in QC to ensure completion of workscope and facilitate communications between inspectors and operator's engineers	Workpacks are prepared and distributed for each inspection workscope showing the inspection requirements (type of inspection, tools to be used, inspector qualifications and reporting requirements) together with any other requirements such as specific access (e.g. scaffolding and coatings for topsides inspection, any operational constraints for subsea inspections).
4 Experiences from executing inspections captured and fed back into developing and improving subsequent annual plans and workscopes Contractor performance monitored and used in bid assessment and to improve future contract execution Operator and contractor work together to identify difficulties encountered and improve methods and tools for future planning and execution "Real-time" modification of workscope based on inspection findings including communications with operator's engineers	Operator will be able to show how their inspection planning and execution has evolved with experience, for example by comparing workscope changes over a period of years. Operator will be able to show that inspection Workpacks have been added when anomalies have been identified.
5 Global experience used to optimise inspection practice. Organization actively supports development of tools for workscope (i.e. by identifying key relevant issues) definition and execution of inspections via active R&D programme Opportunities and resources made available for offshore testing and demonstration of new tools and techniques Organization adapts its structure to implement the above points where necessary	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer. Operator will be able to discuss the R&D they support for inspection technologies, including provision for on-site testing where appropriate.

Process P2.1.4 – Allocation & management of resources

Estimation and approval of resources (money, personnel, logistics, infrastructure, production requirements) to meet the SIM strategy.

Creation of the organisation accordingly and define responsibilities.

Key Questions:

- How well does the organisation estimate and approve its resources (money, personnel, logistics, infrastructure, production requirements) to meet the SIM strategy?
- How well does the organisation create the appropriate structure and define its responsibilities?

Regulatory requirements:	**Standards:**
• T.B.D.	• T.B.D.

Description of Maturity Level	**Examples / Evidence**
1 Ad hoc allocation	Difficult to follow the linkage between SIM requirements and budget allocation.
2 Previous practice followed	Budget generally stays the same from year to year with escalation increases.
3 Resourcing and organisation based on strategy and documented. All planned activities have identified resource requirements (both personnel and other requirements) which cover both preparation (e.g. scaffolding) and execution of the activity. The planning includes balancing of personnel requirements to minimise change out of personnel and logistical consideration (e.g. bed space limitations). The resource allocation is adequate and allows for contingencies. There is a mechanism for revising resource allocations and modifying the planning in the event of findings and remedial work requirements during inspection and maintenance	The long term inspection plan and each year's inspection programme are the basis of input to the budget (availability of resources such as transportation and accommodation as well as funding). Any adjustments to the budget based on availability of resources or conflicts with other planned activities are compensated by adjustments in following year(s). The management can identify the available contingency in their budgets in terms of funding, accommodation and transport capacity.
4 Acquisition and allocation of resources reflects the known condition of the structure and the current SIM strategy (i.e. including recognition of any changing conditions, ageing and life extension).	Plans for repairs and enhancements to reflect deterioration and life extension are highlighted in the budget over several years to enable the installation to remain in acceptable condition throughout.
5 Optimised approaches to allocating resources making use of world-wide corporate and industry knowledge.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P2.2.1 – Reporting on maintenance and inspections	
Establishment and execution of procedures for recording, evaluating and reporting of maintenance and inspection results	
Key Questions: • How well does the organisation establish and execute procedures for recording, evaluating and reporting of maintenance and inspection results?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No procedures in place; inspections catalogued, reported and stored on ad-hoc basis.	No evidence of systematic reporting on maintenance and inspection results to asset management.
2 Reporting and any cataloguing based on previous practice which may not meet current requirements or management expectations.	Although the execution of maintenance and of inspection is reported, there is no evidence of defined criteria of how inspection results are presented or how failure or late completion of maintenance or inspection is reported.
3 Formal procedures in place and followed for receiving, cataloguing and reporting inspection results. Computerised cataloguing of inspections and of anomalies is expected at this level.	Criteria for reporting can be shown, these can be built into a scheduling and reporting software package but in this case the software must have the reporting requirements built in.
4 Formal procedures updated and improved based on on-going experience, feedback and developments in this area; appropriate resource allocations provided for this activity. Computerised systems are expected which include automated reporting which highlight anomalies and the status of the evaluation of those anomalies. Training on the use of the reporting procedures and tools is provided to relevant staff.	The reporting procedures will, if based on computerised systems, have a means of highlighting late work, identification of anomalies and failure to complete work highlighted to management – a computerised “dashboard” as part of an intranet home page can fulfil this function but should enable highlighting of priority items and enable “drill-down” into the details of the anomalies.
5 Worldwide state-of-the-art techniques and tools developed and used. Regular training in these techniques and tools prepared and provided, Tools improved to reflect user experience. Organization changes made within SIM to facilitate improved reporting if necessary.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety and engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P2.2.2 – Manage inspection and integrity data	
Collection and recording of data from the inspection programmes	
Key Questions: • How well does the organisation collect and record data from the inspection programmes?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Ad hoc treatment of data received from contractor No formalised retention of data for subsequent analysis	Inspection reports can be produced, but particular reports, particularly historical ones, can be difficult to find.
2 Reports received from contractor retained but not collated or analysed	Reports are held in a common location and the operator can locate particular inspection reports, i.e. for a particular component and year of inspection, but it is likely to require finding the index copy for a particular year and then searching for the report requested.
3 Inspection data catalogued and recoverable. Inspection and repair results throughout the life of the installation are readily available to inspection personnel and integrity assessment engineers such that the prior history can be reviewed (e.g. when indications are found).	On request the operator can readily report the dates and details of inspection of any component throughout the installation's life. He can also find the actual inspection report, although this can have been transcribed or scanned into a computer based system.
4 Management of inspection data improved and updated to improve data recovery, and tracking of trends. Analysis of trends fed back to allow the long term inspection programme to be modified. Training in managing of inspection data provided to relevant personnel	Computerised software is not only able to present relevant inspection results but can also display trending data, for example the length of weld defect indications over time.
5 Worldwide experience used to optimise management of inspection data to provide first class system Training updated and optimised to enable relevant personnel to be fully competent in managing inspection data	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P2.2.3 – Determine repair and mitigation measures	
Determination of required repair and mitigation measures to maintain barrier and structural integrity based on input from the inspection programme and from the assessment of ageing.	
Key Questions: • How well does the organisation determine the required repair and mitigation measures to maintain structural integrity based on feedback from the inspection programme and from the assessment of ageing?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Repair and mitigation measures are a reaction to the identification of defects – e.g. no previous consideration of the possibility of defects or of how they would be assessed Reliance could be entirely upon sub-contractor without management direction	No evidence of an engineering assessment of defects – e.g. gas detectors replaced like-for-like if out of spec, surface breaking indications ground out. Not necessarily any reporting to an engineer of the actions carried out.
2 Criteria for design of repairs adopted from previous work without identifying context & requirements	Where similar defects have been previously discovered a similar mitigation approach is followed – this can lead to systematic problems and trending information not being captured or reported.
3 Formal procedures in place for designing repairs and possible mitigation measures, as required, to maintain structural integrity.	When anomalies and defects are identified they are routinely reported for an engineering assessment. The operator will be able to provide a correspondence trail (possibly on a maintenance management computer system) which shows the reporting of the anomaly or defect and the engineering response. There will be an engineering procedure (or possibly several) addressing repairs and assessment.
4 Experiences from preceding repairs and mitigation measures captured and fed back into developing and improving future repair design criteria and mitigation measures Contractor experience assessed and utilised in updating repair design criteria.	The operator will be able to produce a report (possibly informal) showing that where similar defects have been identified, or where frequent repairs have been necessary, a “long-term” fix has been engineered.
5 World-wide experience used in determining best practice repair criteria and possible mitigation measures. Operator and contractor collaborate to share experiences to achieve best practice and to improve future processes and the organization Training provided to both duty holder personnel and contractors in developing and improving future repair design criteria and mitigation measures	Internal notes will show how the information from industry groupings (e.g. OLF and OGP engineering and structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P2.2.4 – Plan and undertake remedial actions	
Planning and execution of the remedial actions identified above.	
Key Questions: • How well does the organisation plan and execute the remedial actions identified above?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Undertaking of remedial actions ad-hoc as they arise, without any planning	No evidence of systematic consideration of remedial action requirements – an example would be erecting scaffold for access to location where repairs are required without considering whether that scaffold can be used for other activities at the same time.
2 Repair and remedial measures follow previous practice with no overview of the efficacy of the repairs or remedial measures	Workpacks for the execution of repairs will have been adapted from similar ones for previous repairs, with only specific changes (e.g. location of the repair) modified.
3 Defined methods in place for establishing adequate installation specific repairs or mitigation measures Resources and tools made available for implementation of adequate repairs or mitigation measures based only on defined approaches	There will be a procedure, which may be quite generic, describing the steps required to plan repairs, remedial works and mitigations, the procedure will cover allocation of resources as well as requirements to define tools and methodology.
4 Planning and undertaking repair and mitigation measures is regularly updated according to feedback from previous years. Operator and contractor collaborate to achieve good practice by identifying difficulties encountered and provide resources and tools to improve future planning and execution Training in repair and mitigation measures supplied to key personnel	Procedures and possibly workpacks for inspection and maintenance will include steps for repairs and remedial for the most likely defects; tools and equipment will be available for such eventuality.
5 Worldwide experience used to assist selection of tools and techniques to achieve effective and long lasting repairs Organization active in researching and developing repair techniques and materials Opportunities and resources made available for offshore testing and demonstration of new tools and techniques Assessment of specialist sub-contractors undertaken to ensure familiarity with long-term best practices Operator and contractor work as single team, both use feedback to improve future processes and their organization	Internal notes will show how the information from industry groupings (e.g. OLF and OGP engineering and structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P2.3 – Control of Risk Influencing Factors	
Risk influencing factors are matters of importance for the barrier functions and barrier elements ability to function as intended and can include competence of personnel, organizational issues including adequate and clear communications and ergonomic factors that affect the ability to undertake work (e.g. poor or difficult access)	
Key Questions: • How well does the organisation assess, manage and mitigate the factors that can reduce the effectiveness of inspection and maintenance operations (e.g. poor or difficult access)?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No significant acknowledgement or control of risk influencing factors.	Lack of understanding of what risk influencing factors.
2 Evidence of measures taken to improve risk influencing factors, for example, access for inspection and maintenance of barriers; but no consistent effort or systematic approach.	Many of the items requiring routine maintenance and inspection will be provided with permanent access requirements, but these will generally be part of the original design and fabrication.
3 Procedure in place and followed for the systematic assessment of hazardous locations, work practices, access, and interaction with other platform operations. Platform modifications undertaken, where practicable, to improve risk influencing factors based on the systematic assessment. Change control procedures includes assessing impacts of changes on risk influencing factors, both hardware related and soft factors.	As well as tool box talks and similar risk assessment measures, when repairs and inspection are planned consideration will be given to the safe and (relatively) easy access for the work to facilitate maximizing the quality of the planned work.
4 Management and installation personnel understand the concepts of risk influencing factors and their parts in identifying risk influencing factors and the need for improvements to them. R&D and new technologies reviewed for possible impact on risk influencing factors, for example use of remote inspection technology.	The operator will be able to produce records of meetings attended by asset management showing that senior asset management show an interest in risk influencing factors and quality of work by ensuring, for example, safe and ergonomic access for all tasks.
5 Organisation proactively addresses risk influencing factors, shares work practices and methodologies with industry and feeds back information to individual installation teams. Involved in promoting and resourcing improvements in risk reducing factors such as improved and remote maintenance equipment and access arrangements.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer. Operator will be able to discuss the R&D they support for remote control technologies for routine tasks, including provision for on-site testing where appropriate.

Process P2.4.1 – Emergency Preparedness	
Development of the emergency preparedness plan for each installation including the recognition of an emergency situation developing and the organisational and technical response to that situation in order to protect human and environmental resources and assets.	
Key Questions: • How well does the organisation develop the emergency preparedness plan for each installation including the recognition of an emergency situation developing and the organisational and technical response to that situation in order to protect human and environmental resources and assets?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No emergency preparedness plan	Operator cannot provide evidence of emergency preparedness representing realistic conditions.
2 Emergency preparedness plans based on previous practice or not fully documented and operated by a limited number of personnel in the organisation. Emergency preparedness plans follow pre-set procedure (e.g. checklists) but do not allow flexibility to address specifics of an actual incident and operated by a limited number of personnel in the organisation.	Operator has plans for emergency conditions but cannot demonstrate that these are specific to each installation; for example, generic emergency situations are considered by particular weaknesses are not addressed. A plan fulfilling level 1 will, for example, consider fires in gas compression areas differently to those in utility areas, but will not take account of different fire wall capacities.
3 Emergency preparedness plans based on feasible emergency scenarios and installation limitations and weaknesses;	The operator will be able to produce an analysis, a report or records of workshops, in which installation weak points are identified and the emergency plans revised to take account of such weaknesses. Weak points could include particular susceptibility to ballast water and weight / COG control, for example.
4 Emergency preparedness plans updated based on any changes in installation condition or performance requirements, and on feedback from emergency exercises. Emergency Preparedness plans have various tools available including computer models, hardware and software for immediate assessment of incidents.	Operator will be able to produce feedback from emergency exercises and from reassessments of the installations' integrity and will be able to show how these have been addressed in the emergency preparedness. This could be by revisions to the plan or to the training requirements for particular positions.
5 Emergency preparedness plan informed and updated based on global experience, including any significant installation incidents offshore.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer. The installation will occasionally take part in larger scale emergency exercises involving groups of installations near each other or with ships..

Process P2.4.2 – Emergency Response Training and exercises	
To undertake emergency exercises covering the full range of possible emergency situations over a suitable period of time and the learning of lessons from those exercises	
Key Questions: • How well does the organisation undertake emergency exercises covering the full range of possible emergency situations over a suitable period of time and the learning of lessons from those exercises?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No training or exercises undertaken	No programme of emergency exercises. – note that undertaking routine lifeboat drills does not meet the requirements for emergency preparedness above level 1.
2 Emergency training and exercises limited in scope and extent of personnel involved	Small scale exercises are undertaken involving a small number of platform personnel (<5%) with limited on-shore involvement. Limited training of offshore personnel except platform management, fire crews and basis offshore survival and familiarity training.
3 Appropriate training and exercises undertaken and documented for all scenarios and all appropriate personnel	All personnel trained for emergencies in relation to their role in such emergencies. Routine emergency exercises undertaken covering all scenarios over a period of time.
4 Training and exercises involve offshore, onshore and 3rd party personnel (emergency services and technical backup)	Regular exercises involve all organisations that would be involved in a real emergency, including external parties.
5 Emergency response training informed and updated to include global experience and feedback from installation experience.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P3.1.1 – Validation of context	
To review and identify any changes to parameters of the context including operating conditions and external factors	
Key Questions: • How well does the organisation review and identify any changes to parameters of the context including operating conditions and external factors?	
Regulatory requirements: • Management regulation § B on Barriers	**Standards:** • PSA "Barrierenotat" • ISO 130702
Description of Maturity Level	**Examples / Evidence**
1 Evaluation of the context absent or undertaken on an ad hoc basis only. Consideration of factors affecting life extension absent	No evidence of consideration of the context since original design – it is likely that at level 1 staff will have difficulty understanding the concept of "context".
2 Evaluation of the context based on previous practice or not fully documented and identified/known by a limited number of personnel in the organisation. Factors affecting life extension addressed but not at company level.	The various parameters of the context will be defined, perhaps across several documents (e.g. safety case, analysis briefs), and some may have been updated, but the organisation will not be able to produce evidence that the parameters have been systematically reviewed and revised.
3 Formal procedure in place and followed for the periodic collation, review and validation of all aspects of the context. Variations in the context and their significance highlighted to management such that other processes can be updated if necessary.	The organisation will be able to produce records (reports, technical notes or notes from workshops) showing that the context has been systematically reviewed within the last say 5 years and that changes have been identified and disseminated.
4 Medium and long term variations in aspects of the context are identified and used to predict the context in future years such that inspection and maintenance requirements can be modified accordingly and plans for modifications to the installation put in place if necessary. Reservoir life predictions and future development plans included in the context to assess likelihood of life extension.	The organisation will be able to produce records (reports, technical notes or notes from workshops) showing that as part of the context review, that predictions have been made for the future, covering at least the next 5 years (or end of field life if it is currently predicted to be within the next 5 years).
5 Industry wide experience used to inform the process of evaluation of context in order to achieve best practice.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP engineering and structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P3.1.2 – In-service history	
Maintenance of and recording, in a readily recoverable form, data and information relating to the service life of the facility. Identification of trends potentially reducing performance of barriers and integrity. <u>**Include modifications, repairs and other anomalies**.</u>	
Key Questions: • How well does the organisation maintain and record, in a readily recoverable form, data and information relating to the service life of the facility? • How well does the organisation Identify trends potentially reducing performance of barriers and integrity? • Where have cracks, damage and other degradation been found? Any reoccurring cracks and degradation in same area? • Is it possible to use the database tool to show cracks and other degradation through history? • Is it possible to indicate trends in cracks and degradation by this database tool? Show us!?	
Regulatory requirements: • Management regulation § 10 and § 19	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No records kept of in-service history	Operator will not be able to produce a history of events affecting the installations (e.g. ship impacts of any magnitude) or of modifications and repairs.
2 Records of in-service incidents, damage and repairs kept on ad-hoc basis	Specific individuals will be able to recall events, modifications and repairs, but they will not be able to produce a comprehensive catalogue that covers the full life of the installation.
3 In-service history is documented and available when required for input to other processes	There will be a centralised record of all events, modifications and repairs that any technical staff are aware of and able to access – if the operator uses an intranet based system for access the installation data the record should be available from that system.
4 In-service history is updated as new information arises. Availability of in-service history to other processes improved, based on feedback, using good practice information technology	There will be a culture within the organisation, particularly offshore, of ensuring that the in-service history is maintained. Offshore personnel will know how to get relevant information added.
5 In-service history follows best worldwide practice, making full use of archived data and new information acquired to provide a complete in-service history	Internal notes will show how the information from industry groupings (e.g. OLF and OGP engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P3.1.3 – Manage life extension approval process – production installations only

Establishment of the platform condition at the end of the original intended life and the determination of the acceptability of extending the planned service life, including review of loadings, assessment of resistance and application of acceptance criteria for production platforms that do not fall under classification society requirements.

Note – this process is not relevant if the end of the currently approved life is more than 5 years or, if less than 5 years and recent analysis predicts end of installation life (including decommissioning) is before the end of the currently approved life.

Key Questions:

- How well does the organisation establish the platform condition at the end of the original intended life and the determination of the acceptability of extending the planned service life, including review of loadings, assessment of resistance and application of acceptance criteria for production platforms that do not fall under classification society requirements?
- What age is the facility? Has life extension of the facility been performed or planned?
- Does the operator have written procedures for how to perform life extension evaluations?
- Do the procedures set requirements to competency in ageing issues?

Regulatory requirements:

- Management regulation § 25 – 26 and § 14

Standards:

- T.B.D.

Description of Maturity Level	Examples / Evidence
1 No consideration given to any life extension requirements	Operator will be unaware of life extension regulations relating to the installation.
2 Criteria for life extension based on previous work and not updated to meet current life extension requirements or condition of structure.	The operator will be intending to use its most recent condition reports and structural analyses to justify life extension without specific consideration being given to the life extension process. The operator will not be able to produce evidence of a systematic review of the condition or of the analyses with life extension being explicitly considered.
3 Formal procedures for life extension in place and followed, procedures include requirements for assessing future changes in loadings, environment and resistance, and the consequences of any changes. Any required changes in acceptance criteria for the extended life incorporated into inspection planning and procedures.	The operator will be able to produce the procedures it has followed for the life extension application; these are likely to be a collection of standard procedures revised to reflect the particular circumstances of a extension.
4 Formal procedures for life extension are updated and improved based on feedback from managing ageing infrastructure. Training in life extension assessment provided for relevant staff.	Where an operator has installations for which it has applied for life extension at different times, the procedures for the life extension will have been updated in between based on the experience gained.
5 Worldwide experience of ageing structures used to improve assessment procedures, tools and techniques. Training is developed and provided to all appropriate staff. Research undertaken, where necessary, to provided improved tools and techniques, and to validate such tools and techniques, for assessing life extension. Organization changes made within SIM to facilitate improved assessment (e.g. appropriate use of internal and external (global) expertise.	Internal notes will show how the information from the OLF workgroup on life extension application is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry group can be used as part of this experience transfer.

Process P3.1.4 – Particular issues for ageing of mobile units – Classed installations only	
Establishment the condition of a classed installation at the end of the original intended life and the determination of the acceptability of extending the planned service life, including consideration of environmental conditions in various locations in which it has operated, in-service and out-of-service times, periodic survey results, review of loadings, assessment of resistance and application of acceptance criteria Note – this process is not relevant if the installation is not intended to be covered by the classification requirements of a class society such as DNV.	
Key Questions: • How well does the organisation establish the condition of a classed installation at the end of the original intended life and the determination of the acceptability of extending the planned service life, including consideration of environmental conditions in various locations in which it has operated, in-service and out-of-service times, periodic survey results, review of loadings, assessment of resistance and application of acceptance criteria? • What age is the facility? Has life extension of the facility been performed or planned? • Does the operator have written procedures for how to perform life extension evaluations? • Do the procedures set requirements to competency in ageing issues?	
Regulatory requirements: • Management regulation § 25 – 26 and § 14	**Standards:** • T.B.D.

Description of Maturity Level	**Examples / Evidence**
1 Class survey requirements not met.	Unit will be out of class.
2 No consideration given to any life extension requirements other than following class periodic survey requirements.	Operator / owner will not be able to provide evidence of proactively addressing ageing through modifications except as a reaction (usually by undertaking repairs) following class surveys.
3 Formal procedures in place to establish the condition of a classed installation, procedures include requirements for assessing future changes in loadings, environment and resistance, fatigue utilization, and the consequences of any changes. Classification society review undertaken for the whole length of the period for which a life extension application is required.	Operator / owner will be able to produce a documented procedure for assessing the implications of ageing and the likely facilities required for its on-going employment. There will be records or reports of studies and workshops addressing ageing.
4 Formal procedures for life extension application are updated and improved by both duty holder and classification society, based on feedback from managing ageing infrastructure. Training in life extension assessment provided for relevant staff.	The procedures noted above will be regarded as live documents and there will be evidence of systematic revision of the procedures (through revision numbers and descriptions).
5 Worldwide experience of ageing structures from both duty holder and classification society used to improve assessment procedures, tools and techniques. Training is developed and provided to all appropriate staff. Research undertaken, where necessary, to provided improved tools and techniques, and to validate such tools and techniques, for assessing life extension. Organization changes made within SIM to facilitate improved assessment (e.g. appropriate use of internal and external (global) expertise.	Internal notes will show how the information from industry groupings (e.g. IADC & IMCA committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer..

Process P3.2.1 – Evaluate, analyse and assess inspection data	
Assessment of data from the inspection programmes, identifying any deviations from requirements, assessing trends (see 3.1.2) potentially due to ageing and determining requirements for repair/mitigation.	
Key Questions: • How well does the organisation assess data from the inspection programmes, identify any deviations from requirements, assess trends potentially due to ageing and determine requirements for repair/mitigation?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Any evaluation entirely ad hoc without adequate criteria	Where evidence for evaluation of inspection data can be presented the criteria for the evaluation will not be both clear and relevant.
2 Criteria established for assessment and acceptance of defects or definition of mitigation method Acceptance criteria for anomalies based only on previous projects	Operator will be able to provide documents (possibly on-line) showing the evaluation including the circumstances of the anomaly (e.g. defect description), the underlying criteria (e.g. the loading regime), the acceptance criteria and the result of the evaluation. The acceptance criteria might not be specific to the location of the component with the anomaly.
3 Defined practice in place with associated competences describing criteria and methods for assessment and acceptance criteria for anomalies. Criteria defined for assessment and referral of findings for structural analysis	Operator can produce a procedure for the evaluation of anomalies describing data requirements and methodologies for assessment together with acceptance requirements and required competences for various types of assessment. It is likely external assistance and assessment will be required for the evaluation of more complex anomalies and for defects that are border-line for acceptability.
4 Inspection findings analysed on a regular basis to identify trends in structural performance Data trends are identified and used to modify long term inspection programmes and SIM strategy with appropriate resources in place; acceptance criteria are revised, based on experience from assessment of non-conformances Assessment and analysis includes consideration of degradation mechanisms and expected condition at subsequent inspection opportunities Contractor performance in analysis and assessment monitored and used in bid assessment to improve future performance	Operator will be able to show that, following completion of evaluations and assessments, they have analysed the occurrence of anomalies to establish whether any trends are evident. In such cases trends should have been investigated more thoroughly to establish any systematic cause or possible mitigation.
5 Organization active in researching and developing improved techniques for analysis and assessment Worldwide experience used to assist selection of most appropriate tools and techniques for evaluation and assessment based on best practice acceptance criteria Worldwide experience on analysis and assessment applied to decision making on remedial measures	Internal notes will show how the information from industry groupings (e.g. OLF and OGP engineering structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P3.2.2 – Assure integrity	
Assurance of the integrity of the installation based on data from the inspection programme including comparison with acceptance criteria and required lifetime.	
Key Questions: • How well does the organisation assure the integrity of the installation based on data from the inspection programme including comparison with acceptance criteria and required lifetime?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Ad hoc assurance reporting without comparison of findings with agreed acceptance criteria. Limited or no evaluation of barrier condition.	The asset management will not have a clear understanding of the integrity of the installation. Although they will be aware of various inspection findings and assessments they will not be able to produce evidence of the integrity of the whole installation.
2 Integrity assurance based solely on assessment of previously experienced defects/anomalies and their required repairs, comparison of integrity requirement to generic acceptance criteria only with no understanding of their context. Condition of barriers evaluated by limited personnel in the organisation. Formal integrity assurance or reporting of condition of the installation to management and others based only on previous projects, not fully documented and identified / operated by a limited number of personnel in the organisation.	Although the operator may be able to produce a report of the integrity of the installation, this report will primarily address matters such as anomalies found in inspection and their repairs. It is unlikely to be an assessment of the true integrity by containing a discussion on uninspected parts of the installation of the likelihood and significance of other potential defects.
3 Formal procedures for demonstration of integrity in place which include comparison with defined and agreed acceptance criteria and risk reduction requirements. Integrity assurance demonstrated by including immediate findings of inspections and repairs undertaken into integrity models. Resources in place to maintain integrity models and analysis methods required for integrity assurance.	An integrity report will include discussion of both “known and repaired” anomalies and also unknown defects. It will also contain a commentary on the long term inspection programme and any recommendations for change in the following year. The report will be produced, or at least updated, annually.
4 Assurance of integrity includes analysis of trends in degradation of components together with extrapolation of that degradation through to expected end of the installation’s life. Research and development into both the behaviour of components and into the effects of degradation are reviewed and incorporated into the assessment of integrity.	The integrity report will be looking beyond the following year, for at least 5 years and probably to the end of field life. It will contain recommendations for improvements (where necessary) and the budgetary implications of the recommendations will be addressed.
5 Organization aware of and contributing to improved integrity assurance theories, standards, techniques and tools, with optimised resources available. Industry wide experience used to inform the process of selection of tools and techniques to achieve best practice integrity assurance. Organization adapted to identify and incorporate best practices in integrity assurance & programme effectiveness.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P3.2.3 – Compare KPIs with requirements

Quantitative measurement of the performance and capability of the installation by comparison of a set of key performance indicators (KPIs) that relate directly to integrity (strength, durability and condition, etc.) with pre-defined acceptance criteria for those KPIs.

Note – This process is only applicable if KPI's have been defined. If there are no KPI's the maturity level for this process cannot exceed 1.

Key Questions:

- How well does the organisation compare quantitative measurements of the performance and capability of the installation with a set of pre-defined key performance measures (KPIs) that relate directly to integrity (strength, durability and condition, etc.)?
- How are KPI's developed for structures and marine systems?
- Are the KPI's relevant for the actual integrity of the structures and marine systems, or are they measuring work-flow and remaining work?
- Do the KPI's say something about the structures and marine systems ability to do their intended function?
- Can they show us long term trend in relevant KPI's?

Regulatory requirements:	**Standards:**
• Management regulation § 10	• T.B.D.

Description of Maturity Level	**Examples / Evidence**
1 No KPIs performance requirements prepared; no comparison or only ad-hoc comparison of KPIs with requirements.	The operator cannot provide KPIs or a comparison of the condition of the barriers relative to KPIs.
2 KPIs based solely on previous practice or not fully documented and managed by a limited number of personnel in the organisation	There will not be a common understanding about what KPIs are, about the need for KPIs, or what a performance requirement is. KPIs are most likely to be missing for the structure and for structural integrity.
3 Formal comparison of documented installation-specific KPIs against performance, inspection results and repairs. Discrepancies are highlighted to management and remedial and / or mitigating measures undertaken.	The organisation will be able to provide evidence that they have defined KPIs; that for each KPI there is a performance requirement, and they will be able to compare the KPI with the performance requirements. This is often displayed as "traffic lights"
4 In the comparison of performance with KPIs, long term trends in performance are monitored and any predicted shortfall in achieving a KPI performance requirement is proactively addressed with remedial and / or mitigating measures. Any available research and development on performance of barriers with respect to degradation is included in the predictions on future KPI achievements.	In the comparison of KPIs with the associated performance requirements trends will be monitored; i.e. the operator will be able to say not only which KPI's fail to meet the performance requirements, but also how the difference between the KPIs and the associated performance requirements changes with time.
5 Organisation uses all corporate experience of the management of KPIs to improve the understanding of barrier performance and degradation. Organization participates in R&D to improve understanding of barrier performance and definition of long term KPIs, with suitable resources available.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural and engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P3.2.4 – In-place structural assessment	
Comparison of the static or quasi static strength and stability of the installation (resistance) with the applied loadings (actions)	
Key Questions: • How well does the organisation compare the static or quasi static strength and stability of the installation (resistance) with the applied loadings (actions)? • Have in-place structural analysis been performed for the facility since design?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 In-place structural assessment undertaken on an ad hoc basis. Use of inappropriate computerized analysis tools.	Although structural analysis for in-place conditions has been undertaken the organisation cannot explain its choice of analytical tools or modelling methodology.
2 In-place assessment based on previous practice and not fully documented. Use of computerized analysis tools that are not customized for offshore structures.	Although a brief for the analysis might be available it will not comprehensively define all the parameters and methodology used for the modelling. Contents should include matters such as selection of wave directions and appropriate wave heights and periods to maximise forces in different components.
3 Documented process including existence of in-place analysis brief containing definitions of applied loads, material properties, modelling techniques, code checking requirements and assumptions based on appropriate national or international standards	The organization will be able to produce a comprehensive analysis brief and also reports from recent structural analyses. The analysis brie will be based on the current definition of the context. The results of the analysis will be summarised in a relatively short document or section of the report highlighting any areas of concern and the most highly utilized locations.
4 Process improved based on feedback from previous experience. Training provided in understanding of analysis methods and interpretation of results, including awareness of limitations of analysis methods and comparison of alternative computer analysis packages	The analysts will have a good understanding of the pros and cons of the different software packages and will be able to discuss the choice of software they use. They will be familiar with national and international “code-checking” requirements and formulations. They will have partaken in “user-conferences” organised by the software developers.
5 Organization actively involved in advancement of analysis methods and computerized tools. with sufficient resources available to develop and propagate improved methods Organizational structure adapts to optimize use of assessment procedures and tools Long term planning is best practice based on evaluating and implementing appropriate feedback both from internal and external sources.	The organisation will play a central role in the development and verification of analytical software - even though it may be purchased from a software vendor. They will be fully involved in decisions on enhancements selected for incorporation into the software. They will be able to produce records of discussions with the software developers.

<table>
<tr><td colspan="2">Process P3.2.5 – Fatigue assessment</td></tr>
<tr><td colspan="2">Comparison of the fatigue strength of the installation with the total required life and the varying loadings</td></tr>
<tr><td colspan="2">Key Questions:
• How well does the organisation compare the fatigue strength of the installation with the total required life and the varying loadings?</td></tr>
<tr><td>Regulatory requirements:
• T.B.D.</td><td>Standards:
• T.B.D.</td></tr>
<tr><td>Description of Maturity Level</td><td>Examples / Evidence</td></tr>
<tr><td>1 Fatigue structural assessment undertaken on an ad hoc basis Use of inappropriate computerized analysis tools.</td><td>Although fatigue analysis for in-place conditions has been undertaken the organisation cannot explain its choice of analytical tools or modelling methodology.</td></tr>
<tr><td>2 Fatigue assessment based on previous practice and not fully documented. Use of computerized analysis tools that are not customized for offshore structures.</td><td>Although a brief for the fatigue analysis might be available it will not comprehensively define all the parameters and methodology used for the modelling. The significance of variations in parameters will be considered as part of the analysis (e.g. sensitivity to water depth due to settlement)</td></tr>
<tr><td>3 Documented process including existence of Fatigue analysis brief containing definitions of applied loads, material properties, modelling techniques, calculation of stress concentration factors (including use of joint categorization), use of design fatigue factors, consideration of directionality and assumptions based on appropriate national or international standards</td><td>The organization will be able to produce a comprehensive fatigue analysis brief and also reports from recent fatigue analyses. The analysis brie will be based on the current definition of the context.
The results of the analysis will be summarised in a relatively short document or section of the report highlighting any areas of concern and the locations with the shortest fatigue lives.
Where lives are indicated to be less than the expected end of life of the installation the organisation will have an understanding of the safety factors in the analysis, and the inspection programme will be influenced by the analysis results..</td></tr>
<tr><td>4 Process improved based on feedback from previous experience.
Training provided in understanding of fatigue behaviour, analysis and interpretation of results, including awareness of limitations of analysis methods and comparison of alternative computer analysis packages
Use of alternative methods of derivation of SCFs when required (e.g. physical testing, solid finite element models).</td><td>The analysts will have a good understanding of the pros and cons of the different software packages and will be able to discuss the choice of software they use.
They will be familiar will the basis of the parametric SCF formulae and the underlying research.</td></tr>
<tr><td>5 Organization actively involved in advancement of analysis methods and computerized tools. with sufficient resources available to develop and propagate improved methods
Organizational structure adapts to optimize use of assessment procedures and tools
Long term planning is best practice based on evaluating and implementing appropriate feedback both from internal and external sources.</td><td>The organisation will play a central role in the development and verification of analytical software - even though it may be purchased from a software vendor. They will be fully involved in decisions on enhancements selected for incorporation into the software. They will be able to produce records of discussions with the software developers.</td></tr>
</table>

Process P3.2.6 – Assessment of robustness (redundancy, tolerance to damage)	
Evaluation of the tolerance of the structure to variations in the physical arrangement of the structure and to variations in the applied loadings	
Key Questions: • How well does the organisation evaluate the tolerance of the structure to variations in the physical arrangement of the structure and to variations in the applied loadings?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Unaware of the need to assess robustness.	Organisation will not be clear on the meaning of robustness – likely to confuse robustness with redundancy.
2 Limited assessment of robustness based on previous practice and not fully documented. Robustness assessed solely by review of results of static in-place analysis (e.g. effects of loss of components if appropriate).	Analysis of robustness undertaken by some form of redundancy analysis, i.e. specifically by removing members to see how utilizations are affected. There is likely to be a somewhat arbitrary definition when a structure is deemed to collapse following this approach.
3 Robustness assessed using documented tools and techniques appropriate to the type of structure (e.g. loss of buoyancy for floating structures and significance of foundations for fixed structures).	The organisation will have used specific analysis tools (such as USFOS) to determine a numerical reserve strength ratio (RSR). They will understand how an RSR is calculated and what it can say about tolerance to varying loads (i.e. limited with respect to gravity loads).
4 Importance of and requirements for robustness understood including the criticality of primary components, different requirements for different types of structure, use of linear and non-linear techniques; significance of multi-component and widespread failures. Process improved based on feedback from previous experience. Training provided in understanding of robustness, analysis and interpretation of results, including awareness of limitations of analysis methods and comparison of alternative computer analysis packages.	The operator will be able to discuss the linkage between robustness, RSRs and appropriate resistance factors, particularly if they are using a non-conventional structural arrangement. Note – ISO 19902 states that higher resistance factors should be used for minimal structures to provide equivalent robustness to conventional 4, 6 and 8 leg jacket structures.
5 Organization actively involved in advancement of analysis methods and computerized tools. with sufficient resources available Organizational structure adapts to optimize use of assessment procedures and tools Long term planning is best practice based on evaluating and implementing appropriate feedback both from internal and external sources.	The organization will have been involved in industry initiatives (JIPs and national / international standards development work in the area of robustness).

Process P3.3 – Management Reporting	
To assess the adequacy of the reporting to asset and organisation management the condition of the installation's barriers and the need for future maintenance expenditure and the on-going effects of ageing	
Key Questions: • *Question?*	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Absence of reports to management or ad hoc reporting (implies reporting by exception – if something needs attention).	Reporting to management on barrier integrity will be the exception rather than the rule. Reports will not have been regularly issued.
2 Management reporting follows previous practice but may not give management an appropriate understanding of either the condition of the installation's barriers, specific maintenance or inspection requirements, or the increasing integrity management requirements due to ageing.	Reporting to management will be regularly – at least once a year and preferably once a quarter or more. The reports will indicate which KPIs do not achieve the performance requirements but not necessarily comment on the failures in terms of implications for risk.
3 Formal procedures in place for management reporting, such procedures will define how the condition of the installation is reported, and will describe the extent of anomalies within the installation and the assessment and mitigation of anomalies.	There will be a guidance document stating how the regular reports are prepared (i.e. what information they should include) and they will include discussion of the implications of any failure to meet performance requirements.
4 Future requirements for integrity management will be defined in management reporting which will include the consequences of ageing and life extension and the associated resource allocation implications.	The guidance document and the regular reports will include discussion of expected future changes, for example due to ageing.
5 Management feedback (clarity and comprehensibility of the report, management understanding and reaction to changing integrity management needs {particularly resources}) used to modify procedures for reporting and content and presentation of reports.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety and engineering committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P4.1 – Evaluation of effectiveness of inspection programme	
Evaluation of the effectiveness of the inspection programme for reporting and input to future development of the inspection strategy.	
Key Questions: • How well does the organisation evaluate the effectiveness of the inspection programme for reporting and input to future development of the inspection strategy?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No evaluation or evaluation ad-hoc and unplanned	Inspection programme appears to be assumed effective.
2 Basic evaluation of effectiveness of inspection programme, based on historical practice	Recording of whether scheduled inspections have been undertaken and priority given to overdue inspections.
3 Formal procedures in place for evaluating effectiveness of inspection programme, including reporting and input to development of future inspection strategy.	Documentary feedback available on the inspection, highlighting any difficulties encountered and any limitations to the extent of inspection possible. Feedback has been collated and inspection strategy modified appropriately.
4 Evaluation of effectiveness of inspection programmes updated regularly based on feedback and both assurance and reporting processes modified accordingly. Training provided in evaluating inspection programmes to relevant personnel, including appropriate application of tools and techniques	Evidence in place the feedback has been systematically sought, evaluated and procedures updated as appropriate.
5 Worldwide experience used in developing optimised evaluation of inspection programmes, reporting and inputting to development of future inspection strategies. Tools and techniques for evaluating inspection programmes developed with appropriate resources in place Organization adapted to identify and incorporate best practices in integrity assurance & programme effectiveness	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer. Operator will be able to discuss the R&D they support for inspection technologies, including provision for on-site testing where appropriate.

Process P4.2 – Improvement of barrier performance	
To identify the need for improvements to barrier performance by comparing KPIs or Performance Standards against actual performance To report any need for improvements to management. To undertake improvements to barriers and barrier performance where appropriate.	
Key Questions: • How well does the organisation identify the need for improvements to barrier performance by comparing KPIs or Performance Standards against actual performance? • How well does the organisation report any need for improvements to management? • How well does the organisation undertake improvements to barriers and barrier performance where appropriate?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Evaluation and execution of improvements to barrier performance absent or undertaken on an ad hoc basis only.	No evidence that barrier performance has been reviewed.
2 Evaluation and execution of improvements to barrier performance based on previous practice or not fully documented and improvements implemented by a limited number of personnel in the organisation.	Evidence can be provided that some barrier performance has been addressed but no evidence of a systematic review or modifications.
3 Formal written procedures in place for evaluation of improvements to barrier performance and operated throughout the company. Management considers need for barrier performance improvements and allocates resources in a timely manner depending on the urgency for the improvements. Scheduling of platform operations (including maintenance and project work) updated to facilitate execution of barrier performance improvements in a timely manner.	Procedures can be provided; evidence of use of the procedures such as reports or records of meetings. Where improvements have been undertaken a time line can be described showing a timely progression from the consideration of each improvement through to its execution.
4 Evaluation of improvements to barrier performance updated regularly based on feedback and the process modified accordingly.	The procedures will have been updated if the time between an idea for an improvement and its execution is excessive.
5 Industry wide experience used to inform the process of improvement of barrier performance in order to achieve best practice.	Internal notes will show how the information from industry groupings (e.g. OLF and OGP Safety, engineering and management committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P5.1 – QA/ QC	
To demonstrate QA/QC practices in barrier management, including selection and verification of contractors, validation of techniques and tools and handling of non-conformances.	
Key Questions: • How well does the organisation demonstrate QA/QC practices in barrier management, including selection and verification of contractors, validation of techniques and tools and handling of non-conformances?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No internal checking, audit or verification of SIM activities No formal audit of management processes (QA) for SIM activities	No evidence of internal checking of work undertaken within operator or contractor. No evidence of management system audit of SIM activities.
2 Procedures for internal checking and audit in place and implemented but based solely on previous experience and not updated Minimal feedback of audit findings to SIM team members	Evidence of internal checking (e.g. “yellow line” check copies) available and audit reports, but no evidence of improvement between successive audits over say a 5 year period. Clear understanding of the differences between QA, QC and Verification.
3 Formal QA procedures in place and implemented which conform to national or international standards (including handling of non-conformances) Formal audits on both organization and SIM contractors undertaken based on above procedures with appropriate resources available	Operator and contractors have, for example, ISO 9001 accreditation with a reputable (e.g. DNV) auditor. Non-conformance reports and corrective action reports available.
4 Organization reviews processes and practices in both itself and in its contractors based on feedback and assimilation of industry initiatives on QA/QC. Improvement plans prepared and documented for all processes in SIM, based on QA/QC findings Training in QA/QC provided to key personnel, both in the duty holder and SIM contractors	Evidence of how audit observations and findings have influenced modifications to the QA and QC procedures can be presented. Evidence of continual improvement, through meetings attended by senior management and initiatives sponsor by senior management, available.
5 Organization active in developing improved tools for QA/QC for SIM with appropriate resources in place Organization engaged in national and international initiatives for development and improvement of QA/QC standards for SIM Organization adapts its structure based on feedback and assimilation of above initiatives on QA/QC for SIM Training updated in QA/QC to achieve appropriate levels of competency in relevant personnel, both in the duty holder and SIM contractors	Internal notes will show how the information from industry groupings (e.g. OLF and OGP safety and management committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P5.2 – Independent verification	
To manage the use of independent verification of programmes and assessments associated with barrier management.	
Key Questions: • How well does the organisation manage the use of independent verification of programmes and assessments associated with barrier management?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 No verification of SIM activities with no formal procedures in place	No evidence presented that the SIM programme has been reviewed by independent personnel.
2 Verification based on historical practice only	A review has been undertaken and signed off, but the scope of the review has been limited to comparison with the scope on other installations.
3 Procedures in place for independent verification, including method of selection of appropriate verifier(s).	The criteria for the selection of the independent verifier are documented along with the scope of each verification activity. The qualifications and the experience of the individual undertaking the verification are appropriate.
4 Verification procedures updated based on previous verifications (including selection of verification personnel). Verification recommendations reviewed and acted upon where appropriate	It can be shown that recommendations made by independent verifiers, particularly relating to the Independent Verification activities, have be considered and followed up where appropriate, for example by reference to letters and reports from the verifiers. If no evidence of this sort can be found evidence that feedback has be requested from the verifier can be accepted.
5 Independent verification process optimised, based on worldwide experience, selection of contractor and optimal use of feedback to SIM and verification organisations	Internal notes will show how the information from industry groupings (e.g. OLF and OGP structural committees) is promulgated through the organisation and how experience from assets is fed back to a central engineering department. Minutes of meetings of the industry groups can be used as part of this experience transfer.

Process P5.3 – Awareness & education	
To create awareness of hazards and risks in managing barriers and to provide teaching to disseminate knowledge of them to a wider community.	
Key Questions: • How well does the organisation create awareness of hazards and risks in managing barriers and provide teaching to disseminate knowledge of them to a wider community?	
Regulatory requirements: • T.B.D.	**Standards:** • T.B.D.
Description of Maturity Level	**Examples / Evidence**
1 Awareness and education of management of barriers absent or undertaken on an ad hoc basis only.	No evidence of staff training related to barrier management.
2 Awareness and education of management of barriers based on previous practice or not fully documented and operated by a limited number of personnel in the organisation.	Some staff have undergone training courses or sessions related to specific barriers and their maintenance
3 Formal procedures in place for an awareness and education of the management of barriers and operated throughout the company.	A register can be produced showing how staff are identified for different types of training (could be called a training matrix) related to barrier functionality.
4 Awareness and education of the management of barriers updated regularly based on feedback and the process modified accordingly.	Company can demonstrate that they have had input within the last 5 years to a review and a revision of the training programme.
5 Industry wide experience of the management of barriers used to inform the awareness and education programme in order to achieve best practice.	Company can produce evidence (e.g. minutes of meetings) showing that they work with other operators and that training requirements and courses represent an amalgam of the experience of the different operators.

Annex D Improvement steps for-processes

Process P1.1.1 – Manage DFI resume & condition summary	
Establishment and development of data and information required for the design, fabrication and Installation (DFI) résumé.	
1 to 2	Collate basic design, fabrication and Installation (DFI) information
2 to 3	Document DFI résumé such that data and history is available for Structural Integrity Management.
3 to 4	Update DFI résumé as new information arises, including any changes to the requirements for the structure as well as any anomalies and the assessments thereof.
4 to 5	Acquire knowledge of methods used worldwide to determine best practice and then obtain necessary data of the installation to match.

Process P1.1.2 – Understand structure's strengths & limitations	
Development of an understanding of the particular strengths and limitations of an individual installation, taking account of the structure type, fabrication and in-service history and repairs, particular vulnerabilities that may be related to structure type, installation function, equipment features external environment etc.	
1 to 2	Develop basic understanding of structural integrity considerations and ageing processes,
2 to 3	Document structural performance, including any strengths and limitations, vulnerabilities, together with causes and possible effects of deterioration. Ensure SIM strategy reflects structural performance and any vulnerabilities. Document the ageing processes applicable to SIM, their effects on the structural system and how to recognise these effects
3 to 4	Ensure structural performance is updated from experience, taking account of any changes in expected loadings, installation conditions and life extension requirements. Introduce training for understanding of structural performance, identifying limitations and vulnerabilities in the system
4 to 5	Incorporate corporate and industry wide knowledge into the determination of structural performance and vulnerabilities. Develop own training to increase knowledge of structural understanding.

Process P1.1.3 – Definition of the context	
The context is "Premises, parameters and decision criteria to be taken into account in the management of barriers / structures and marine systems" This process relates to the compilation of data to define the context including: *Production and well data; Current standards and regulations; Weight limitation and configuration ; Subsidence and freeboard; Level and distance (tilt and …) tolerances; Visiting ship size and configurations; Passing traffic routes; Metrological and oceanographic design basis; Marine growth amount; Seabed: Scour, debris, burial, etc. – acceptance criteria for…; Dynamic response; Damping of motion response (structural, hydrodynamic, geotechnical); Geophysical design basis ; Personnel limitations ; Knowledge and technology; Acceptance criteria with regards to structural degradation…; Accessibility for inspection; Fatigue factors used in design and the inspection required based on the those choices; Basis for structural analysis (FLS; ULS; ALS; SLS, redundancy); Drawings and condition (damage); Design life*	
1 to 2	Some context criteria collated, but incomplete. Context not widely accessible.
2 to 3	Context has been collated – i.e. available on paper or in electronic form and details all aspects of the context and is readily available to all interested personnel including asset management and offshore.
3 to 4	Formalised procedures exist and followed for the periodic and systematic review and updating of all criteria defining the context. Management made aware of significance of any variations in the context.
4 to 5	Organisation has procedures and practices in place to modify and predict changes in context based on company-wide practice and to manage changes where practicable to account for limitations in the integrity of the barrier functions.

Process P1.2.1 – Identification of internal and external hazards	
To determine and categorise hazards relating to both function and operation of the installation (internal, e.g. presence of hydrocarbons and high pressure fluids) and to its location (external, e.g. passing marine traffic, metocean factors). Use of risk identification techniques, e.g. HazIds, comparison with other installations.	
1 to 2	Some limited exercises (HAZIDs and HAZOPs) have been undertaken to initially identify hazards and have differentiated between internal hazards due to the presence of the installation (and to some extent controllable) and external hazards (largely uncontrollable). The exercises have not necessarily used the best discipline expertise but will have involved safety personnel and offshore personnel.
2 to 3	Organisation has a procedure for undertaking systematic hazard identification for each installation which is followed, and specifies how the participants are selected (i.e. in terms of position, expertise and experience). Updates are undertaken on a frequent basis and significant changes notified to management.
3 to 4	The procedures for the preparation and review of hazards are periodically reviewed and modified where necessary to ensure that changes in the organisation are reflected. Participants are selected to ensure the most experienced and expert resources within the organisation with consultants to ensure all hazards are properly captured.
4 to 5	Organisation learns from data other assets and from contractors involved in other assets to ensure learnings from work done elsewhere is incorporated, particularly where similar regulatory regimes operate or where incidents have led to root cause analyses

Process P1.2.2 – Awareness of potential emergency situations	
Development of an understanding of how the various hazards applicable to different types of installation and of particular and uncommon hazards can lead to the development of emergency situations applicable to the installation being considered.	
1 to 2	Emergency situations have been assessed based on the hazards identified in P1.2.1 with consideration of their likelihood and magnitude and the potential consequence for the installation being considered.
2 to 3	Procedures detail the methodology for the assessment of the hazards to determine whether they can develop into emergency situations. For internal hazards each system and subsystem will have been considered using a series of keywords such as overpressure, under-pressure, corrosion, leak, fire.
3 to 4	Discussions have been held and data exchanged, with owners and operators of similar facilities to identify particular scenarios, which may be less obvious, which can apply. Literature on accidents and incidents on similar types of installation have been studied to ensure that all scenarios have been captured.
4 to 5	Organisation actively engages with operators of similar facilities and partakes in open discussions on hazards and potential emergencies for mutual benefit to ensure that all possibilities are captured and included in emergency planning.

Process P1.3 – Establish barrier functions	
To establish barriers and their functions that manage a specific sequence of events leading to or arising from hazards identified from process 1.2.	
1 to 2	Establishment of barriers and their functions based on previous practice or not fully documented and barrier functions established by a limited number of personnel in the organisation.
2 to 3	Systematic procedures are in place, documented and followed for determining appropriate barriers for each hazard, for example by the use of “bow-tie” and / or “Swiss cheese” models. Procedures require consideration of redundancy of barriers (i.e. different types of barriers) to prevent incidents and barriers to mitigate against the consequences of incidents.
3 to 4	Feedback obtained from within the organisation and from contractors relating to the adequacy of barriers is used to determine if the barrier and their functions should be modified or improved.
4 to 5	Industry wide experience used to inform the establishment of barriers and their functions in order to achieve best practice.

Process P1.4.1 – Risk assessment methodology	
Use of risk assessment techniques based on identified hazards and potential consequences	
1 to 2	Installation's overall risk assessment has been undertaken and reported but no clear demonstration about how the data for the risk assessment has been collated. Risk assessments are undertaken on individual tasks as part of permit to work systems.
2 to 3	Risk assessment is systematic and both procedures and results are documented. Probabilities of occurrence and magnitudes of consequences are rationally derived and risks levels determined logically. Risks are categorised on the basis of their overall risk as well as on probabilities and on consequences. Knowledge of the highest risks is widespread throughout the asset management and steps are being undertaken to reduce all unacceptable risks. Risk assessments on individual tasks are collated as assessed by operations supervisors / superintendents as part of permit to work system.
3 to 4	The risk assessment procedures and calculations are periodically reviewed and where appropriate revised on the basis of experience from within the asset and within the organisation. The results of risk assessments and the higher risks are shared throughout the organisation enabling good practice to develop and be used throughout. Results of research and development of risk assessment are reviewed and incorporated into those assessments for each installation.
4 to 5	Organisation aims to be best practice and is involved with identification of areas where research and development can improve the understanding and reduction of risks including both probabilities and consequences. Organisation contributes resources to such R&D and proactively shares knowledge and experience with the industry.

Process P1.4.2 – Understand significance of potential emergency situations	
Analysis of potential emergency situations to determine significance of different scenarios to establish possible consequences.	
1 to 2	Although particular individuals understand the selection of emergency situations covered in the emergency procedures, there is an absence of a methodological determination of the development of emergency situations.
2 to 3	Procedures are in place and followed for the systematic assessment of hazards, what-if assessments, and HAZOPs to understand how emergency situations can arise, the results are used as a basis for both the development of a barrier strategy and of the emergency procedures Particular attention has been paid to the type of installation (e.g. floating, reliant on pressure control for integrity) in determining hazards and their contribution to potential emergency situations. Discipline expertise is applied to the consideration of potential emergency situations.
3 to 4	Change control procedures include steps for assessing any implications for the development of emergency situations. All installations (worldwide) on which accidents or near-misses have occurred are analysed for similarities and the barriers and emergency procedures amended where appropriate.
4 to 5	Organisation is actively involved in industry initiatives and committees (e.g. OLF, OGP) involved with promoting safety and discussing accidents and near misses. Formalized procedures are in place to ensure the dissemination of knowledge gained from outside into the individual assets and installation teams.

Process P1.5 – Risk Mitigation	
To define requirements for the mitigation of risks identified in 1.4	
1 to 2	Highest risks have been assessed and limited measures undertaken to reduce or limit those risks, however no consistent approach or evidence of reduction of targeting the risk mitigation on the highest risks.
2 to 3	A systematic and formalised procedure has been followed to evaluate risk mitigation measures. Priority has been placed on reducing the highest controllable risks and both probabilities and consequences have been addressed. Prevention of escalation has been considered. Cost benefit analysis has been used to choose between reducing differing risks The risk assessments have been used as a tool for educating installation personnel and in preparing the emergency manuals.
3 to 4	Periodic reviews are undertaken of available risk mitigation measures including reviewing new techniques and products available for risk management (e.g. gas detection and blast protection). Additional risk mitigation is undertaken where benefits are identified. Information is shared throughout the industry on risk mitigation measures and approaches and fed back to assets and installations systematically.
4 to 5	External expertise is sought and employed to minimise risk levels in cost effective ways. Organisation uses its knowledge of risk levels and mitigation measures to lead and resource research and test new technology into reducing risks.

Process P1.6.1 – Barrier selection and prioritization	
From the barrier functions identified (see P1.3) the risk analysis (P1.4) and the implementation of risk mitigation measures (P1.5) select and prioritize appropriate barriers to manage the risks	
1 to 2	There is a linkage between the required barrier function and the provision of a barrier to provide that function (e.g. The prevention of rupture of a gas pipe (the function) and the provision of pipe supports to prevent rupture (the barrier). The linkage is not formally derived and may not always be clear.
2 to 3	Procedures are in place and followed for the systematic interpretation of the risk analysis. Specific barriers have been selected or identified to prevent or mitigate against particular hazardous situations. Barriers have been selected to include a mix of passive barriers and active barriers as appropriate. The function of the barriers has been documented and communicated to the platform management and offshore personnel, who understand the concepts of barriers and what constitutes a barrier – all barriers are identified.
3 to 4	Periodic review of the selection of barriers is undertaken in accordance with a formalised procedure. Results of research and development and product testing are monitored to determine whether alternative barriers could be effective. Organisation has good internal communications which lead to a common approach to barrier selection.
4 to 5	Organisation makes best use of internal resources and external contractors for the selection of barriers to manage risks Organisation participates in research and development of potential new barriers, e.g. improved techniques and more reliable active systems.

Process P1.6.2 – Develop and update SIM Strategy	
Development of a SIM document which includes in-service inspection, evaluation, assessment and reporting.	
1 to 2	Develop basic SIM and condition monitoring strategies
2 to 3	Document SIM Strategy and communicate within organisation.
3 to 4	Institute process for updating SIM Strategy including recognition of changes in the condition or life extension requirements.
4 to 5	Incorporate global experience (both from within and outside corporation) into account in updating SIM strategy.

Process P1.7.1 – Performance requirements for barriers	
Preparation of performance requirements, including defining the Key Performance Indicators (KPIs), for all barriers	
1 to 2	Develop basic barrier performance requirements and define KPIs
2 to 3	Develop written procedures to define barrier performance; ensuring performance requirements reflect identified hazards. Ensure these procedures are operated throughout the company. Define KPIs, prepare and document requirements related to each barrier.
3 to 4	Ensure periodic review of the condition of barriers from local experience, taking account of the condition of similar barriers and revise performance requirements if necessary. Review data from research and development and incorporate into the barrier performance requirements.
4 to 5	Introduce industry wide experience into the performance requirements for barriers. Refine KPI requirements based on industry wide experience.

Process P1.7.2 – Barrier degradation mechanisms	
Identify mechanisms for possible degradation of all barriers and use to derive inspection and maintenance requirements.	
1 to 2	Identify basic degradation mechanisms for barriers
2 to 3	Develop written procedures for identifying conditions which degrade barriers and ensure they are operated throughout the company.
3 to 4	Introduce using feedback and experience to update the identification of conditions which degrade barriers and modify the process based on this feedback.
4 to 5	Develop best practice by initiating research and development into factors affecting barrier reliability and degradation. Use expertise from throughout the organisation and from external expertise to improve the undertaking of this process .

Process P1.7.3 – Definition of high level acceptance criteria	
Definition of a set of criteria for managing structural integrity, to be applied to other processes, particularly Process 6.	
1 to 2	Develop basic acceptance criteria.
2 to 3	Document acceptance criteria and communicate through organisation as appropriate.
3 to 4	Instigate regular reviews and updates of acceptance criteria based on condition of structure and life extension requirements
4 to 5	Include global experience into updates of acceptance criteria.

Process P1.7.4 – Define Long term inspection programme	
Definition of long-term platform-specific inspection programmes based on the agreed SIM strategy and incorporating platform history and characteristics together with the effects of ageing. This sub-process derives from 2.1 below	
1 to 2	Develop long term platform inspection programme (which could be based on annual repeat of same scope).
2 to 3	Develop and document a long term inspection programme in which a specified scope can be distributed over several individual annual programmes.
3 to 4	Institute regular updates to the inspection programme to include the effects of any changes in condition of the structure and any changes in environment together with life extension requirements and any changes in load carrying capacity required.
4 to 5	Incorporate global experience of similar structures into the long term inspection programme.

Process P2.1.1 – Operating procedures	
To prepare, maintain and execute procedures for the routine operation of the installation that relate to both the function of the installation, the hazards identified and necessary barriers and their potential degradation	
1 to 2	There is a methodology for Inspection and maintenance of barriers at a basic level, usually with the requirements detailed in a computerised scheduling system.
2 to 3	Procedures documented and followed for the planning and scheduling of maintenance and inspection of barriers. Derivation of maintenance and inspection regime (frequency and extent of activities) rationally derived and documented.
3 to 4	Inspection and maintenance activities and frequencies are periodically reviewed to reflect experience of degradation of barriers. Procedures documented and followed for routine inspection and assessment of appropriate hazards to ensure continuing applicability of the barriers. R&D into inspection and maintenance techniques reviewed to determine benefits of changes to schedules and scopes.
4 to 5	Organization shares knowledge throughout the company and with other operators on scheduling, maintenance and inspection of barriers. Takes the lead in promoting and resourcing R&D and product development for barrier inspection and maintenance.

Process P2.1.2 – Inspection planning	
Planning of platform specific topsides and sub-sea inspection programmes, including specific requirements related to ageing	
1 to 2	Develop annual inspection plan (which could be based on annual repeat of same scope).
2 to 3	Develop and document an inspection plan based on the latest long term inspection programme. Ensure that inspectors are qualified for the tasks they undertake
3 to 4	Institute regular updates to the inspection plan to include the effects of any changes in long term inspection programme.
4 to 5	Incorporate global experience of similar structures into the inspection plans. Develop training materials and tools and disseminate to relevant staff.

Process P2.1.3 – Inspection execution	
Management and execution of the in-service inspection programmes.	
1 to 2	Maintain records of previous inspection work packs and use as basis of future inspections
2 to 3	Develop and document inspection work packs and scopes which include definition of location and scope of each inspection task including any preparatory works (e.g. scaffolding, cleaning) and tools required.
3 to 4	Institute regular updates to the inspection work packs and procedures for initiating and undertaking work to include the effects of any changes in the inspection plans. Record and monitor contractor performance and identify and address any short comings in execution, methods and tools.
4 to 5	Incorporate global experience of the inspection of similar structures into the work scopes and work packs. Develop and test new tools for undertaking inspection in realistic conditions, including offshore. Develop training materials and disseminate to relevant staff including contractors' personnel.

Process P2.1.4 – Allocation & management of resources	
Estimation and approval of resources (money, personnel, logistics, infrastructure, production requirements) to meet the SIM strategy. Creation of the organisation accordingly and define responsibilities.	
1 to 2	Develop basis of allocation of resources to SIM
2 to 3	Allocate resources to SIM based on the agreed strategy for SIM. Resource allocation and decisions relating to resource allocation are documented.
3 to 4	Incorporate the current understanding of the condition of the structure and any life extension requirements into the allocation of resources.
4 to 5	Incorporate global understanding of structural integrity, SIM, ageing and life extension into the allocation of resources

Process P2.2.1 – Reporting on maintenance and inspections	
Establishment and execution of procedures for recording, evaluating and reporting of maintenance and inspection results	
1 to 2	Compile and catalogue inspection reports based on previous practice.
2 to 3	Develop and document a formal procedure for the cataloguing, storage, and reporting of inspection reports, preferably using a computerised system.
3 to 4	Institute regular reviews, and if necessary updates, to the procedures for inspection reporting. Ensure the data management systems are searchable and will highlight the discovery of anomalies and the status of the assessment of such anomalies. Provide training in the use of the systems..
4 to 5	Incorporate global experience of inspection data management into the systems and procedures. Develop training materials and tools and disseminate to relevant staff.

Process P2.2.2 – Manage inspection and integrity data	
Collection and recording of data from the inspection programmes	
1 to 2	Compile and catalogue inspection plans and reports from contractor.
2 to 3	Develop and document a formal procedure for the cataloguing, storage, searching and recovery of inspection reports, preferably using a computerised system.
3 to 4	Institute regular reviews, and if necessary updates, to the procedures for computerised data storage and their execution. Ensure the data management systems are searchable and will highlight the discovery of anomalies and the status of the assessment of such anomalies. Provide training in the use of the systems..
4 to 5	Incorporate global experience of inspection data management into the improvement of systems and procedures. Develop training materials and tools and disseminate to relevant staff.

Process P2.2.3 – Determine repair and mitigation measures	
Determination of required repair and mitigation measures to maintain barrier and structural integrity based on input from the inspection programme and from the assessment of ageing.	
1 to 2	Develop criteria for design of repairs adopted from previous work.
2 to 3	Document procedures for designing repairs and possible mitigation measures, as required to maintain structural integrity
3 to 4	Capture experiences from preceding repairs and mitigation measures and update procedures for repair design criteria and mitigation measures Assess contractor experience and use in updating repair design criteria.
4 to 5	Use global experience to determine best practice repair criteria and possible mitigation measures. Develop and disseminate training materials for repair design criteria and mitigation measures to all relevant personnel.

Process P2.2.4 – Plan and undertake remedial actions	
Planning and execution of the remedial actions identified above.	
1 to 2	Develop repair and remedial measures following previous practice
2 to 3	Document procedures and methods for establishing adequate installation specific repairs or mitigation measures Provide resources and tools for the implementation of adequate repairs or mitigation measures
3 to 4	Update planning and execution of repair and mitigation measures based on experience. Collaborate with contractor to identify and implement good practice for repair and mitigation. Train appropriate personnel in repair and mitigation measures.
4 to 5	Use global experience to assist selection of tools and techniques to achieve effective and long lasting repairs Research and develop appropriate repair techniques and materials Make resources available for offshore testing and demonstration of new tools and techniques Assess performance and capabilities of specialist sub-contractors

Process P2.3 – Control of Risk Influencing Factors	
Risk influencing factors are matters of importance for the barrier functions and barrier elements ability to function as intended and can include competence of personnel, organizational issues including adequate and clear communications and ergonomic factors that affect the ability to undertake work (e.g. poor or difficult access)	
1 to 2	Evidence of measures taken to improve risk influencing factors, for example, access for inspection and maintenance of barriers; but no consistent effort or systematic approach.
2 to 3	Procedure in place and followed for the systematic assessment of hazardous locations, work practices, access, and interaction with other platform operations. Platform modifications undertaken, where practicable, to improve risk influencing factors based on the systematic assessment. Change control procedures includes assessing impacts of changes on risk influencing factors, both hardware related and soft factors.
3 to 4	Management and installation personnel understand the concepts of risk influencing factors and their parts in identifying risk influencing factors and the need for improvements to them. R&D and new technologies reviewed for possible impact on risk influencing factors, for example use of remote inspection technology.
4 to 5	Organisation proactively addresses risk influencing factors, shares work practices and methodologies with industry and feeds back information to individual installation teams. Involved in promoting and resourcing improvements in risk reducing factors such as improved and remote maintenance equipment and access arrangements.

Process P2.4.1 – Emergency Preparedness	
Development of the emergency preparedness plan for each installation including the recognition of an emergency situation developing and the organisational and technical response to that situation in order to protect human and environmental resources and assets.	
1 to 2	Emergency preparedness plans based on previous practice or not fully documented and operated by a limited number of personnel in the organisation. Emergency preparedness plans follow pre-set procedure (e.g. checklists) but do not allow flexibility to address specifics of an actual incident and operated by a limited number of personnel in the organisation.
2 to 3	Emergency preparedness plans based on feasible emergency scenarios and installation limitations and weaknesses;
3 to 4	Emergency preparedness plans updated based on any changes in installation condition or performance requirements, and on feedback from emergency exercises. Emergency Preparedness plans have various tools available including computer models, hardware and software for immediate assessment of incidents. Training and exercises involve offshore, onshore and 3rd party personnel (emergency services and technical backup)
4 to 5	Emergency preparedness plan informed and updated based on global experience, including any significant installation incidents offshore.

Process P2.4.2 – Emergency Response Training and exercises	
To undertake emergency exercises covering the full range of possible emergency situations over a suitable period of time and the learning of lessons from those exercises	
1 to 2	Emergency training and exercises limited in scope and extent of personnel involved
2 to 3	Appropriate training and exercises undertaken and documented for all scenarios and all appropriate personnel
3 to 4	Training and exercises involve offshore, onshore and 3rd party personnel (emergency services and technical backup)
4 to 5	Emergency response training informed and updated to include global experience and feedback from installation experience.

Process P3.1.1 – Validation of context	
To review and identify any changes to parameters of the context including operating conditions and external factors	
1 to 2	Evaluation of the context based on previous practice or not fully documented and identified/known by a limited number of personnel in the organisation. Factors affecting life extension addressed but not at company level.
2 to 3	Formal procedure in place and followed for the periodic collation, review and validation of all aspects of the context. Variations in the context and their significance highlighted to management such that other processes can be updated if necessary.
3 to 4	Medium and long term variations in aspects of the context are identified and used to predict the context in future years such that inspection and maintenance requirements can be modified accordingly and plans for modifications to the installation put in place if necessary. Reservoir life predictions and future development plans included in the context to assess likelihood of life extension.
4 to 5	Industry wide experience used to inform the process of evaluation of context in order to achieve best practice.

Process P3.1.2 – In-service history	
Maintenance of and recording, in a readily recoverable form, data and information relating to the service life of the facility. Identification of trends including modifications, repairs and other anomalies potentially reducing performance of barriers and integrity.	
1 to 2	Collate in-service history
2 to 3	Document in-service history such that data and history is available for Structural Integrity Management.
3 to 4	Update in-service history as new information arises, including any changes to the requirements for the structure as well as any anomalies and the assessments thereof.
4 to 5	Acquire knowledge of methods used worldwide to determine best practice and then obtain necessary data of the installation to match.

Process P3.1.3 – Manage life extension approval process – production installations only	
Establishment of the platform condition at the end of the original intended life and the determination of the acceptability of extending the planned service life, including review of loadings, assessment of resistance and application of acceptance criteria for production platforms that do not fall under classification society requirements. Note – this process is not relevant if the end of the currently approved life is more than 5 years or, if less than 5 years and recent analysis predicts end of installation life (including decommissioning) is before the end of the currently approved life.	
1 to 2	Develop criteria for life extension based on previous work
2 to 3	Document procedures for life extension including assessing future changes in loadings, environment and resistance. Incorporate any required changes in acceptance criteria into inspection planning and procedures
3 to 4	Updated and improve procedures for life extension based on feedback from managing ageing infrastructure. Provide training in life extension assessment to relevant staff.
4 to 5	Improve assessment procedures, tools and techniques based on Global experience of ageing structures. Develop appropriate training and provided to all appropriate staff. Research and develop improved tools and techniques, and validate such tools and techniques.

Process P3.1.4 – Particular issues for ageing of mobile units – Classed installations only	
Establishment the condition of a classed installation at the end of the original intended life and the determination of the acceptability of extending the planned service life, including consideration of environmental conditions in various locations in which it has operated, in-service and out-of-service times, periodic survey results, review of loadings, assessment of resistance and application of acceptance criteria Note – this process is not relevant if the installation is not intended to be covered by the classification requirements of a class society such as DNV.	
1 to 2	Follow class survey requirements.
2 to 3	Document procedures for establishing the condition of a classed installation. Life extension application to be based on full expected life rather than periodic survey rules
3 to 4	Update and improve procedures for life extension application based on feedback from managing ageing infrastructure. Provide training in life extension assessment to relevant staff.
4 to 5	Improve assessment procedures, tools and techniques based on Global experience of ageing structures. Develop appropriate training and provided to all appropriate staff. Research and develop improved tools and techniques, and validate such tools and techniques.

Process P3.2.1 – Evaluate, analyse and assess inspection data	
Assessment of data from the inspection programmes, identifying any deviations from requirements, assessing trends (see 3.1.2) potentially due to ageing and determining requirements for repair/mitigation.	
1 to 2	Develop criteria for assessment and acceptance of defects
2 to 3	Document procedure for the assessment and acceptance criteria for anomalies. Define criteria for assessment and referral of findings for structural analysis
3 to 4	Analyse Inspection findings on a regular basis to identify any trends in structural performance Modify long term inspection programmes and SIM strategy based on any trends identified in structural performance Assess and analyse anomalies with reference to possible degradation mechanisms. Monitor and assess contractor performance in analysis and assessment and use in bid assessment.
4 to 5	Incorporate global experience of anomaly assessment into the improvement of systems and procedures. Develop tools and techniques for assessment of anomalies. Develop training materials and tools and disseminate to relevant staff.

Process P3.2.2 – Assure integrity	
Assurance of the integrity of the installation based on data from the inspection programme including comparison with acceptance criteria and required lifetime.	
1 to 2	Ensure assurance reporting is based on findings and agreed criteria. Introduce evaluation of barrier condition
2 to 3	Develop formal procedures to demonstrate the in-place integrity and comparison with defined and agreed acceptance criteria and integrate these into the company. Ensure findings from inspections and repairs are incorporated into integrity models. Ensure resources are in place to maintain integrity modules and analysis methods for integrity assurance.
3 to 4	Introduce the use of trend data from any degradation of components to assure integrity, including extrapolating any degradation through to expected installation life. Review results from research and development into the behaviour of components and the effects of degradation on integrity assurance.
4 to 5	Collate organisation wide information on integrity assurance into local procedures. Selection of tools and methods for integrity assurance based on industry wide experience Adapt organisation to incorporate best practice in integrity assurance.

Process P3.2.3 – Compare KPIs with requirements	
Quantitative measurement of the performance and capability of the installation by comparison of a set of key performance indicators (KPIs) that relate directly to integrity (strength, durability and condition, etc.) with pre-defined acceptance criteria for those KPIs. Note – This process is only applicable if KPI's have been defined. If there are no KPI's the maturity level for this process cannot exceed 1.	
1 to 2	Develop KPIs and performance requirements based either on previous practice or using limited personnel in the organisation.
2 to 3	Document specific KPIs for each installation and compare inspection results and repair data against these performance requirements KPIs. Ensure any discrepancies with KPIs are made known to management and appropriate remedial or mitigating measures are put into place.
3 to 4	Use long term trend data on performance in the comparison with KPIs and address any predicted shortfall though remedial or mitigation measures. Collect appropriate research and development data on the effect of degradation on barrier performance and use in predictions of achieving future KPIs performance requirements.
4 to 5	Collate corporate knowledge and experience of the management of KPIs to improve the understanding of barrier performance and degradation. Develop R&D to improve understanding of barrier performance and definition of KPIs

Process P3.2.4 – In-place structural assessment	
Comparison of the static or quasi static strength and stability of the installation (resistance) with the applied loadings (actions)	
1 to 2	Prepare basic procedure for in-place structural assessment Ensure computer analysis tools are suitable.
2 to 3	Prepare and document detailed in-place analysis brief Ensure computer analysis tools are appropriate for and optimized for offshore structures (e.g. automatic wave loading and appropriate code checking built in)
3 to 4	Establish and resource mechanisms to collate and incorporate feedback from assessments from internal and external experience (other facilities / other operators, contractors and regulators). Introduce training on analysis methods and techniques
4 to 5	Continuously review and revise in-place analysis procedures by selecting and implementing best practice tools and methods and by modifying organizational structure if necessary Provide resources (time and money) to develop methods and tools to improve in-place assessment practice

Process P3.2.5 – Fatigue assessment	
Comparison of the fatigue strength of the installation with the total required life and the varying loadings	
1 to 2	Prepare basic procedure for Fatigue structural assessment Ensure computer analysis tools are suitable.
2 to 3	Prepare and document detailed Fatigue analysis brief Ensure computer analysis tools are appropriate for and optimized for offshore structures (e.g. automatic wave loading and calculation of fatigue damage).
3 to 4	Establish and resource mechanisms to collate and incorporate feedback from assessments from internal and external experience (other facilities / other operators, contractors and regulators). Introduce training on analysis methods and techniques
4 to 5	Continuously review and revise Fatigue analysis procedures by selecting and implementing best practice tools and methods and by modifying organizational structure if necessary Provide resources (time and money) to develop methods and tools to improve Fatigue assessment practice

Process P3.2.6 – Assessment of robustness (redundancy, tolerance to damage)	
Evaluation of the tolerance of the structure to variations in the physical arrangement of the structure and to variations in the applied loadings	
1 to 2	Prepare basic procedure for Analysis of robustness structural assessment Ensure computer analysis tools are suitable.
2 to 3	Prepare and document detailed Analysis of robustness analysis brief Ensure computer analysis tools are appropriate for and optimized for offshore structures (e.g. automatic wave loading and calculation of Analysis of robustness damage).
3 to 4	Establish and resource mechanisms to collate and incorporate feedback from assessments from internal and external experience (other facilities / other operators, contractors and regulators) . Introduce training on analysis methods and techniques
4 to 5	Continuously review and revise robustness analysis procedures by selecting and implementing best practice tools and methods and by modifying organizational structure if necessary Provide resources (time and money) to develop methods and tools to improve Analysis of robustness assessment practice

Process P3.3 – Management Reporting	
To assess the adequacy of the reporting to asset and organisation management the condition of the installation’s barriers and the need for future maintenance expenditure and the on-going effects of ageing	
1 to 2	Management reporting follows previous practice but may not give management an appropriate understanding of either the condition of the installation’s barriers, specific maintenance or inspection requirements, or the increasing integrity management requirements due to ageing.
2 to 3	Formal procedures in place for management reporting, such procedures will define how the condition of the installation is reported, and will describe the extent of anomalies within the installation and the assessment and mitigation of anomalies.
3 to 4	Future requirements for integrity management will be defined in management reporting which will include the consequences of ageing and life extension and the associated resource allocation implications.
4 to 5	Management feedback (clarity and comprehensibility of the report, management understanding and reaction to changing integrity management needs {particularly resources}) used to modify procedures for reporting and content and presentation of reports.

Process P4.1 – Evaluation of effectiveness of inspection programme	
Evaluation of the effectiveness of the inspection programme for reporting and input to future development of the inspection strategy.	
1 to 2	Evaluate effectiveness of inspection programme, based on historical practice
2 to 3	Document procedures for evaluating effectiveness of inspection programme, which include reporting and input to development of future inspection strategy.
3 to 4	Evaluate effectiveness of inspection programmes and use to update inspection and reporting processes. Train appropriate personnel in evaluation of inspection programmes.
4 to 5	Use global experience to determine best practice for the evaluation of the effectiveness of the inspection programme. Research and develop appropriate tools and techniques. Develop and disseminate training materials for the evaluation of the inspection programme.

Process P4.2 – Improvement of barrier performance	
To identify the need for improvements to barrier performance by comparing KPIs or Performance Standards against actual performance To report any need for improvements to management. To undertake improvements to barriers and barrier performance where appropriate.	
1 to 2	Introduce evaluation and execution of barrier performance either from previous practice or using limited personnel.
2 to 3	Develop written procedures for evaluation of improvements to barrier performance and ensure operated throughout the company. Allocation of resources made to enable appropriate execution of improvements to barrier performance within the organisation. Schedule platform operations to facilitate execution of barrier performance improvements.
3 to 4	Evaluate improvements to barrier performance and update process regularly based on feedback
4 to 5	Collate industry wide experience on improving barrier performance to achieve best practice

Process P5.1 – QA/ QC	
To demonstrate QA/QC practices in barrier management, including selection and verification of contractors, validation of techniques and tools and handling of non-conformances.	
1 to 2	Implement basic internal checking and auditing procedures.
2 to 3	Document and implement QA procedures which conform to national or international standards Undertake formal audits on both organization and SIM contractors
3 to 4	Use feedback to improve processes and practices in both itself and in its contractors. Document improvement plans for all processes in SIM, based on QA/QC findings Train QA/QC personnel, both in the duty holder and SIM contractors
4 to 5	Develop improved tools for QA/QC for SIM with appropriate resources in place Engage in national and international initiatives for development and improvement of QA/QC standards for SIM Develop training in QA/QC to achieve appropriate levels of competency in relevant personnel, both in the duty holder and SIM contractors

Process P5.2 – Independent verification	
To manage the use of independent verification of programmes and assessments associated with barrier management.	
1 to 2	Develop verification procedures based on historical practice.
2 to 3	Document and implement procedures for independent verification, which include selecting appropriate verifier(s)
3 to 4	Update verification procedures based on previous experience Review verification recommendations and act upon them where appropriate
4 to 5	Determine global best practice for independent verification and incorporate into procedures

Process P5.3 – Awareness & education	
To create awareness of hazards and risks in managing barriers and to provide teaching to disseminate knowledge of them to a wider community.	
1 to 2	Awareness and education of management of barriers based on previous practice or not fully documented and operated by a limited number of personnel in the organisation.
2 to 3	Formal procedures in place for an awareness and education of the management of barriers and operated throughout the company.
3 to 4	Awareness and education of the management of barriers updated regularly based on feedback and the process modified accordingly.
4 to 5	Industry wide experience of the management of barriers used to inform the awareness and education programme in order to achieve best practice.