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Revised Structural Integrity Management Capability Maturity Model incorporating sub-processes for life extension



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#### Summary

As part of PSA's project on how to address life extension of Norwegian Continental Shelf installations, the earlier Capability Maturity Model for Structural Integrity Management has been extended to explicitly assess life extension considerations. This report includes the entire model including maturity descriptions and improvement steps for all processes and sub-processes.

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### 1. Introduction

The 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.

The 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, 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.

PSA invited Poseidon to be involved in an audit on structural integrity management of a Norwegian installation using the above model. In addition based on recent work for the Energy Institute [1] it was proposed to extend the existing model by developing sub-processes for several of the main processes listed above. These have the advantage that, in carrying out an audit, an area of potential weakness can be assessed in more depth than by using the core processes alone. As an example "allocation and management of resources to achieve SIM" appears in the first main process. However it could be important in its own right and it was proposed to bring it out as a sub-process with its own description and maturity levels. The project contributes to the development of structural integrity management audits at PSA, and contributed to the execution of an audit on one operation. The work was performed with a close relationship to the PSA in order to ensure a consensus on the implementation of premises and boundaries.

This project was aimed at updating the SIM CMM Model taking into account PSA's experience from recent audits and new knowledge, new or updated processes.

In addition the authors were invited to prepare and participate in an audit towards one operator in conjunction with PSA. The learnings form this were incorporated into the updating of the SIM CMM model as necessary.



## 2. Terminology

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

Structural Integrity Management 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.
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.

# 3. Background – Previous work on SIM CMM & proposed modifications

## 3.1. Background

In a previous study for PSA (undertaken via Cranfield University [2], 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. It is based on seven key processes which are shown in Table 1.



#### Table 1: Descriptions of the seven core processes for structural integrity management

	Title of process	Description
1	Develop overall SIM philosophy and condition monitoring strategy	Develop a philosophy and strategy to ensure that adequate levels of structural integrity are maintained at all times.
2	Establish long term Structural Integrity Management programme and	Prepare an overall plan for conduct of the maintenance program and corrective maintenance activities.
	emergency preparedness	Develop emergency preparedness for structural damage in connection with extreme conditions and accidents.
3	In-service inspection planning, offshore execution	Detection and characteristic description of any damage / defects, as well as information on corrosion protection and condition.
4	Data logging, evaluation, analysis & assessment	Confirm that acceptance criteria are met or that ongoing inspection is suitable, recommend any remedial measures or a revision of inspection plan.Maintain an up to date management system for results and evaluations from condition monitoring programme throughout the lifetime of the installation.
5	Implementation of repair and mitigation measures	Initiate and implement remedial or mitigation measures so that an adequate level of safety is maintained as is reasonably practicable.
6	Integrity assurance & reporting, evaluation of effectiveness of programme	Document the system and acceptance criteria applied to in-service inspection planning, offshore execution, result evaluation and assessment.Conduct an evaluation to confirm that the acceptance criteria are met, or need for revision of inspection plan.
7	Internal checking & auditing of management processes	Check that structural integrity management processes are carried out according to the overall plan for conduct of the maintenance program.

These seven processes define structural integrity management and are closely linked to those inherent in NORSOK N-005 [3]. The links between the seven processes are demonstrated in Figure 1, below. It is noted that Process 7 (Internal checking & auditing of management processes) is located centrally in the figure, showing its link to all other processes.

For each of the seven key processes descriptions were developed for each of the five maturity levels, ranging from initial (level 1) to optimised (level 5). When applied to an organisation these enable maturity levels to be defined for each of the key processes. Improvement steps were also devised so that an organisation can see the steps necessary to move to a higher maturity level.





Figure 1 – Maturity Model for Managing Structural Integrity

The initial model was trialled using a volunteer from one of the major Norwegian oil companies. A number of improvements were identified and incorporated in the descriptions of the maturity levels and in the improvement steps.

The model has been used by PSA in audits. In addition the model was used in a formal audit in September 2006, involving PSA and the authors of this report. The benefits and limitations of the current model were identified and a report prepared [4]. Some further improvements of the model were identified and are considered below.

#### 3.2. Development of sub-processes

As a result of both audits undertaken by PSA and the authors and further development of a separate Maturity Model for Asset Integrity Management [1] for the Energy Institute some further modifications of the original SIM CMM model were identified. These are:

- Preparation of an Information Package that could be sent out pre-audit, based on a model developed for the Energy Institute [1], see section 2 and annex 1.
- Preparation of a set of generic improvements steps, which could be applied to any process. (see section 4).



- The inclusion of sub-processes related to the main processes. This had proved successful in the Energy Institute project [1] and was planned to be implemented in this project (see section 5).
- Modification of the content of Process 1 (Develop overall philosophy and strategy for condition monitoring) to include the issue of understanding of structural limitations and weaknesses. This was based on the concerns that the management of a major oil company lacked appreciation of the structural limitations of their installations.
- The issue of competence/training had been identified in the work for the Energy Institute and was seen as very important in resourcing activities. The current descriptors would be reviewed with this in mind.
- The preparation of "Supporting Processes" aiding the seven key processes. This approach had been used in the Energy Institute model [1]. PSA indicated an interest in the following complementary processes:
  - Recognition and handling of unconventional and unfamiliar structural features
  - Management of safety, competence and quality in the supply chain
  - Managing approach to R&D and learning from experience

These are developed in section 6.

#### 3.3. Incorporation of life extension sub-processes

During 2006 and 2007 Poseidon have been assisting PSA in the development of their approach to life extension, this work is reported in references [5] and [6]. In addition Poseidon have assisted PSA in an audit of the structural Integrity Management by an operator of a Norwegian Continental Shelf development with signs of ageing and approaching life extension [7]. The learnings from these projects has been captured in the addition of sub-processes specifically addressing life extension. These new sub-process have been defined along with descriptions of the maturity levels and the various improvements steps.

The sub-processes that have been introduced to address ageing and life extension are shown below:

Main process	Sub-processes	Description
1.Develop overall SIM philosophy & life-cycle condition monitoring strategy	1.3 Definition of ageing effects	To understand the causes and effects of ageing on structures and include them in developing the philosophy and the budgeting process.
4.Data logging, evaluation, evaluation and assessment	4.3 Assessment for life extension	To establish the platform condition, including review of loadings, assessment of resistance and application of acceptance criteria



Several of the other processes and sub-processes have, however, been modified to address ageing and life extension considerations, these are shown below:

Main process	Sub-processes	Agein g	Life extension
1 Develop overall SIM philosophy & life-	1.1 Development of SIM philosophy		$\checkmark$
. cycle condition monitoring strategy	1.2 Definition of high level acceptance criteria		✓
	1.3 Definition of ageing effects	$\checkmark$	
	1.4 Allocation & management of resources	~	~
	1.5 Understanding of structural performance, strengths and limitations	$\checkmark$	~
2.Establish long term inspection programme and emergency preparedness	2.1 Definition of long-term platform- specific inspection programmes	~	$\checkmark$
3.In-service inspection planning and offshore execution	3.1 Inspection planning	$\checkmark$	
4 Data logging, evaluation, evaluation and . assessment	4.2 Evaluation, analysis and assessment of inspection data	~	
	4.3 Assessment for life extension	$\checkmark$	$\checkmark$
5.Implementation (design and execution) of repair and mitigation measures	5.1 Determine requirements for repair and mitigation measures	$\checkmark$	
6 Integrity assurance and reporting,	6.1 Assurance of integrity	$\checkmark$	$\checkmark$
. evaluation of effectiveness of SIM	6.2 Evaluation of effectiveness of inspection programme	~	~
	6.3 Management reporting	$\checkmark$	$\checkmark$

## 4. 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. A similar pack has been developed for the Energy Institute project and this has provided a useful source for the current pack. 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 SIM maturity model
- Application of the structural integrity model
- 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 1.

#### 5. Generic improvement steps

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

## 6. Development of maturity descriptions for sub-processes

The Cranfield work developed the main processes and provided the descriptions, maturity levels and improvement steps to accompany them. In practice it was found that the process descriptions were too coarse to determine the overall maturity in all aspects of each process.

A number of sub-processes have been proposed to enable more definitive assessment of an organisation's capability in each of the main activities associated with each key process. A total of 21 sub-processes are proposed shown in Table 2 below.

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

	Main process	Sub-processes	Description
1. Develo SIM pl life-cy condit monito strate	Develop overall SIM philosophy & life-cycle condition	1.1 Development of SIM philosophy	To develop an SIM philosophy document which includes details of acceptance criteria, in-service inspection, evaluation and assessment methodology and reporting.
	monitoring strategy	1.2 Definition of high level acceptance criteria	To define a set of criteria for managing structural integrity, to be applied to other processes, particularly Process 6.

## Table 2 Set of sub-processes for the seven core processes involved in managing structural integrity



	Main process		Sub-processes	Description
		1.3	Definition of ageing effects	To understand the causes and effects of ageing on structures and include them in developing the philosophy and the budgeting process.
		1.4	Allocation & management of resources	To estimate and approve resources (money, personnel, logistics, infrastructure, production requirements) to meet the SIM philosophy.
				To create the organisation accordingly and define responsibilities.
		1.5	Understanding of structural performance, strengths and limitations	To ensure that the asset team understand any significant structural limitations weaknesses and vulnerabilities of their installation.
2.	Establish long term inspection programme and emergency	2.1	Definition of long-term platform-specific inspection programmes	To define long-term platform-specific inspection programmes based on the agreed SIM strategy and incorporating platform history and characteristics together with the effects of ageing.
	preparedness	2.2	Development of emergency preparedness	To develop technical, operational and management measures (including derivation of any data on structural limitations and failure scenarios) that are planned to be implemented under the management of the emergency response organisation in case of hazardous or accidental situations occurring, in order to protect human and environmental resources and assets.
3.	In-service inspection planning and offshore execution	3.1	Inspection planning	To plan platform specific topsides and sub-sea inspection programmes, including specific requirements related to ageing.
		3.2	Execution of inspection	To manage and complete in-service inspection programmes.
		3.3	Reporting	To set up procedures for recording, evaluating and reporting of inspection results
4.	Data logging, evaluation,	4.1	Management of SIM information	To collect and record data from the inspection programmes.
	evaluation and assessment	4.2	Evaluation, analysis and assessment of inspection data	To assess data from the inspection programmes, identifying any deviations from requirements, assessing trends potentially due to ageing and determining requirements for repair/mitigation.
		4.3	Assessment for life extension	To establish the platform condition, including review of loadings, assessment of resistance and application of acceptance criteria
		4.4	Development of DFI résumé	To establish and develop data and information required for the design, fabrication and Installation (DFI) résumé.



	Main process		Sub-processes	Description
5.	Implementation (design and execution) of repair and	5.1	Determine requirements for repair and mitigation measures	To determine what repair and mitigation measures are required to maintain structural integrity based on feedback from the inspection programme and from the assessment of ageing.
	mitigation measures	5.2	Plan & undertake remedial actions	To plan and carry out the remedial actions identified above.
6.         	Integrity assurance and reporting, evaluation of	6.1	Assurance of integrity	To provide assurance of the structural integrity of the installation based on data from the inspection programme including comparison with acceptance criteria and required lifetime.
	effectiveness of SIM	6.2	Evaluation of effectiveness of inspection programme	To evaluate the effectiveness of the inspection programme for reporting and input to future development of the inspection strategy.
				To ensure that lifetime SIM acceptance criteria are relevant.
		6.3	Management reporting	To assess the adequacy of the reporting to asset and organisation management the condition of the structure and the need for future maintenance expenditure and the ongoing effects of ageing
7.	Internal checking and audit of management processes	7.1	QA/QC	To demonstrate QA/QC practices in SIM, including selection and verification of contractors, validation of techniques and tools and handling of non-conformances.
		7.2	Independent verification	To manage the use of independent verification of programmes and assessments.

Descriptors for five maturity levels for each of the 21 sub-processes have been prepared and are shown in Annex 3.

## 7. Development of maturity descriptions for supporting processes

A set of descriptions for maturity levels for three supporting processes have been developed, which are for:

- Recognition and handling of unconventional and unfamiliar structural features
- Management of safety, competence and quality in the supply chain
- Managing approach to R&D

These are shown in Annex 4.



### 8. Recommendations & conclusions

- The SIM CMM Model has been updated based on feedback from audits and from experience gained from another related project [1].
- The model now includes seven core processes with 21 sub-processes, and 3 supporting
  processes. Maturity descriptions have been developed for all of these 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 subprocesses 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 an audit and any limitations taken into account by further modifications to the maturity descriptions.

## 9. References

[1] Energy Institute, Capability Maturity Model for Maintenance Management, for a group of sponsors, November 2007

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

- [3] NORSOK Condition Monitoring of Loadbearing Structures, N-005
- [4] Earlier confidential report to PSA on SIM audit (September 2006)

[5] Poseidon Group AS, Recommendations for design life extension regulations, February 2007, Poseidon International Ltd, POS-DK06-195-R02

[6] Poseidon Group AS, Specialist Support on Structural Integrity Issues, November 2007, Poseidon International Ltd, POS-DK07-136-R01

[7] Confidential report to PSA on SIM audit (2007), POS-DK07-138-R02



## Annex 1. Information Package

The 20 PowerPoint slides below provide a brief introduction to the capability maturity model and its application to structural integrity management.







Core Process	Description	P	rocess 1 Develop overall philosophy and strategy for condition monitoring	
1	Develop overall philosophy and strategy for condition monitoring		<ul> <li>How well the organisation develops and implements the life cycle strategy for SIM, taking account of production requirements, national regulations, relevant codes &amp; standards, undates to standards, company standards [ife evelopsing requirements]</li> </ul>	
2	Establish long term SI management programmes		in defining the integrity requirement.	
3	In-service inspection planning, offshore execution & reporting	٠	How well the organisation allocates and manages resources to achieve SIM (time, appropriate personnel, information and money) $\label{eq:stable}$	
Δ	Data logging, evaluation & assessment, emergency	Sub-	processes	
	preparedness	1.1	Development of structural integrity management philosophy	
5	Implementation of repair and mitigation measures	1.2	Definition of high level acceptance criteria	
	Integrity assurance & reporting, evaluation of effectiveness of	1.3	Definition of ageing effects	
6	programme	1.4	Allocation & management of resources	
7	Internal checking & auditing of management processes,	1.5	Understanding of structural performance, strengths & limitations	
7	Internal checking & auditing of management processes,	1.5	Understanding of structural performance, strengths & limitations	

## Process 2 Establish long term SI management programmes

 How well the organization interprets and assimilates the management strategy in developing a long term platform specific SIM programme incorporating platform characteristics

#### Sub-processes

- 2.1 Definition of long term platform-specific inspection programmes
- 2.2 Development of emergency preparedness

## Process 3 In-service inspection planning, offshore execution & reporting How well the organisation plans, develops and manages platform specific topsides

 How well the organisation plans, develops and manages platform specific topsides and subsea inspections

#### Sub-processes

3.1 Inspection planning

3.2 Execution of inspection

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3.3 Reporting

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		Construction of the second second second
Supporting	Description	"Steps necessary for an organisation to progress to a higher maturity level"
1	Recognition and handling of unconventional and unfamiliar structural features	<ul> <li>Steps described to enable an organisation to move from:</li> </ul>
2	Management of safety, competence and quality in the supply chain	• level 1 $\Rightarrow$ level 2,
3	Managing approach to R&D	<ul> <li>level 2 ⇒ level 3,</li> <li>level 3 ⇒ level 4,</li> </ul>
		• level 4 $\Rightarrow$ level 5
		in each of the core processes
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Termin	nology (with abbreviated examples)	
SIM Policy	High level statement reflecting corporate / asset needs for the installation: e.g. the installation shall support the current topsides load with a probability of failure of less than $1 \times 10^4$ until year 2020	Conclusions     Structural Integrity (SI) Management Maturity Model is a
SIM Philosophy	Produced by engineering, but should be endorsed by management, outlining the how the installation shall be maintained: e.g. cost effective inspection techniques will be deployed to ensure any anomalies are identified in sufficient time to allow cost effective remedial measures to be undertaken to ensure the adequate performance of the installation	capability in each of the core processes which constitute offshore structural integrity management
SIM Strategy	Details the techniques used for assessment of the installation and the quality and extent of inspections; Techniques that can be used for anomaly assessment should also be addressed: e.g. Analyses will be undertaken using best available data on metocean and deck loadings and of structural resistances, a cost effective mix of ROV inspections and detailed weld inspections shall be used and fracture mechanics assessments may be used to calculate remaining lives at defects	<ul> <li>Defines characteristic processes in SI management, describes maturity levels and improvement steps for each</li> <li>Seven core processes, with 21 sub-processes and three supporting processes</li> <li>Can be applied to the key organizations involved in SI</li> </ul>
Inspection Programme	Details which parts of the structure are to be undertaken together with the timings for such inspections and the minimum quality of inspection of each part of the installation. Acceptance criteria for reporting of defects shall be deleted and criteria for any remedial work that can be taken by the inspectors without engineering advice can be defined.	management – at different levels in the organization – responses can be collated and improvement steps considered
-		177110007 30



## Annex 2. 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 3. Maturity descriptions & improvement steps for complete-processes

Pre	Process 1 Develop overall SIM philosophy and life-cycle condition monitoring strategy		
To develop an SIM philosophy document which includes details of service requirements (life, loadings), acceptance criteria, in-service inspection, evaluation and assessment methodology and reporting			
	Description of Maturity Level	Improvement steps to next level	
1.	No planning at management level for SIM strategy or accident/incident investigation with limited allocation of resources	Develop managerial awareness of need to set SIM strategy and be aware that there are legislative requirements to be met	
		Collate existing corporate practice in setting SIM strategy and high level acceptance criteria	
2.	<ol> <li>No management level consideration of installation specific SIM requirements, strategy and accident/incident investigation based on available preceding practice only.</li> <li>High level acceptance criteria follows previous corporate practice but does not consider asset (reservoir etc) needs.</li> </ol>	Develop process for determining long-term needs of the facility and incorporate these requirements, into defining SIM strategy	
		Define process for setting high level acceptance criteria	
prev con		Develop/have in place a mechanism for effective communication and liaison between all involved in determining SIM requirements (e.g. asset management team, corporate facilities engineering, reservoir management).	
		Allocate resources to appropriate departments and at appropriate time to develop and disseminate SIM strategy and high level acceptance criteria	



Process 1 Develop overall SIM philosophy and life-cycle condition monitoring strategy			
To loa an	To develop an SIM philosophy document which includes details of service requirements (life, loadings), acceptance criteria, in-service inspection, evaluation and assessment methodology and reporting		
	Description of Maturity Level	Improvement steps to next level	
3.	High level acceptance criteria defined in terms of performance requirements Corporation has defined processes for SIM understood by all involved in SIM (does not	Establish and resource mechanisms to collate and incorporate feedback from platform-specific SIM activities and from external experience (other facilities / other operators, contractors and regulators) into revising SIM strategies.	
	need to be documented but in all cases requires validation throughout organization)	Establish and resource mechanisms to continuously revise acceptance criteria based on accumulating SIM experience and changing asset needs, e.g.	
	Process in place for defining SIM strategy for each platform based on:	assess interactions between developing asset needs and structural capacity	
	corporate policy,	Develop process for Corporate units to disseminate	
	<ul> <li>platform characteristics (strength utilizations, fatigue lives, consequences of failure &amp; DFI data)</li> </ul>	feedback from internal SIM and from external organizations	
	<ul> <li>production requirements (forecast reservoir life etc)</li> </ul>	their role in promoting, executing and improving SIM.	
	Adequate resources allocated to develop, implement and improve long-term asset or area specific SIM programmes		
	Accident/incident investigation process is defined and implement if necessary		
4.	High level acceptance criteria developed and modified in line with changes in perceived	Optimize corporate management team to deliver best practice in SIM	
	asset (reservoir etc) needs and risk reduction requirements	Optimize feedback and dissemination of experience from corporate SIM experience collated from all	
	The asset or area specific SIM strategy is routinely reviewed and modified based on feedback from SIM teams and corporate	platforms(local and international) and use to assist both industry and local regulator in developing and refining future SIM requirements and methods	
	organization and experience from other operators, contractors and the regulator	Allocate resources to achieve setting of "best practice" in SIM including where necessary reorganization of departments and personnel and	
	Resources available to facilitate feed back into philosophy and strategy (including supporting suitable mechanisms such as inter-company meetings)	development of tools	
	Accident/incident investigation process contains flexibility to react to requirements of any accident/investigation. Processes in- place to feed learnings back into modification, maintenance and operation of the installation		



Process 1 Develop overall SIM philosophy and life-cycle condition monitoring strategy	
To develop an SIM philosophy document which includes details of service requirements (life, loadings), acceptance criteria, in-service inspection, evaluation and assessment methodology and reporting	
Description of Maturity Level	Improvement steps to next level
<ul> <li>5. Management is proactive in identifying improvements to strategy, practice and setting of high level acceptance criteria based on own experience, risk reduction requirements and experience of other parts of the industry</li> <li>Management reviews implementation of SIM and modifies its organizational structure if required to optimize management of SIM</li> <li>SIM experience collated from all platforms and used to assist industry (nationally and internationally) and local regulator (PSA) in developing and refining future requirements and methods</li> <li>Organization is active in developing and improving tools for SIM strategy (both engineering and inspection) with sufficient resources available</li> <li>Accident/incident investigation exploits best international practice and learnings for back</li> </ul>	
throughout organization and into regulators and other companies.	



Pro	Process 2 Establish long term inspection programme and emergency preparedness		
To an	To define long-term platform-specific inspection programmes based on the agreed SIM strategy and incorporating platform history and characteristics together with the effects of ageing		
Description of Maturity Level		Improvement steps to next level	
1.	Team approaches SI issues on an ad hoc basis	Prepare basic procedures for emergency response	
	No long term platform specific SIM programme	Collate previous inspection practice as a basis	
	No preparedness for structural incidents (ship impacts, dropped objects etc)	programme	
2.	. Inspection planning uses an industry standard practice or follows previous inspection practice only, rather than addressing the characteristics of each platform	Develop and disseminate emergency response procedures which include incorporation of analysis, assessment and mitigation into response	
	Emergency preparedness for structural incidents follows pre-set procedure (e.g. checklists) but does not allow flexibility to address specifics of an actual incident	Develop and implement long-term platform- specific inspection programme which incorporate corporate policy, platform characteristics and production requirements	
		Asset management provides appropriate resources for developing long-term platform-specific inspection programme	
3.	Team follows management requirements and implements long-term platform specific inspection programme with appropriate resources available	Establish and resource mechanisms to collate and incorporate feedback from platform- specific SIM activities and from external experience (other facilities / other operators.	
	Organization has a validated DFI resumé for all structures	contractors and regulators) .	
	Emergency Preparedness includes defined processes for incorporation of analysis, assessment and appropriate mitigation into response	Revise long-term inspection programmes and emergency preparedness as necessary, based on continuous feedback	
		Improve DFI resumes for all structures by acquiring and validating missing data	
	Management strategy, installation condition and characteristics incorporated into determining long term platform specific programmes i.e. addresses	Provide sufficient resources for emergency response assessment including developing and maintaining computer models, hardware and software	
	corporate policy,		
	<ul> <li>platform characteristics and condition (strength utilizations, fatigue lives, consequences of failure, DFI data, previous inspection results)</li> </ul>		
	<ul> <li>production requirements (forecast reservoir life etc) )</li> </ul>		



Pr	Process 2 Establish long term inspection programme and emergency preparedness		
To an	To define long-term platform-specific inspection programmes based on the agreed SIM strategy and incorporating platform history and characteristics together with the effects of ageing		
Description of Maturity Level		Improvement steps to next level	
4.	Emergency Preparedness has various tools available including computer models, hardware and software for immediate assessment of incidents	Continuously review and revise emergency preparedness by selecting and implementing best practice tools and methods and by modifying organizational structure if necessary	
	Organization has created DFI resumé for each structure including all available data and by acquiring necessary missing information by additional sampling and testing	Continuously review and revise long-term inspection programmes by evaluating and incorporating feedback and experiences from all available sources (local and international)	
	Experience from previous SIM activities (including partners and contractor experience) compiled and applied to improve SIM strategy and long term programmes	Provide resources (time and money) to develop methods and tools to improve SIM practice	
	Management provides sufficient resources to enable feedback for the improvement of long term inspection and emergency preparedness processes		
5.	Organization has carried out comprehensive review (utilising best practice tools and methods) of potential structural failures to optimise Emergency Preparedness effectively, including modifying the organisational structure		
	Organizational structure adapts to optimize long- term inspection programmes from corporate and external SIM experience		
	Long term planning is best practice based on evaluating and implementing appropriate feedback both from internal and external sources		
	Organization is active in developing and improving tools for SIM programme development with sufficient resources available		



Pre	Process 3 In-service inspection planning and offshore execution		
To rec	To plan platform-specific topsides and sub-sea inspection programmes, including specific requirements related to ageing		
	Description of Maturity Level	Improvement steps to next level	
1.	No operator involvement in planning inspections	Develop managerial awareness of need for planning of inspections and be aware that there are legislative requirements to be met	
		Document previous practice as basis for inspection planning	
2.	. Planning delegated to offshore contactor without operator technical input (from Process 2) based on previous practice	Develop and implement procedures to translate long-term programme into annual work scopes including defining tools and resources needed	
	Inspection planning follows previous practice without input from or into long-term programme	Develop and implement procedures for approval and use of competent, experienced and qualified inspectors	
		Develop and implement procedures for recording inspection results, preparing summary reports and for initiating assessments of anomalies etc.	
3.	Procedures in place for translation of long term programme into annual workscopes taking account of operational requirements and resource constraints (if done by contractor – need to demonstrate contractor competence)	Establish resource and implement mechanisms to collate and incorporate feedback from inspection activities and from external experience (other facilities / other operators, contractors and regulators) into revising subsequent	
	Procedures for execution of inspection workscopes define extent and tools for each inspection and resources needed	annual plans and work scopes Establish resource and implement mechanisms to monitor contractor	
	Procedures and verification in place for approval and appointment of inspectors with respect to competence, expertise and qualifications	performance to improve bid assessments and execution of inspection contracts	
	Formal recording of inspection results and preparation of summary reports identifying all significant exceptions and the extent of completed inspections	Encourage and facilitate communication and collaboration between (contractor's) inspectors and operator's engineers to allow "real-time" modifications to work- scope when deviations (anomalies) are	
	Operator involved in QC to ensure completion of workscope and facilitate communications between inspectors and operator's engineers	identified	



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Process 3 In-service inspection planning and offshore execution			
To rec	To plan platform-specific topsides and sub-sea inspection programmes, including specific requirements related to ageing		
	Description of Maturity Level	Improvement steps to next level	
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 QC practice allows "real-time" modification of workscope based on inspection findings including communications with operator's engineers Appropriate resources made available for planning managing and implementing inspection, offshore execution and reporting to enable improvement steps (I 13)	Continuously review and revise inspection practice by selecting and implementing best available tools and methods and by modifying organizational structure if necessary Continuously review and revise inspection practice by evaluating and incorporating feedback and experiences from all available sources Provide resources (time and money) to research and develop improved tools and techniques for inspection	
	Operator has QA process in place for contractor based inspection		
5.	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		
	Worldwide experience used to assist selection of tools and techniques to achieve SIM requirements		
	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		



Pre	Process 4 Data logging, evaluation, analysis and assessment		
То	To collect and record data from the inspection programmes		
	<b>Description of Maturity Level</b>	Improvement steps to next level	
1.	Ad hoc treatment of data received from contractor	Develop basic filing system for Contractors inspection reports	
	No formalised retention of data for subsequent analysis	Develop criteria for assessment and acceptance of deviations (anomalies) and for application of mitigation methods based on previous projects	
2.	. Reports received from contractor retained but not collated or analysed	Develop system for recovering inspection data for use in assessment of deviations (anomalies)	
	Criteria established for assessment and acceptance of defects or definition of mitigation method	Develop defined practices with appropriate competences for assessment and setting of	
	Acceptance criteria for anomalies based only on previous projects	and for definition of mitigation methods	
3.	Criteria defined for reporting and referral of findings (to be demonstrated for inspectors and inspection co-ordinators)	Analyse inspection data and assessment results to identify trends and modify long-term inspection programmes and acceptance criteria	
	Defined practice in place with associated competences describing criteria and methods for assessment and acceptance criteria for anomalies, requirements for repairs, long and short term mitigation measures	Evaluate degradation mechanisms for assessment and analysis of future structure condition	
		Establish, resource and implement mechanisms to monitor contractor	
	Resources in place for data collection, assessment of defects and definition of repair or mitigation measures	performance in analysis and assessment to improve bid assessments and practice	
	Inspection data catalogued and recoverable		



Pre	Process 4 Data logging, evaluation, analysis and assessment		
То	To collect and record data from the inspection programmes		
	Description of Maturity Level	Improvement steps to next level	
4.	Inspection findings analysed to identify trends in structural performance Data trends are identified and used to modify long	Continuously review and revise data logging, evaluation, analysis & assessment by selection and implementing best available tools and methods and by modifying	
	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	organizational structure if necessary	
		Continuously review and revise data logging, evaluation, analysis & assessment by evaluating and incorporating feedback and	
		Provide resources (time and money) and encourage development of tools and techniques (including funding of appropriate	
	Contractor performance in analysis and assessment monitored and used in bid assessment to improve future performance	R&D and assessing efficacy of repair methods) for analysis & assessment	
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 and on efficacy of previous repairs applied to decision making on remedial measures		
	Resources and techniques adapted to promote and pursue best practice, including best use of internal and external specialists		

Pr	Process 5 Implementation (design and execution) of repair and mitigation measures		
De	Determine requirements for repair & mitigation measures		
	Description of Maturity Level	Improvement steps to next level	
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 entirely upon sub-contractor without management direction	Develop managerial awareness of possible need for repair and mitigation measures and be aware that there are legislative requirements to be met Collate and use previous repair practice	
2.	Repair and remedial measures follow previous practice with no overview of the efficacy of the repairs or remedial measures Repair criteria adopted from previous work without identifying context & requirements	Define methods for establishing installation specific repairs and mitigation measures Make available resources and tools for implementation of adequate repairs or mitigation measures on "as needed" basis	
3.	Defined methods for establishing adequate installation specific repairs or implementation measures Resources and tools made available for implementation of adequate repairs or mitigation measures based only on defined approaches	Establish resource and continuously implement mechanisms to collate and incorporate feedback from repair and mitigation activities and from external experience (other facilities / other operators, contractors and regulators) into improving repair design criteria Establish resource and continuously implement mechanisms to monitor contractor to improve future bid assessments and practice Encourage and facilitate communication and collaboration between repair contractor and operator to improve future performance	
4.	Experiences from preceding repairs captured and fed back into developing and improving future repair design criteria Contractor performance monitored and used in bid assessment and improve future performance Operator and contractor collaborate to identify difficulties encountered and provide resources and tools to improve future planning and execution	Continuously review and revise repair practices by selection and implementing best available tools and methods and by modifying organizational structure if necessary Continuously review and revise repair practices by evaluating and incorporating feedback and experiences from all available sources (local and international) Provide resources (time, money and offshore testing opportunities) and encourage development of repair tools and techniques (including funding of appropriate R&D) Continuously assess the market place for best available practice and contractors for repairs	



Pr	Process 5 Implementation (design and execution) of repair and mitigation measures	
De	Determine requirements for repair & mitigation measures	
	Description of Maturity Level	Improvement steps to next level
5.	Organization active in researching and developing repair techniques and materials	
	Worldwide experience used to assist selection of tools and techniques to achieve effective repairs	
	Repairs developed to account for planned lifecycle costs/benefits rather than short term	
	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 organization	



Process 6 Integrity assurance and reporting, evaluation of effectiveness of SIM						
To provide assurance of the structural integrity of the installation based on condition monitoring data including comparison with acceptance criteria, ageing and life extension requirements where appropriate						
	Description of Maturity Level	Improvement steps to next level				
1.	Ad hoc assurance reporting without comparison of findings with agreed acceptance criteria	Develop managerial awareness of need to carry out Integrity assurance & reporting and be aware that there are legislative requirements to be met				
		Put in place some basic procedures for integrity assurance for assessment of deviations (anomalies/defects etc) based on previous practices				
2.	. Integrity assurance based solely on assessment of specific defects and repairs	Develop processes to demonstrate and document integrity assurance and ensure that these are incorporated into the company practice				
	Formal integrity assurance or reporting of condition of structure to management and others based on previous projects	Prepare and maintain DFI resume using all available data				
		Develop and implement procedures for comparing anomalies with acceptance criteria and for creating, maintaining and updating structural integrity analysis models				
		Asset management provides appropriate resources for developing and maintaining structural integrity analysis models				
3. Formal procedures for demonstration of structural integrity in place which include comparison with defined and agreed		Management encourage evaluation of and feedback from integrity assurance to improve SIM, e.g. through use of continuous improvement plans				
	acceptance criteria and risk reduction requirements	Improve structural integrity models based on feedback from SIM (e.g. refinement of models in				
	Integrity assurance demonstrated by including immediate findings of inspections and repairs undertaken into structural integrity models	critical areas) and improve analysis and assessment methods				
	Resources in place to maintain structural integrity models and analysis methods required for integrity assurance					
	Organization has created DFI resumé for each structure including all available data					



Process 6 Integrity assurance and reporting, evaluation of effectiveness of SIM								
To da wh	To provide assurance of the structural integrity of the installation based on condition monitoring data including comparison with acceptance criteria, ageing and life extension requirements where appropriate							
	Description of Maturity Level	Improvement steps to next level						
4.	Effectiveness of SIM programmes assessed and both assurance and reporting processes modified accordingly Management encourage feedback into improving corporate and local SIM strategies Structural integrity models and analysis methods are improved based on experience from integrity assurance and on risk reduction requirements, with appropriate resources in place	Continuously embed and integrate integrity assurance processes within organisation Feedback from external organizations including regulators is used to improve integrity assurance process and methods Allocate resources to achieve implementation of "best practice" integrity assurance (including the reorganization of departments and personnel) Tools for integrity assurance are developed and optimised based on best available expertise (including all parts of oil & gas industry, other industries and R&D) with appropriate resources in place.						
5.	Organization aware of and contributing to improved integrity assurance theories, standards, techniques and tools, with suitable resources available. Industry wide experience used to assist selection of tools and techniques to achieve best practice integrity assurance Organization adapted to identify and incorporate best practices in integrity assurance & programme effectiveness							



Process 7 Internal checking & auditing of management processes							
To val	To demonstrate QA/QC practices in SIM, including selection and verification of contractors, validation of techniques and tools and handling of non-conformances						
	Description of Maturity Level	Improvement steps to next level					
1.	No internal checking, audit or verification of SIM activities with no formal procedures in place (C1	Develop managerial awareness of need to carry out internal checking and audit processes and be aware of associated legislative requirements to be met					
	No formal audit of management processes (QA) for SIM activities	Document and implement basic practices for internal checking and for auditing based on previous experience					
2.	. Procedures for internal checking and audit in place and implemented but based solely on previous experience	Develop processes to demonstrate internal checking and audit and ensure that these are defined, resourced and implemented within SIM programme (including contractors)					
	Minimal feedback of audit findings to SIM team members	Implement QA in line with international / national standards					
3.	Formal QA procedures in place and implemented which conform to national or international standards (including handling of non-conformances)	Put in place expertise and resources (time and money) for asset management to plan internal checking and audit into integrity assurance programme					
	Formal audits on both organization and SIM contractors undertaken based on above	Implement management systems to track and close- out actions arising from Internal checking and audit					
	procedures with appropriate resources available	Confirm that feedback from Internal checking and audit is used to improve SIM deliverables, e.g. through use of continuous improvement plans					
		Demonstrate management of Internal checking and audit process is completely embedded into SIM programme					
		Implement follow-up of audit actions on SIM and transfer lessons learned into corporate systems					



Process 7 Internal checking & auditing of management processes							
To demonstrate QA/QC practices in SIM, including selection and verification of contractors, validation of techniques and tools and handling of non-conformances							
	Description of Maturity Level	Improvement steps to next level					
4.	Resources in place for both procedure preparation, verification of procedures, audits and execution of improvement plans	Optimize corporate management team to deliver best company practice Continuously embed Internal checking and audit					
	Organization reviews processes and	processes SIM programme					
	practices in both itself and in contractors based on feedback and assimilation of industry initiatives on QA/QC	Corporate units disseminate experience from external organizations including regulators to improve Internal checking and audit					
	Organization actively involved in developing and improving SIM programmes and practices as a result of feedback from audits	Allocate resources to achieve implementation of "best practice" internal checking and audit (including the reorganization of departments and personnel)					
		Review requirement for Internal checking and audit and optimize contribution of specialist groups					
		Implement rigorous checking of Internal checking and audit procedures to ensure best practice in full co- operation with an independent and competent party.					
		Tools for internal checking and audit are optimized and based on best available with appropriate resources in place.					
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						
	Independent verification process optimised, based on selection of contractor and feedback to SIM and verification organisations						



## Annex 4. Maturity descriptions & improvement steps for subprocesses

Core Process	1. De	velop overall SIM philosophy and life-cycle condition monitoring strategy		
Sub-process			Description of Maturity Level	Improvement steps to next level
1.1 Developme SIM philosoph <i>[To develop al</i>	ent of y n SIM	1.	No SIM philosophy or condition monitoring strategy in place	Develop basic SIM philosophy and condition monitoring strategy
philosophy document which includes details of service requirements (life, loadings), acceptance criteria, in-service inspection, evaluation and assessment methodology and reporting]		2.	No management level consideration of installation specific SIM requirements, strategy based on available preceding practice only.	Document SIM philosophy and strategy and communicate within organisation.
		3.	Philosophy and strategy are documented and have been based on installation condition but are not updated to reflect changing circumstances.	Institute process for updating SIM philosophy and strategy including recognition of changes in the condition or life extension requirements.
		4.	Philosophy and strategy updated regularly to reflect any changes in expected loadings, the condition of installation and any life extension requirements.	Incorporate global experience (both from within and outside corporation) into account in updating SIM strategy and philosophy.
		The specific SIM philosophy is routinely reviewed and modified based on feedback from SIM teams and corporate organization and experience from other operators, contractors and the regulator.	Develop tools, techniques and training for SIM to optimise performance	
			Training introduced to support development of philosophy and strategy.	



Core 1. Develop overall SIM philosophy and life-cycle condition monitoring strate Process			
Sub-process	Description of Maturity Level	Improvement steps to next level	
	5. SIM philosophy 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 philosophy and strategy development		
	Management is proactive in identifying improvements to philosophy and 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		
1.2 Definition of high level acceptance	1. No acceptance criteria in place	Develop basic acceptance criteria.	
criteria [To define a set of criteria for managing structural integrity, to	2. Acceptance criteria based on fabrication inspection criteria, or on previous asset specific acceptance criteria	Document acceptance criteria and communicate through organisation as appropriate.	
be applied to other processes, particularly process 6]	3. Acceptance criteria are documented, may be specific to the location within the structure, but can be out of date.	Instigate regular reviews and updates of acceptance criteria based on condition of structure and life	
	High level acceptance criteria defined in terms of performance requirements	extension requirements	
	4. Acceptance criteria are regularly updated based on any changes in expected loadings, the condition of installation and any life extension requirements.	Include global experience into updates of acceptance criteria. Establish training for the	
	Training introduced to support development of acceptance criteria	development and use of acceptance criteria	
	<ol> <li>Acceptance criteria optimised by exchange of experience and utilisation of best available global practices.</li> </ol>		
	Improved training developed for key staff on derivation and understanding of acceptance criteria		



Core 1. De Process	velop overall SIM philosophy and life-cycle conc	lition monitoring strategy
Sub-process	Description of Maturity Level	Improvement steps to next level
1.3 Definition of ageing effects [To understand the causes and effects of	<ol> <li>No understanding of ageing processes, causes or effects.</li> </ol>	Develop basic understanding of ageing processes and their effects on the structural system
ageing on structures and include them in developing the philosophy and the budgeting process]	<ol> <li>Understanding based on previous experience (e.g. deterioration on other installations) but not specific to particular case. Budgets not updated to allow for inspection and mitigation for ageing effects.</li> </ol>	Document the ageing processes applicable to SIM, their effects on the structural system and how to recognise these effects; communicate as appropriate.
	<ul> <li>Causes and possible effects of deterioration are documented and regularly reviewed, SIM philosophy reflects these and budget</li> </ul>	Instigate regular reviews of the understanding of ageing processes and their effects.
	includes allowance for additional inspection and mitigation if appropriate.	Provide training to SIM staff on these ageing processes, their effects and recognition of those effects.
	<ol> <li>Ongoing experience of inspection and other data used to update the understanding of ageing and to modify the SIM philosophy and budget.</li> </ol>	Acquire and incorporate global experience of ageing causes and effects into SIM processes.
	Training provided to SIM staff in understanding causes, effects and recognition of ageing	Research ageing mechanisms where appropriate.
		Develop training materials and provide training to all relevant staff on ageing.
	<ol> <li>Worldwide experience of ageing used to increase understanding of ageing causes and effects; research undertaken if appropriate to understand ageing mechanisms.</li> </ol>	
	Training developed and provided to all relevant SIM staff.	
1.4 Allocation of management &	1. Ad hoc allocation	Develop basis of allocation of resources to SIM
[To estimate and approve resources (money, personnel,	2. Previous practice followed	Allocate resources to SIM based on the agreed philosophy and strategy for SIM and document.



Core Process	1. De	velop overall SIM philosophy and life-cycle condition monitoring strategy				
Sub-proc	ess		Description of Maturity Level	Improvement steps to next level		
logistics, infrastructure, production requirements) the SIM philos To create the	to meet ophy.	3.	Resourcing and organisation based on philosophy and strategy and documented but not necessarily updated to suit current requirements	Incorporate the current understanding of the condition of the structure and any life extension requirements into the allocation of resources.		
organisation accordingly an responsibilities	n and define ties]	4.	Acquisition and allocation of resources reflects the known condition of the structure and the current SIM philosophy and strategy (i.e. including recognition of any changing conditions, ageing and life extension).	Incorporate global understanding of structural integrity, SIM, ageing and life extension into the allocation of resources		
		5.	Optimised approaches to allocating resources making use of world-wide corporate and industry knowledge.			
1.5 Understand structural perfo strengths and	Understanding of actural performance engths and itations <i>e ensure that the</i> set team derstand any nificant structural itations aknesses and nerabilities]	anding of 1. rformance d	1.	No understanding of structural performance	Develop basic understanding of structural integrity considerations.	
Imitations [To ensure tha asset team understand an significant stru limitations		2.	Understanding of structural performance limited and based on previous practice	Understand and document the limitations on the particular structure's capacity, performance and the requirements for life cycle operation.		
weaknesses a vulnerabilities]		3.	Structural performance documented, including any particular limitations and vulnerabilities, but not necessarily updated	Institute regular updates to the understanding to include the current condition and any changes in environment together with life extension requirements and any changes in load carrying capacity required.		
				Ensure personnel have an appreciation of structural performance issues, limitations and potential consequences.		



Core Process	1. Dev	. Develop overall SIM philosophy and life-cycle condition monitoring strat						
Sub-proc	ess	Description of Maturity Level	Improvement steps to next level					
		<ul> <li>Structural performance updated based on any changes in expected loadings, the condition of installation and any life extension requirements.</li> <li>Asset personnel trained to understand the structural performance including any particular limitations and vulnerabilities</li> </ul>	Incorporate global experience of similar structures into the understanding of structural performance, SIM, ageing and life extension. Develop training materials and tools and disseminate to relevant staff.					
	-	<ol> <li>Determination of structural performance, vulnerabilities and weaknesses makes use of world-wide corporate and industry knowledge.</li> <li>Training developed to increase the knowledge of structural understanding and shared globally.</li> </ol>						



Core Process	2 Establ	lish long term inspection programme and emergency preparedness			
Sub-proc	ess		Description of Maturity Level	Improvement steps to next level	
2.1 Definition of term platform- inspection pro	Definition of long- n platform-specific pection programme <i>define long-term</i>		No long term programme in place – each year's programme ad hoc	Develop long term platform inspection programme (which could be based on annual repeat of same scope).	
platform-speci inspection programmes k the agreed Sli strategy and incorporating history and characteristics	pection grammes based on agreed SIM tegy and prporating platform ory and racteristics ether with the cts of ageing]	2.	Long term programme based on annual repeat of the same programme.	Develop and document a long term inspection programme in which a specified scope can be distributed over several individual annual programmes.	
together with a effects of agei		3.	Long-term programme documented and includes different inspection requirements in different years	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.	Long-term programme reviewed regularly and modified when necessary to take account of structural condition, performance requirements, ageing and life extension.	Incorporate global experience of similar structures into the long term inspection programme. Develop training materials and tools and disseminate to relevant staff.	
		5.	Global experience and feedback from similar installations is regularly obtained and used in review and modification of long term programme.		
2.2 Developm emergency preparedness	ent of	1.	No emergency preparedness plan	Develop basic emergency preparedness for potential structural integrity incidents.	
[To develop te operational ar management measures that planned to be implemented to the managem	echnical, nd t are under ent of	2.	Emergency response based on previous practice and may not be documented Emergency preparedness for structural incidents follows pre-set procedure (e.g. checklists) but does not allow flexibility to address specifics of an actual incident	Understand and document an emergency preparedness plan for potential structural incidents based on the particular limitations of the installation.	



Core Process	2 Estab	lish long term inspection programme and emergency preparedness			
Sub-process			Description of Maturity Level	Improvement steps to next level	
the emergency organisation in case of hazardous or accidental situations occurring, in order to protect human and environmental resources and assets		3.	Emergency preparedness plan based on feasible emergency scenarios and structural limitations and weaknesses and prepared with input from structural engineers and analysis of the structure; plan is documented	Institute regular updates to the emergency plans based on an understanding of the current condition of the structure	
			but not necessarily updated.	Ensure personnel are trained to recognise the symptoms of structurally significant events and the necessary response to such situations.	
		4.	Emergency preparedness plan updated based on any changes in structural condition or performance requirements, and on feedback from emergency exercises. Emergency Preparedness has various tools available including computer models, hardware and software for immediate assessment of incidents Emergency response personnel trained to recognise situations with structural integrity implications.	Incorporate global experience of incidents and of emergency plans into the preparedness for the installation under consideration with particular reference to actual and potential structural incidents. Develop training materials and tools and disseminate to relevant staff.	
		5.	Emergency preparedness plan updated based on global experience, including any significant structural incidents offshore. Emergency response training updated to include global experience and feedback from structural experience.		



Core Process	3 In	In-service inspection planning and offshore execution				
Sub-proc	ess:		Description of Maturity Level	Improvement steps to next level		
3.1 Inspection planning [To plan platfo specific topsic	n form- ides and	1.	No operator involvement in planning inspections	Develop annual inspection plan (which could be based on annual repeat of same scope).		
sub-sea inspe programmes, including spec requirements	ction cific related	2.	Planning delegated to offshore contactor without operator technical input (from Process 2) based on previous practice	Develop and document an inspection plan based on the latest long term inspection programme.		
to ageing]			Inspection planning follows previous practice without input from or into long-term programme	Ensure that inspectors are qualified for the tasks they undertake		
		3.	Procedures in place for translation of long term programme into annual workscopes taking account of operational requirements and resource constraints	Institute regular updates to the inspection plan to include the effects of any changes in long term inspection programme.		
	4.		Procedures and verification in place for approval and appointment of inspectors with respect to competence, expertise and qualifications			
		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	Incorporate global experience of similar structures into the inspection plans.		
			inspection campaigns	Develop training materials and tools and disseminate to relevant staff.		
		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			



Core Process	3 In	service inspection planning and offshore execution				
Sub-proc	cess	Description of Maturity Level	Improvement steps to next level			
3.2 Execution of inspection [To manage and complete in-service		1. Unplanned and ad hoc	Maintain records of previous inspection work packs and use as basis of future inspections			
inspection programmes]		<ol> <li>Execution based on previous practice or reliant on individuals.</li> </ol>	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.	<ul> <li>Procedures for execution of inspection workscopes define extent and tools for each inspection and resources needed</li> <li>Operator involved in QC to ensure completion of workscope and facilitate communications between inspectors and</li> </ul>	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.			
		operator's engineers	Record and monitor contractor performance and identify and address any short comings in execution, methods and tools.			
		<ol> <li>Experiences from executing inspections captured and fed back into developing and improving subsequent annual plans and workscopes</li> </ol>	Incorporate global experience of the inspection of similar structures into the work scopes and work packs.			
		Contractor performance monitored and used in bid assessment and to improve future contract execution	Develop and test new tools for undertaking inspection in realistic conditions, including offshore.			
		identify difficulties encountered and improve methods and tools for future planning and execution	Develop training materials and disseminate to relevant staff including contractors' personnel.			
		"Real-time" modification of workscope based on inspection findings including communications with operator's engineers				



Core Process	3 In	-service inspection planning and offshore execution			
Sub-process		Description of Maturity Level	Improvement steps to next level		
		<ul> <li>5. Global experience used to optimise inspection practice.</li> <li>Organization actively supports development of tools for workscope (i.e. by identifying key relevant issues) definition and execution of inspections via active R&amp;D programme</li> <li>Opportunities and resources made available for offshore testing and demonstration of new tools and techniques</li> <li>Organization adapts its structure to implement the above points where necessary</li> </ul>			
3.3 Reporting [To set up and follow		<ol> <li>No procedures in place; inspections catalogued, reported and stored on ad-hoc basis.</li> </ol>	Compile and catalogue inspection reports.		
procedures for recording, catalogu and reporting of inspection results] Note: At higher maturity levels a	aloguing of ults] er s a	<ol> <li>Reporting and any cataloguing based on previous practice which may not meet current requirements or management expectations.</li> </ol>	Develop and document a formal procedure for the cataloguing, storage, and reporting of inspection reports, preferably using a computerised system.		
used for both offshore inspe reporting in su process 3.3.ai management recording the assessments inspection rep under process	the the oction b- of and of orts at.	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.	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		



Core Process	3 In-s	service inspection planning and offshore execution					
Sub-process		Description of Maturity Level	Improvement steps to next level				
		<ul> <li>Formal procedures updated and improved based on ongoing experience, feedback and developments in this area; appropriate budgets provided for this activity.</li> <li>Computerised systems are expected which include automated reporting which highlight anomalies and the status of the evaluation of those anomalies.</li> <li>Training on the use of the reporting procedures and tools is provided to relevant staff.</li> </ul>	Incorporate global experience of inspection data management into the systems and procedures. Develop training materials and tools and disseminate to relevant staff.				
		<ol> <li>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.</li> <li>Organization changes made within SIM to facilitate improved reporting if necessary.</li> </ol>					



Core Process	4 Data lo	gging, evaluation, analysis and assessment			
Sub-process		Description of Maturity Level	Improvement steps to next level		
<ul> <li>4.1 Management of SIM information</li> <li>[To collect and record data from the inspection programmes]</li> <li>Note: At higher maturity levels a common system is used for both the offshore inspection</li> </ul>		<ol> <li>Ad hoc treatment of data received from contractor</li> <li>No formalised retention of data for</li> </ol>	Compile and catalogue inspection plans and reports.		
		<ol> <li>Reports received from contractor retained but not collated or analysed</li> </ol>	Develop and document a formal procedure for the cataloguing, storage, searching and recovery of inspection reports, preferably using a computerised system.		
reporting in sub- process 3.3.and the management of and recording the assessments of inspection reports under process 4.	ib- nd the of and of ports \$ 4.	3. Inspection data catalogued and recoverable	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.	<ul> <li>Management of inspection data improved and updated to improve data recovery, and tracking of trends</li> <li>Training in managing of inspection data provided to relevant personnel</li> </ul>	Incorporate global experience of inspection data management into the improvement of systems and procedures. Develop training materials and tools and disseminate to relevant staff.		
		<ul> <li>5. Worldwide experience used to optimise management of inspection data to provide first class system</li> <li>Training updated and optimised to enable relevant personnel to be fully competent in managing inspection data</li> </ul>			



Core Process	4 Data lo	ogging, evaluation, analysis and assessment				
Sub-proc	ess	Description of Maturity Level	Improvement steps to next level			
4.2 Evaluation, analysis and assessment of inspection data [To assess data from the inspection		1. Any evaluation entirely ad hoc without adequate criteria	Develop criteria for assessment and acceptance of defects			
		2. Criteria established for assessment and acceptance of defects or definition of mitigation method	Document procedure for the assessment and acceptance criteria for anomalies.			
programmes, identifying any deviations froi requirements, assessing trei	r m nds	Acceptance criteria for anomalies based only on previous projects	Define criteria for assessment and referral of findings for structural analysis			
assessing trends potentially due to ageing and determining requirements for repair/mitigation]	e to for	3. Defined practice in place with associated competences describing criteria and methods for assessment and acceptance criteria for anomalies.	Analyse Inspection findings on a regular basis to identify any trends in structural performance			
	onj	Criteria defined for assessment and referral of findings for structural analysis	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.			
	4.		Monitor and assess contractor performance in analysis and assessment and use in bid assessment.			
		<ul> <li>Inspection findings analysed on a regular basis to identify trends in structural performance</li> <li>Data trends are identified and used to modify long term inspection programmes</li> </ul>	Incorporate global experience of anomaly assessment into the improvement of systems and procedures.			
		and SIM strategy with appropriate resources in place; acceptance criteria are revised, based on experience from assessment of	Develop tools and techniques for assessment of anomalies.			
		Assessment and analysis includes consideration of degradation mechanisms and expected condition at subsequent inspection opportunities	Develop training materials and tools and disseminate to relevant staff.			
		Contractor performance in analysis and assessment monitored and used in bid assessment to improve future performance				



Core Process	4 Data lo	ogging, evaluation, analysis and assessment				
Sub-proc	;ess		Description of Maturity Level	Improvement steps to next level		
		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			
4.3 Assessment for life extension		1.	No consideration given to any life extension requirements.	Develop criteria for life extension based on previous work		
platform condition, including review of loadings, assessment of resistance and application of	ition, >w of >ssment and	2.	Criteria for life extension based on previous work and not updated to meet current life extension requirements or condition of structure.	Document procedures for life extension including assessing future changes in loadings, environment and resistance.		
acceptance criteria]				Incorporate any required changes in acceptance criteria into inspection planning and procedures		
		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.	Updated and improve procedures for life extension based on feedback from managing ageing infrastructure.		
			Any required changes in acceptance criteria for the extended life incorporated into inspection planning and procedures.	Provide training in life extension assessment to relevant staff.		
		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.	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.		



Core Process	4 Data lo	gging, evaluation, analysis and assessment				
Sub-proce	ess	Description of Maturity Level	Improvement steps to next level			
		<ol> <li>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.</li> </ol>				
4.4 Development of DFI resume		1. No DFI résumé in place	Collate basic design, fabrication and Installation (DFI) information			
develop data a information req for the design, fabrication and	nd Iuired	<ol> <li>DFI résumé historical and not collated into a useful format</li> </ol>	Document DFI résumé such that data and history is available for Structural Integrity Management.			
Installation (DFI) résumé]	(FI) 3. 4.	<ol> <li>DFI résumé is documented and available when required for input to other processes</li> </ol>	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.			
		<ol> <li>DFI résumé is updated as new information arises.</li> <li>Availability of DFI résumé to other processes improved, based on feedback, using good practice information technology</li> </ol>	Acquire knowledge of methods used worldwide to determine best practice and then obtain necessary data of the installation to match.			
		5. DFI résumé follows best worldwide practice, making full use of archived data and new information acquired to provide a complete résumé				



Core Process	5 Impler	nent	nentation (design and execution) of repair and mitigation measures				
Sub-proc	ess		Description of Maturity Level	Improvement steps to next level			
5.1 Determine requirements for repair & mitigation measures		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	Develop criteria for design of repairs adopted from previous work.			
repair and mit	what igation		contractor without management direction				
measures are required to maintain structural integrity based on feedback from the inspection programme		2.	Criteria for design of repairs adopted from previous work without identifying context & requirements	Document procedures for designing repairs and possible mitigation measures, as required to maintain structural integrity			
assessment of agein	f ageing]	ageing] 3.	Formal procedures in place for designing repairs and possible mitigation measures, as required to maintain structural integrity, but may not be updated	Capture experiences from preceding repairs and mitigation measures and update procedures for repair design criteria and mitigation measures			
	4.			Assess contractor experience and use in updating repair design criteria.			
		4.	Experiences from preceding repairs and mitigation measures captured and fed back into developing and improving future repair design criteria and mitigation measures	Use global experience to determine best practice repair criteria and possible mitigation measures.			
			Contractor experience assessed and utilised in updating repair design criteria.	Develop and disseminate training materials for repair design criteria and mitigation measures to all relevant personnel.			
		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				



Core Process	5 Impler	nen	entation (design and execution) of repair and mitigation measures				
Sub-proc	ess		Description of Maturity Level	Improvement steps to next level			
5.2 Plan & undertake repair and mitigation measures		1.	Undertaking of remedial actions ad-hoc as they arise, without any planning	Develop repair and remedial measures following previous practice			
[To plan and carry out the remedial actions identified above]		2.	Repair and remedial measures follow previous practice with no overview of the efficacy of the repairs or remedial measures	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.	<ol> <li>Defined methods in place for establishing adequate installation specific repairs or mitigation measures</li> </ol>	Update planning and execution of repair and mitigation measures based on experience.				
		4.	Resources and tools made available for implementation of adequate repairs or mitigation measures based only on defined approaches	Collaborate with contractor to identify and implement good practice for repair and mitigation.			
	4.			Train appropriate personnel in repair and mitigation measures.			
			<ol> <li>Planning and undertaking reprintigation measures is regulated according to feedback from provide the provided achieve good practice by ide</li> </ol>	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	Use global experience to assist selection of tools and techniques to achieve effective and long lasting repairs		
			difficulties encountered and provide resources and tools to improve future planning and execution	Research and develop appropriate repair techniques and materials			
			I raining in repair and mitigation measures supplied to key personnel	Make resources available for offshore testing and demonstration of new tools and techniques			
			Assess performance and capabilities of specialist sub- contractors				



Core 5 I Process	plementation (design and execution) of repair and mitigation measures					
Sub-process	Description of Maturity Level	Improvement steps to next level				
	<ul> <li>5. Worldwide experience used to assist selection of tools and techniques to achieve effective and long lasting repairs</li> <li>Organization active in researching and developing repair techniques and materials</li> <li>Opportunities and resources made available for offshore testing and demonstration of new tools and techniques</li> <li>Assessment of specialist sub-contractors undertaken to ensure familiarity with long-term best practices</li> <li>Operator and contractor work as single team, both use feedback to improve future processes and their organization</li> </ul>					



Core Process	6 Integri	v assurance and reporting, evaluation of effectiveness of SIM				
Sub-process		Description of Maturity Level	Improvement steps to next level			
6.1 Assurance structural integri [To provide ass of the structural integrity of the installation bas condition monit data including comparison wit acceptance critic ageing and life extension requirements w appropriate ]	e of 1. grity ssurance al 2. ssed on hitoring where 3. 4.	<ol> <li>Ad hoc assurance reporting without comparison of findings with agreed acceptance criteria</li> </ol>	Develop basic integrity assurance routines.			
		<ol> <li>Integrity assurance based solely on assessment of specific defects and repairs</li> <li>Formal integrity assurance or reporting of condition of structure to management and others based only on previous projects</li> </ol>	Document procedures for demonstration of structural integrity which include comparison with defined and agreed acceptance criteria, risk reduction requirements, findings of inspections, assessment of anomalies and any repairs undertaken.			
		<ol> <li>Formal procedures for demonstration of structural integrity in place which include comparison with defined and agreed acceptance criteria and risk reduction requirements</li> <li>Integrity assurance demonstrated by including immediate findings of inspections and repairs undertaken into structural integrity models</li> <li>Resources in place to maintain structural integrity models and analysis methods required for integrity assurance</li> </ol>	Update structural integrity models and analysis methods based on experience from integrity assurance and on risk reduction requirements. Provide training in the application of structural models and analysis methods to appropriate personnel.			
		<ol> <li>Structural integrity models and analysis methods are improved based on experience from integrity assurance and on risk reduction requirements, with appropriate resources in place</li> <li>Training provided in the application of structural models and analysis methods</li> </ol>	Use global experience to determine best practice for the assurance and dissemination of structural integrity. Research and develop appropriate tools and techniques.			
			Develop and disseminate training materials for the demonstration of structural integrity.			



Core ( Process	6 Integrit	assurance and reporting, evaluation of effect	iveness of SIM
Sub-process		Description of Maturity Level	Improvement steps to next level
		<ul> <li>5. Organization aware of and contributing to improved integrity assurance theories, standards, techniques and tools, with suitable resources available.</li> <li>Industry wide experience used to assist selection of tools and techniques to achieve best practice integrity assurance</li> <li>Organization adapted to identify and incorporate best practices in integrity assurance &amp; programme effectiveness</li> </ul>	
<ul> <li>6.2 Evaluation of effectiveness of inspection programmes</li> <li>[To evaluate the effectiveness of the inspection programme for reporting and input to future development of the inspection strategy.</li> <li>To ensure that SIM acceptance criteria include effects of ageing and any life extension]</li> </ul>	n of 1. of 2. the 2. the 3 of the 3 ogramme 4 ogramme 4 ogramme 5	<ol> <li>No evaluation or evaluation ad-hoc and unplanned</li> </ol>	Evaluate effectiveness of inspection programme, based on historical practice
		<ol> <li>Basic evaluation of effectiveness of inspection programme, based on historical practice</li> </ol>	Document Procedures for evaluating effectiveness of inspection programme, which include reporting and input to development of future inspection strategy.
		that SIM ce criteria fects of d any life	<ol> <li>Formal procedures in place for evaluating effectiveness of inspection programme, including reporting and input to development of future inspection strategy, but may not be updated</li> </ol>
		<ul> <li>Evaluation of effectiveness of inspection programmes updated regularly based on feedback and both assurance and reporting processes modified accordingly.</li> <li>Training provided in evaluating inspection programmes to relevant personnel, including appropriate application of tools and</li> </ul>	Use global experience to determine best practice for the evaluation of the effectiveness of the inspection programme. Research and develop appropriate tools and
		techniques	techniques. Develop and disseminate training materials for the evaluation of the inspection programme.



Core Process	Core 6 Integrity assurance and reporting, evaluation of effectiveness of SIM Process			
Sub-process		Description of Maturity Level	Improvement steps to next level	
		<ol> <li>Worldwide experience used in developing optimised evaluation of inspection programmes, reporting and inputting to development of future inspection strategies.</li> <li>Tools and techniques for evaluating inspection programmes developed with appropriate resources in place</li> </ol>		
		incorporate best practices in integrity assurance & programme effectiveness		
6.3 Manageme reporting <i>(To assess the</i>	ent e	<ol> <li>No consistent reporting to management (implies reporting by exception – if something needs attention)</li> </ol>	Develop management reporting routine based on previous practice.	
adequacy of the reporting to ass organisation management condition of the structure and	equacy of the orting to asset and anisation nagement the odition of the ucture and the need future maintenance penditure and the poing effects of eing]	2. Management reporting follows previous practice but may not give management an appropriate understanding of either the condition of the structure, specific maintenance or inspection requirements, or increasing SIM requirements due to ageing.	Document procedures for management reporting, which include reporting the condition of the structure and the extent and assessment of anomalies.	
for future main expenditure a ongoing effect ageing]		3. Formal procedures in place for management reporting, such procedures will define how the condition of the structure is reported, and will describe the extent of anomalies within the structure and the assessment and mitigation of anomalies. Future requirements for SIM will be defined which will include the consequences of ageing and life extension and the associated budgetary implications.	Assess management understanding of the reporting and modify procedures to improve that understanding where necessary.	
		<ol> <li>Management feedback (clarity and comprehensibility of the report, management understanding and reaction to changing SIM needs {particularly resources}) used to modify procedures for reporting and content and presentation of reports.</li> </ol>	Use global experience in management reporting to optimize procedures and techniques.	
		<ol> <li>Global experience in management reporting used to optimize procedures and techniques. Organization changes made within SIM to facilitate improved management reporting.</li> </ol>		



Core Process	7 Interna	al checking & auditing of management processes		
Sub-process		Description of Maturity Level	Improvement steps to next level	
7.1 QA/QC [To demonstra QA/QC practic SIM, including	ate ces in l alidation and dling of nces.]	<ol> <li>No internal checking, audit or verification of SIM activities</li> <li>No formal audit of management processes (QA) for SIM activities</li> </ol>	Implement basic internal checking and auditing procedures.	
selection and verification of contractors, va of techniques tools and hand non-conforma		<ol> <li>Procedures for internal checking and audit in place and implemented but based solely on previous experience and not updated</li> <li>Minimal feedback of audit findings to SIM team members</li> </ol>	Document and implement QA procedures which conform to national or international standards Undertake formal audits on both organization and SIM contractors	
		<ol> <li>Formal QA procedures in place and implemented which conform to national or international standards (including handling of non-conformances)</li> <li>Formal audits on both organization and SIM contractors undertaken based on above procedures with appropriate resources available</li> </ol>	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	
		<ul> <li>4. Organization reviews processes and practices in both itself and in its contractors based on feedback and assimilation of industry initiatives on QA/QC.</li> <li>Improvement plans prepared and documented for all processes in SIM, based on QA/QC findings</li> <li>Training in QA/QC provided to key personnel, both in the duty holder and SIM contractors</li> </ul>	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	



Core Process	ore 7 Internal checking & auditing of management processes			
Sub-process		Description of Maturity Level		Improvement steps to next level
		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	
7.2 Independe Verification (IV	ent /) he use of	1.	No verification of SIM activities with no formal procedures in place	Develop verification procedures based on historical practice.
independent verification of programmes assessments	and	2.	Verification based on historical practice only	Document and implement procedures for independent verification, which include selecting appropriate verifier(s)
		3.	Procedures in place for independent verification, including method of selection of appropriate verifier(s).	Update verification procedures based on previous experience
				Review verification recommendations and act upon them where appropriate
		4.	Verification procedures updated based on previous verifications (including selection of verification personnel). Verification recommendations reviewed and	Determine global best practice for independent verification and incorporate into procedures
		5.	Independent verification process optimised, based on worldwide experience, selection of contractor and optimal use of feedback to SIM and verification organisations	



# Annex 5. Maturity descriptions & improvement steps for supporting processes.

Supporting Pro	ocess Recognition and handling of un features	nconventional and unfamiliar structural
Des	cription of Maturity Level	Improvement steps to next level
1. Unconvention not recognise	al and unfamiliar structural features are d or not acknowledged as requiring	Develop managerial awareness of potential for dealing with unconventional features.
special attent	ion	Put in place some rudimentary procedures for identifying what is unconventional. Collate any previous experience of management of unconventional features and document.
2. Unconventional strumanaged only by in for these features. A familiar with unconvention of shared.	al structural features are recognised but y by individuals. No company philosophy ures. Although individuals may be	Ensure that reporting has a system in place for noting and reporting unconventional features.
	inconventional features this knowledge is	Acquire staff or confirm that existing staff have the expertise to identify what is unconventional within the context of the company.
		Develop/have in place a mechanism for communicating the need to deal with unconventional features to relevant staff.
3. Installations are recorded performance	vith unconventional structural features and the impact on their effect on overall and maintenance is recognised.	Management teams provide a supporting network to discipline teams to manage unconventional features.
The need for features is re	familiarity of staff with unconventional cognised.	Develop management processes to assess and understand needs and develop expertise (within management) for dealing
Managed at a when require sharing expe	isset team level only, calling in experts d or needed, but not learning from or rience.	with unconventional features.



Su	pporting Process Recognition and handling of un features	conventional and unfamiliar structural
	Description of Maturity Level	Improvement steps to next level
4.	Asset teams recognise and understand the particular characteristics of the structural features that are	Structure of the team optimised to most efficiently manage unconventional features.
	unconventional. They will respond to the limit of their expertise, and know when to call in experts, learning from them.	Provide adequate level of resources for achieving optimum SIM and consider reorganisation of departments and personnel to optimise SIM performance.
	Feedback from experience of managing unconventional structural features in particular assets is gathered and shared within the organisation, to increase familiarity with similar features and to improve structural integrity management.	
5.	Structural integrity management across the global organisation is organised to meet the specific requirements of unconventional structural features	
	The organisation may provide specialist training for its people and supply chain on how unconventional structural features can best be managed and familiarity with such features shared.	
	Unconventional structural features are regularly monitored and reviewed to optimize SIM performance. Experience is shared globally between organisations which have similar unconventional features.	



Supporting Process Management of safety, competence and quality in the supply chain			
	Description of Maturity Level	Improvement steps to next level	
1.	Ad-hoc, no effective management.	Develop managerial awareness of the potential impact of supply chain competence.	
		Put in place some procedures for monitoring supply chain performance.	
2.	Managing safety, competence and quality in supply chain limited and based on previous	Demonstrate awareness of suppliers safety performance.	
	experience only. No active involvement by duty holder in supply chain.	Collate any previous experience from supply chain upsets.	
		Develop process for identifying who is impacted by the supply chain.	
		Acquire staff or confirm that existing staff have the expertise to identify the SIM needs and how they interface with the supply chain.	
		Develop/have in place a mechanism for communicating the supply chain performance within the asset - include benchmarking process of supply chain data.	
3.	Written procedures in place for managing safety, competence and quality in the supply chain.	Demonstrate management involvement in improving safety and reliability of supply chain.	
	Duty holder aware of suppliers' safety and quality performance and competence levels.	Develop mechanism for collating needs of supply chain before they become overwhelming (e.g. inadequate safety standards, cost overruns. significant technical inadequacies, expensive remediation.).	
		Develop management processes to assess and understand company's dependency on the supply chain and develop expertise (within management) for understanding and supporting supply chain (including coaching services where beneficial).	
		Have in place expertise and time for management to plan "look ahead" for potential benefits from developing continuous improvement relationships with supply chain, involve supply chain in company's continuous improvement processes where there is an interface with supply chain.	



Su	Supporting Process Management of safety, competence and quality in the supply chain			
	Description of Maturity Level	Improvement steps to next level		
4.	Active management of suppliers' safety, competence & quality processes to deliver improved performance	Demonstrate active involvement and management of supply chain's team and business processes to improve safety and reliability of SIM.		
		Consider adequate level of resources for contributing to the improvement of supply chain management and of supply chain themselves, consider reorganisation of departments and personnel to improve coaching or support to supply chain.		
5.	Mutual involvement in improving safety, competence & quality processes within duty holder and throughout supply chain to maximize performance.			
	Sharing of best practice on a world wide basis, between peers and throughout supply chain.			



Su	Supporting Process Managing approach to R&D			
	Description of Maturity Level	Improvement steps to next level		
1.	No R&D undertaken	Recognise the need for R&D for solving immediate problems arising from use of previous practice.		
2.	R&D very limited & ad-hoc, only for urgent problem solving.	Implement R&D for solving immediate problems and coordinate research across project.		
	Assets initiate, undertake and pay for their specific research with no formal or systematic communication of scope or results outside asset team.			
3.	Sustained level of R&D to solve immediate problems only.	Implement comprehensive level of R&D to improve internal competence and capability and communicate to all project personnel.		
	R&D focal point exists to co-ordinate research and document results.			
4.	Overall sustained level of R&D undertaken by organisation and R&D resource allocation aligned with requirements (i.e. not necessarily targeted to SIM).	Results from research used to optimise all business processes.		
	Assets have access to a suite of ongoing R&D projects.			
	Results of research into tools & techniques regularly communicated to asset personnel.			
	Assets invited to provide feedback for future research topics			
5.	Assets invited to provide feedback for future (medium & long term) research topics.			
	Sustained level of R&D aimed at improving the global organisation's SIM activities as well as developing improved tools & techniques.			
	R&D management reorganised as necessary to meet changing R&D needs across global organisation.			