

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

MANUALS

STRUCTURAL INTEGRITY MANAGEMENT SYSTEM FOR FIXED OFFSHORE STRUCTURES

PTS 37.28.60.10

FEBRUARY 2010



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This new PTS **37.28.60.10** – Structural Integrity Management System for Fixed Offshore Structures (**February 2010, Revision 0**) has been developed to incorporate new information issued by relevant industry codes and standards.

This PTS also includes PETRONAS Lessons Learnt and PETRONAS Best Practice for the subject matter Structural Integrity Management System for Fixed Offshore Structures.

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PREFACE

PETRONAS Technical Standards (PTS) publications reflect the views, at the time of publication, of PETRONAS OPU/Divisions.

They are based on the experience acquired during the involvement with the design, construction, operation and maintenance of processing units and facilities. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good technical practice to be applied by PETRONAS' OPU in oil and gas production facilities, refineries, gas processing plants, chemical plants, marketing facilities or any other such facility, and thereby to achieve maximum technical and economic benefit from standardisation. The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where PTS may not cover every requirement or diversity of condition at each locality. The system of PTS is expected to be sufficiently flexible to allow individual operating units to adapt the information set forth in PTS to their own environment and requirements.

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1 INTRODUCTION

Structural Integrity Management (SIM) is a continuous assessment process applied throughout design, construction, operations, maintenance and decommissioning to assure that the structures are managed safely. Structural Integrity Management System (SIMS) is PETRONAS's management system for controlling physical risk associated with operating Fixed Offshore Structures. It is expected to prevent and mitigate integrity-related losses associated with safety, environment, business and reputation. The aim of the SIMS is to ensure the continued fitness-for-purpose of the structure throughout its life-cycle.

The SIMS process defined in this Petronas Technical Standard (PTS) is recognized as a best practice. To assist in the SIMS implementation a library of Standard Documentation including Specifications and Guideline documents are referenced in relevant sections throughout this PTS. The SIMS Contractor shall ensure that the Standard Documentation are adopted, however deviations, exceptions or additions to accommodate regional operational, regulatory or environmental conditions may be considered.

The SIMS is built with flexibility and can be customized to support the unique conditions of the associated structures. The SIMS will be frequently evaluated and modified to accommodate changes in structural design and operation, changes in the environment in which the structure operates, new operating data, and other integrity-related information. Periodic evaluation is required to ensure the program takes appropriate advantage of improved technology and the program remains integrated with the business practices and effectively supports the integrity goals.

Using critical operational, engineering, environmental, health and safety standards that apply to all employees, the SIMS ensures the risks associated with PETRONAS's business operations are managed effectively and that all employees, the public and the environment are protected. In addition, the SIMS will continue to improve the performance of PETRONAS's business units, protect PETRONAS's reputation, enhance PETRONAS's risk profile and further establish PETRONAS as a leader in the industry.

1.1 Scope

PTS gives the minimum requirements for a SIM, applicable to operating fixed offshore jackets. The SIMS process described herein has been developed around internationally recognized industry standards including ISO and API and exploits developed know-how and industry best-practices to enable operations to benefit from reduced risks to integrity and HSE, increased life cycle value and improved engineering standardization and productivity.

SIM is an ongoing process for ensuring the continuing fitness-for-purpose of an offshore structure or fleet of structures. SIM is a continuous risk evaluation process applied throughout the design, constructions, operations, maintenance and decommissioning to assure that the structures are managed safely. Throughout the life of the facility new data is collected e.g. through periodic inspections, as a result of accidental events or from planned modifications and/or additions to the platform. Data may also emanate from technology development projects or service experience of similar structures or components within PETRONAS or wider industry. This data is subject to qualified engineering evaluation to assess what impact it has on the existing SIM strategy for the structure. The SIM strategy will reflect the risk associated with its operation – the higher the risk the greater the rigor of the IM strategy and the robustness of the implementation program. If necessary the strategy is modified and adjusted as required to accommodate the revisions. The program provides more data and the cycle begins again.

The SIMS provides the framework within which to develop the necessary organisational arrangements, roles and responsibilities and necessary integrity management activities that, when correctly implemented, will ensure that the technical integrity of PETRONAS's operational Fixed Offshore Structures is maintained for their intended operational lives.

Employees at all levels of the organization are responsible for leading and engaging the workforce in meeting PETRONAS's goals for SIM. Management's leadership, commitment and support are

essential. The SIMS helps leaders focus on mission critical activities and enables them to consistently deliver optimal and sustainable operational and HSE performance. However, the SIMS is not just for leadership, it applies to everyone, good operational and HSE performance benefits everyone and is critical to the success of PETRONAS's business.

1.2 Structural Integrity

The use of the word integrity is meant to denote soundness, fitness for its intended purpose. Risk is central to the concept of structural integrity. Recognising that a finite degree of risk is always present, an asset is deemed to have lost its integrity when:

- It is unable to perform to its required performance standard (i.e. it has failed)
- There is unacceptable risk of failure over its service life

Introducing the concepts of design integrity, technical integrity and operating integrity can further clarify the broad concept of asset integrity.

1.2.1 Design Integrity

An asset has Design Integrity when:

- Functional performance standards have been quantified.
- Operating conditions relevant to functional performance have been quantified.
- Physical behaviour relevant to functional performance has been conservatively modelled and analysed.
- Possible functional failure modes have been considered, resulting in re-design or specified operating and maintenance requirements.

1.2.2 Technical Integrity

Technical integrity refers to the physical realisation of design integrity, i.e. to hardware. An asset has Technical Integrity when, under specified operating conditions, the risk of failure endangering the safety of personnel, environment or asset value, is as low as reasonably practicable. For an asset to have technical integrity there must be positive confirmation that it conforms to the design intent.

In the definition of technical integrity, "specified operating conditions" refers to the physical operating context, the intended asset life, and the operating procedures being followed. There may be a difference between what an asset was intended to be used for and how it is actually being used.

1.2.3 Operating Integrity

An asset has Operating Integrity when it is being operated as intended, such that it can achieve the production target without attracting undue risk to personnel, environment or assets. Therefore we introduce the concept of operating integrity, which refers to the people and systems being used to operate the asset.

1.3 Activities

Whilst most SIM activities have an annual cycle, other activities such as weight control, will be a continuous background process. PETRONAS may also elect to carry out certain inspection activities on a campaign basis e.g. underwater inspection every three or five years.

The SIMS shall identify the responsible party for each activity. The Structural TA shall assure that third parties are fulfilling their duties and identify any deficiencies to the SFP.

1.3.1 Design and Build

Integrity management commences during the initial planning, design and construction of the structure. To facilitate the design of structures that have predictable performance in compliance with performance goals selected for the intended life a performance-based design is utilized. Emphasis is provided on the consideration of the entire life-cycle; from appraisal and selection to disposal, potentially after one or more change-of-use or reuse.

Many lessons arising from previous design and operational experience have application to future performance-based design. By making the design process open to the adoption of past service experience, and assessment engineering tools and technologies competent engineers are able to optimize facilities to better deliver the life-cycle performance.

1.3.2 Operate

During the operating life of the platform a SIM process shall be used to monitor the adequacy of the corrosion protection system and ensure the fitness-for-purpose in order to safeguard human life and property, protect the environment, and prevent the loss of natural resources. SIM is an on-going process, which is maintained throughout the operational life, through to decommissioning, of a platform and is a rational means for managing the effects of degradation, damage, changes in loading, accidental overloading, changes in use, and the experience gained during the evolution of the offshore design practice.

The process is continuous and sequential and provides a logical framework for SIM, and is based on an evaluation of: the original design of the structure, inspection findings throughout the life of a structure, damage found through inspection, overloading, and changes in loading and/or use. The results from the evaluation are used to develop and implement an effective long-term topside and underwater inspection strategy.

1.3.3 Decommissioning

Decommissioning involves closing down operations at the end of field life including shutting in the wells, cleaning up the waste streams, making the platform safe and removing some or all of the facilities and reusing or disposing of them as appropriate. Performance of the structures will be based on the integrity of the structures before decommissioning. Structural decommissioning activities shall be integrated with the late-life SIM strategy for the platform to ensure the structural integrity of the platform is consistent with safe access for decommissioning operations.

1.3.4 Risk

The cornerstone to successful implementation of SIM is the ability to effectively manage the risks associated with the platform operations. Within this context risk is defined as the combination of the likelihood of some event occurring during a time period of interest and the consequences, (generally negative) associated with the event. In mathematical terms, risk can be expressed as:

$$\text{Risk} = \text{Likelihood} \times \text{Consequence}$$

The risk-based approach identifies those structures that require more frequent and detailed inspection or those structures that require some form of mitigation because of the acceptable level of risk. In this way, inspection and mitigation activities can be focused and be more cost effective. This may result in a reduction in the amount of inspection data that is collected.

1.3.5 Fitness-for-Purpose

SIM is a risk-based process for ensuring the fitness for purpose of an offshore structure from installation through to decommissioning. The process is a rational means for understanding the

effects of degradation, damage, changes in loading, accidental overloading, changes in use, life extension, and the evolution of the offshore design practice. SIM provides a framework for the damage evaluation, fitness-for-purpose assessment, inspection planning, maintenance, and repair of a platform or group of platforms. In the long term, asset integrity is managed by ensuring that fit-for-purpose processes have been defined and are employed. These processes must be continuously developed and refined to reflect changes in the facilities and/or changes in the fluids to be processed.

1.4 Distribution

Unless otherwise authorised by PETRONAS, the distribution of this PTS is confined to companies forming part of or managed by PETRONAS, and to Contractors nominated by them.

1.5 Intended Use

This PTS is primarily intended for use in oil and gas production facilities, but may also be used in oil refineries, chemical plants, gas plants and supply/marketing installations. When PTS are applied, a Management of Change (MOC) process shall be implemented. This is of particular importance when existing facilities are to be modified.

The SIMS PTS is designed to provide PETRONAS with a demonstrable, auditable system for the management of structural integrity which will be effective for field life. The SIMS PTS will be 'live' and will be updated to reflect changes in monitoring requirements, processes, personnel and documentation as required throughout the operational phase. The SIMS PTS further serves to assist PETRONAS by bringing together all SIM processes in a single document for ease of reference by all key personnel.

This PTS defines the SIM process for all structural elements on a fixed platform, e.g. piles, substructure, topsides modules, etc. specific Guidance on IM for floating facilities is outside the scope of this PTS. This PTS is aligned with the requirements of Industry Standards API RP2SIM and ISO 19902 which primarily relate to platform substructures. When there is a change in these codes/standards, this document should be revised accordingly.

Whilst it acknowledges the benefit of integrated links and commonality with subsea and pipeline assets, process facilities, lifting equipment and electrical systems integrity, the management of these systems is covered elsewhere. The main objective of this PTS is to set out the strategy for structural integrity management for PETRONAS operated offshore platforms and associated topsides.

1.6 Competency

A risk-based SIM process requires an understanding of the in-service performance of the structure and the establishment of performance objectives. Understanding of assessment engineering and associated technologies and performance data is required to assign likelihood of failure categories for platforms. Although these technologies are relatively mature with proven track records, they are outside of existing codified guidance and unfamiliar to many design contractors. The technologies, therefore, bring with them a level of additional competency over and above the competency associated with a conventional design approach. It is important that these risks are understood to allow informed decisions to be made in the consideration of a risk reduction and mitigation alternatives.

1.7 Regulatory Requirements

Legislation in most countries where PETRONAS operates requires a policy on the prevention of major accidents and environmental damage for hydrocarbon production, processing, storage and export facilities. In some instances the regulations are prescriptive and dictate specific activities and schedules. PETRONAS must continue to comply with the regulations if operating under such regimes. The SIMS PTS is intended to complement regulations and defines a process to provide

assurance that PETRONAS's Minimum Requirements for SIM are being met, including conformance with the PTS and with appropriate industry codes and standards.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this PTS, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with respect to health, safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this PTS which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this PTS as closely as possible.

1.8 Definitions

1.8.1 General Definitions

In this PTS the following words, when used in the context of actions PETRONAS or others, have the specific meanings:

- (a) The **Contractor** is the party which carries out all or part of the design, engineering, procurement, installation, and commissioning or management of a project or operation of a facility. The Principal may sometimes undertake all or part of the duties of the Contractor.
- (b) The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.
- (c) The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant, authorised to act for the Principal.
- (d) The word **shall** indicates a requirement.
- (e) The word **should** indicates a recommendation.

1.8.2 Specific Definitions

The following standard definitions apply in the interpretation of this specification.

- (a) **Structural Integrity:** The ability of a structure to perform its required function effectively and efficiently over a defined time period whilst protecting health, safety and the environment.
- (b) **Structural Integrity Management (SIM):** The means of ensuring that the people, systems, processes and resources that deliver integrity are in place, in use and will perform when required over the whole lifecycle of the structure.
- (c) **SIM Policy:** The SIM policy sets out the overall intention and direction with respect to SIM and the framework for control of the SIM related processes and activities. These shall be aligned with PETRONAS's strategic plan and other corporate policies.
- (d) **SIM Strategy:** The SIM strategy sets out the process for delivering the integrity management of its assets, and which is consistent with the SIM Policy.
- (e) **Inspection:** Targeted examination to determine the condition of a structural component.
- (f) **Inspection Strategy:** A systematic approach to the development of a plan for the in-service inspection of a structure.
- (g) **Inspection Programme:** A detailed scope of work for the offshore execution of the inspection activities. It is developed from the inspection strategy.
- (h) **Inspection work scope:** Instruction to the inspector to define the detailed inspection requirements.

- (i) **Information Management:** The process by which all relevant historical and operational documents, data and information are collected, communicated, stored and made available to those who need it.
- (j) **Structural Evaluation:** Review of current condition of the structure compared to that when it was last assessed and other parameters that affect the integrity and risk levels to confirm or otherwise that the existing structural assessments still apply.
- (k) **Structural Analysis:** Calculation to predict the behaviour of the structure usually relative to specified code requirements.
- (l) **Structural Assessment:** Interpretation of available information including any available analysis results to confirm or otherwise the integrity of the structure.
- (m) **Maintenance:** The upkeep of the condition of a structure or component by proactive intervention.
- (n) **Sub-sea intervention:** Reactive reinstatement of the condition of a structure or component following an inspection.
- (o) **Audit:** Process to confirm that SIM is carried out in conformity with the procedures set out in the SIM policy and strategy, and complies with applicable legislation.
- (p) **Review:** Process to review how the SIM processes can be improved on the basis of in house and external experience and industry best practice.
- (q) **Continual improvement:** Ongoing implementation of findings of audits and reviews to improve the SIM process.
- (r) **Life extension:** Is the demonstration of safe operation of the structure to the end of the extended anticipated operating life.
- (s) **STA:** Structural Technical Authority, the single focal point for all structural integrity management activities.
- (t) **SFP:** Structural Focal Person, the project manager who ensures that structural integrity is managed in partnership with the structural engineers, and other relevant parties.
- (u) **SIMS Custodian:** the overall champion for the SIMS, responsible for ensuring that the SIMS objective and goals are implemented.
- (v) **Project Team:** group of individuals responsible for delivering a SIMS project.
- (w) **SIM Group:** team of individuals responsible for ensuring that SIM is implemented and delivered.
- (x) **SICS:** Structural Information Control System, used for the management of all SIM related data.
- (y) **SMR:** Strengthening/Modification/Repair
- (z) **SLE:** Strength Level Earthquake
- (aa) **DLE:** Ductility Level Earthquake

2 SIMS PHILOSOPHY

2.1 General

SIM is the application of qualified standards, by competent people, using appropriate processes and procedures throughout the structures life cycle, from design through to decommissioning, to ensure that through a process of risk management the structures fitness-for-purpose is maintained. In the long term, structural integrity is managed by ensuring that fit-for-purpose processes have been defined and are employed. These processes must be continuously developed and refined to reflect changes in the facilities, organization and/or technology. SIM is a “cradle-to-grave” activity that encompasses the full life cycle of an operational facility and is based on the clear identification of potential hazards associated with such facilities and the risk management programs developed to control the hazards.

A SIMS is required to assist in preventing, controlling or mitigating risk and ensure that, in addition to code and regulatory compliance, best practice is followed to align with minimum HSE requirements. SIMS is a vital life-cycle process used for the continued safe operation of existing offshore platforms and provides a framework for the assuring the continued fitness-for-purpose of these structures. This PTS provides requirements and guidance for all aspects of the SIM process that constitute good practice in SIM, together with an appropriate management and documentation structure. These processes are as follows:

- SIM Policy and Strategy
- Organisation and Management
- Risk Evaluation
- Mitigation Strategy
- Mitigation Programme
- Information Management
- Practices and Procedures
- Continuous Improvement

The interaction between these processes within the overall SIM process is given in Figure 2-1.

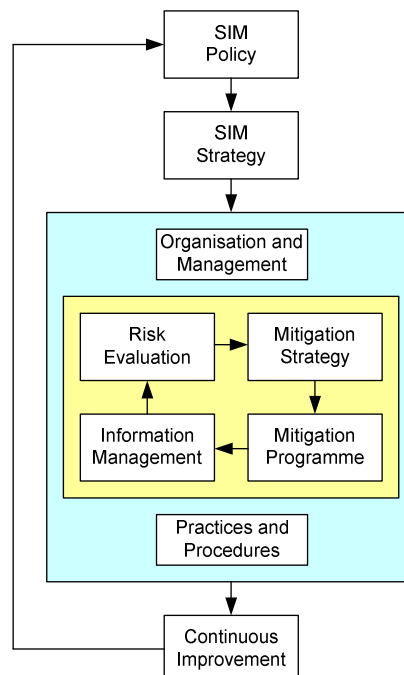


Figure 2-1: SIM Process

2.2 **SIMS Objective**

The objective of the SIM process is to provide an auditable framework to demonstrate the continued fitness-for-purpose of offshore structures and structural safety critical elements. The generalised SIM process is applicable to all offshore structures and subsea facilities, fabricated in steel, other metals, concrete or carbon or fiber reinforced composites. A formal SIMS shall complement existing processes and procedures used by the PETRONAS and other third parties, with the overall objective "to secure the life-cycle structural integrity of offshore installations in order to safeguard those working offshore".

The SIMS will define the monitoring requirements, processes, personnel and documentation that deliver and assure on-going structural integrity. SIMS is owned by PETRONAS and maintained either, alone or jointly with the nominated integrity management contractor. The intention is for the SIMS to be periodically reviewed and updated to ensure that its stated objectives are being met effectively. The SIM process is applicable to all fixed offshore structures and utilizes the following guiding principles in the development of an organized SIMS:

- To manage quality data in systematic database for future retrieval/application.
- To manage the integrity of fixed offshore structures over their life-cycle by applying state-of-the-art analytical techniques.
- To identify and redress any long-term degradation of fixed offshore structures.
- To identify and prioritize the required structural integrity activities.
- To optimize the activities and resources that are required to operate the fixed offshore structures whilst maintaining the structural integrity.
- To provide a basis on the conformance of structural integrity with all necessary legislative requirements.
- To identify and analyze actual and potential precursor events that can result in structural incidents.
- To examine the likelihood and potential severity of potential structural incidents.
- To provide a comprehensive and integrated means for examining and comparing the spectrum of risks and risk reduction activities available.
- To provide a structured and comprehensive means for selecting and implementing risk reduction activities.
- To ensure the utilization of appropriately trained and qualified personnel for risk management and structural integrity assurance.
- To establish and track system performance with the goals of continued improvement and establishment of best practice in structural integrity.

2.3 **SIM Policy**

The SIMS shall have a policy that sets out the overall intention and direction with respect to SIM and the framework for control of the SIM related processes and activities. These shall be aligned with the PETRONAS strategic plan and other corporate policies.

2.4 **SIM Strategy**

The SIMS shall have strategy that sets out the process for delivering the integrity management of its assets, and which is consistent with the SIM Policy.

2.5 **Organization and Management**

To SIMS shall have a management system, which describes: (1) the activities (processes) necessary and sufficient to identify, assess, control and recover from threats which can cause asset functional failures, (2) business controls to ensure that these activities are performed correctly and on time, (3) the organisational roles, responsibilities, competencies, authorities and chain of command to execute these activities and exercise the business controls, and (4) the data flows, data ownership and supporting information systems.

2.6 Risk Evaluation

The SIMS shall ensure that SIM hazards are systematically identified and the risks assessed and managed. The SIMS Risk evaluation is the analytical process that determines the types of adverse events of conditions that might impact the structural integrity, the likelihood that those events or conditions will lead to a loss of integrity, and the nature and severity of the consequences that might occur following a failure. The risk evaluation shall be kept up to date throughout the facility life including decommissioning.

Periodic assessments shall take account of current good practice, incorporate advances in knowledge and changes in risk levels. The frequency, scope and method of inspection shall be sufficient to provide assurance, in conjunction with associated assessments that the integrity of the installation is being maintained.

2.7 Risk Mitigation Strategy

The SIMS shall define a strategy for overall risk mitigation for the platform or fleet of platforms. It may also define any facility expansion opportunities and/or limits. The strategies shall be developed for any mitigation and controlling measures that should be put in place to assure integrity. The Strategies shall include general descriptions of the systems, records of any known anomalies, the roles and responsibilities of personnel concerned, full inspection requirements, and corresponding inspection programmes.

2.8 Risk Mitigation Programme

The SIMS shall define the detailed scope of work for the offshore execution of the risk mitigation activities to determine the current condition of the structure. It is developed from the risk mitigation strategy. If necessary the programme is adjusted in accordance with the change in strategy, this might mean, for example, that the inspection becomes more detailed perhaps moving from visual to NDT survey techniques or vice versa.

2.9 Information Integration

The SIMS shall have a process by which all relevant historical and operational documents, data and information are collected, communicated, stored and made available to those who need it. SIM has the potential to produce large amounts of information, which needs to be collected, communicated and stored in an efficient and accessible manner. Ease of information access, clarity in presentation, information interrogation, trending and others are aspects of data management that have a pronounced effect on the overall effectiveness and efficiency of SIM. Historical data is a cornerstone of informed structural integrity assurance and a suitable system for referencing and archiving documents relating to the SIMS process shall be established and maintained.

2.10 Documentation

Key SIMS documents can be subdivided into three categories:

- Strategies which review historical structural performance and formulate a long term plan to ensure continued satisfactory structural integrity
- Procedures define how SIM activities are performed
- Guidelines establish methodologies for implementing SIMS activities
- Reports document a particular SIM event or data set. This may take the form of a traditional text based report but increasingly may be a spreadsheet or database or other electronic file

2.11 Continuous Improvement

To improve the effectiveness of the SIM process, the SIMS requires the incorporation of learning and monitoring against the process. Periodically evaluating the SIMS ensures the effectiveness of the

plan in achieving its goals. Performance measures are used to both judge program effectiveness and to identify opportunities for improvement of additional emphasis. Performance measure evaluation and trending can also lead to recognition of unexpected results that may include the recognition of risks not previously identified.

Audit is the process to confirm that SIM is carried out in conformity with the procedures set out in the SIM policy and strategy, and legislation. The Review Process assesses how the SIM processes can be improved on the basis of in house and external experience and industry best practice.

A periodic audit of the SIMS is required to provide an objective evaluation on how the SIMS is performing and ensure that adjustments are made and implemented to the system.

3 SIMS POLICY AND STRATEGY

3.1 General

The SIM policy sets out the overall intention and direction of PETRONAS with respect to SIM and the framework for control of the SIM related processes and activities. These shall be aligned with PETRONAS's strategic plan and other corporate policies. It is used to communicate senior management commitment to sustaining asset integrity, being a critical success factor for the business as a whole.

The SIM strategy sets out PETRONAS's process for delivering the integrity management of its assets in line with the SIM Policy and sets acceptance criteria.

PETRONAS's Policy on SIM shall apply equally to all PETRONAS Employees, Contractors and Consultants engaged in the integrity management of existing operational fixed offshore platforms, in the construction of new fixed offshore platforms, and in the decommissioning of fixed offshore platforms.

In managing and integrating SIMS into the overall business process, strict adherence to the intents, objectives and requirements of this Policy is expected. Consequently all specific SIMS systems, guidelines and procedures shall conform and be aligned with this Policy.

3.2 SIM Policy

PETRONAS shall have a SIM policy which is endorsed at senior management level.

The objectives of the SIM policy are:

- to define the overall intentions and direction of the organisation with respect to SIM
- to integrate and align SIM with the overall business plan and other corporate policies
- to set out a framework for SIM

The policy shall:

- (a) Include a commitment to comply with current applicable legislation, regulatory and statutory
- (a) Requirements and to other relevant industrial and national standards and practices.
- (b) Be reviewed periodically and be committed to continual improvement of the SIM process.
- (c) Be documented and effectively communicated to all relevant parties including employees and contractors.

3.3 SIM Strategy

The objective of the SIM strategy is:

- to implement the SIM policy

The strategy shall:

- (a) Include a description of the assets included in the strategy, including their function(s) and
- (b) Performance and condition requirements. This shall include health, safety and environmental performance requirements.
- (c) Identify roles and responsibilities in delivering SIM.
- (d) Define the process and rationale involved in delivering SIM, ensuring best use is made of all information available.
- (e) Include reference to the emergency response strategy.

- (f) Include processes for monitoring the performance of the structures and of the management systems used, benchmarking, management review and corrective actions.
- (g) Include arrangements to capture lessons from in-service performance of structures and feed this back into the management arrangements to seek continual improvement.
- (h) Include references to processes for audit and assurance arrangements.
- (i) Be reviewed periodically to ensure current best practice and emerging technologies are utilised and shall be revised when required.

4 ORGANISATION AND MANAGEMENT

4.1 General

SIM requires PETRONAS to put in place an appropriate organisational structure and have defined management processes. The objective of these is to define responsibilities of individuals and to clearly set out their activities, interactions, lines of communication and interfaces. The following aspects shall be considered as a minimum and included in the SIM strategy:

- Organizational structure
- Roles and responsibilities
- Competency management
- Emergency response
- Incident investigation

The overall SIMS relies on qualified people; using defined processes to continuously maintain the fitness-for-purpose of the structures. The SIMS encompasses stakeholder personnel and third party resources that manage the structure and use the work processes. The SIMS is required to ensure that personnel with assigned SIM responsibilities have defined roles and are competent to carry out SIM-related tasks.

4.2 Organizational Structure

The SIMS requires the identification of those responsible for SIM within PETRONAS to ensure clear, single points of accountability. All operating, maintenance and contractor personnel shall fully understand their role in the prevention and management of structural integrity hazards. All personnel involved with SIMS shall have their line of reporting clearly defined to avoid miscommunications, especially in the event of an emergency.

4.3 Roles and Responsibilities

The SIMS requires the identification of those responsible for SIM to ensure clear, single points of accountability. In defining the accountabilities for the successful implementation of the SIMS it is necessary to clearly establish the roles and responsibilities of all personnel involved in the SIM development, implementation and ownership. All operating, maintenance and contractor personnel shall fully understand their role in the prevention and management of structural integrity hazards.

The SIMS Custodian shall ensure that staff with assigned SIM responsibilities, have defined roles and are competent to carry out SIM-related tasks. A clear and concise responsibility is essential to ensure a smooth SIMS management and undisputable scope of work. In any integrity issues, a fast and competent analysis of the situation is prudent, thus the need of having a competent and reliable persons. A number of roles are required in order to produce the required deliverables and personnel shall be assigned to the roles defined in order to drive the integrity assure process.

To ensure that all those whose work affects SIM are clear about their roles and are trained and competent to carry them out, PETRONAS shall ensure the following is in-place:

- Job descriptions that define the responsibilities and activities of SIM-related jobs, together with the required attributes, competencies qualifications, experience, training and certification (where required by applicable regulators).
- Systems that quantitatively assess and record whether SIM-related staff meet the requirements of their job description, both on appointment and at defined intervals.
- A training and development process designed to bring SIM-related staff up to the required level of competence for their role, along with refresher training to keep them at that level.
- Subject to existing contractual constraints, contractors shall demonstrate and document that their staff are competent to carry out their assigned work.