The Offshore Structural Integrity Management Inspection Guide

Open Government Status: Fully Open

Publication Date: 05/07/2019

Review Date: 05/07/2022

Review History

Date	Changes	Approved
05/07/2019	First approved issue	Howard Harte

Target Audience: ED Inspectors

Contents

Summary

This Inspection Guide (IG) outlines an approach to the inspection of duty holder's arrangements with respect to Structural Integrity Management (SIM) and the key areas that inspectors should consider when inspecting this topic. It also sets out the criteria for satisfactory and unsatisfactory performance factors against which duty holder performance will be rated. References are made to technical standards and guidance that inspectors will use to form an opinion of legal compliance. HSE also provides guidance which is available on the Structural Integrity section of the HSE website

This guide is intended for use by two levels of audiences:

- HSE Inspection Management Teams and Duty Holder (DH) senior management.
- HSE Structural Integrity Specialist Inspectors, DH Structural Integrity Technical Authorities (TA), Class societies and other technical consultants where an in depth assessment is required of the installation and topic.

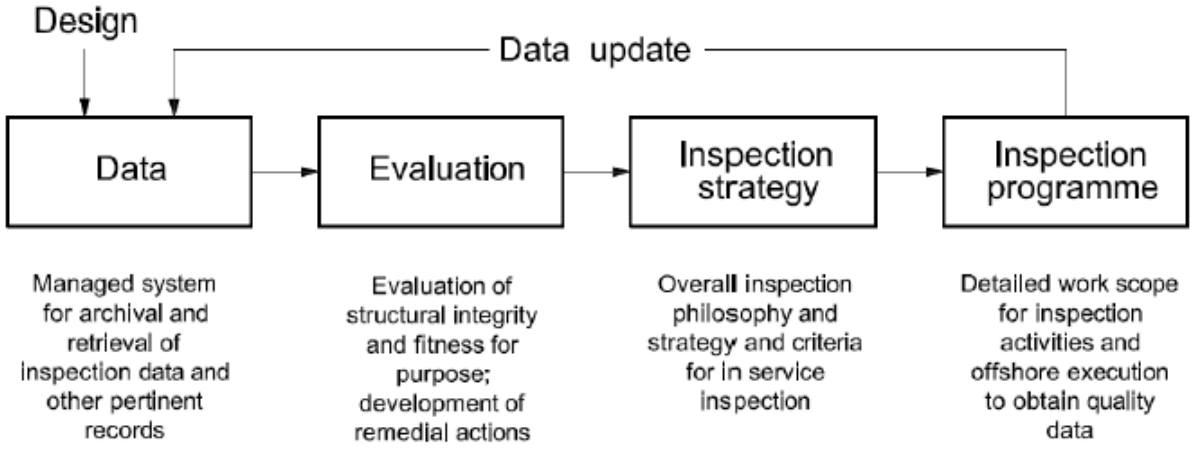
The main DH point of contact is normally the Structural Technical Authority (TA) who is responsible for preparing, implementing, reviewing and auditing the SIM system and process, in compliance with the intended purpose and requirements for an installation throughout its life-cycle. Personnel conducting SIM activities must be competent in offshore structural engineering.

Introduction

The purpose of this Inspection Guide is to provide information and guidance to Offshore Safety Directive Regulator (OSDR) Inspectors to support the delivery of consistent and effective inspection of duty holder arrangements to manage Structural Integrity.

This IG highlights key areas for inspection and provides a framework against which inspectors can judge compliance, assign performance ratings and determine what enforcement action should be taken with respect to legislative breaches that may be found. In doing so, it complements HSE's Enforcement Policy Statement (EPS) and Enforcement Management Model (EMM).

A SIM system is essential for reliable, safe and sustainable operations and is also a legislative requirement. Petroleum and Natural Gas industries - Fixed steel offshore structures (ISO 19902 A.23.1-1) gives guidance on SIM and the 'Data – Evaluation - Inspection Strategy - Program' cycle described is widely accepted as being central to the implementation of a robust strategy. This model will also be used for FPSOs, MODUs and Jack ups.



As part of this cycle a typical Duty Holder's Structural Integrity Management system will encompass a number of key discrete activities including:

- Structural Design, Analysis and Re - assessments
- Metocean Criteria Management
- Structural Inspection and Monitoring (Topsides and Subsea)
- Weight Control
- Repair and Fabric Maintenance
- Knowledge and Data Management

Where Class requirements and inspections are being used for installations which can attend wet or dry docks viz. semi-submersibles and jack ups, then SIM enhancements will be sought for Safety and Environmental Critical Elements (SECE) when operating on the UKCS. Appendix 6.

Where Class requirements are being used for fixed installations viz. FPSOs, then SIM enhancements will be sought for SECEs throughout the life cycle of the installation. Appendix 6.

Duty Holders have responsibilities to maintain the structural integrity of installations, from their installation to final removal.

Relevant Legislation

Health and Safety at Work etc Act 1974 (Application outside Great Britain) Order 2013 (AOGBO) applies the HSWA to offshore installations and any activity in connection with an

offshore installation. This requires a safe working environment be provided which impacts directly on the requirements of the duty holder to apply a robust Structural Integrity Management system.

The Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996 provide more detail about what is required for the integrity of installations throughout their lifecycle.

- **Regulation 4** states the duty holder shall ensure that an installation at all times possesses such integrity as is reasonably practicable;
- **Regulation 5** considers what is necessary when designing an installation;
- **Regulation 6** considers the integrity requirements of working on an installation whether that be new construction or maintenance and modification;
- **Regulation 7** establishes the installation should not be operated such that the structural integrity is compromised
- **Regulation 8** addresses the arrangements in place to ensure the integrity of the installation is maintained
- **Regulation 10** ensures that sufficient integrity is maintained to enable decommissioning and dismantling to be carried out safely.

The Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 provide more detail about the role of the structure to protect offshore personnel from the effects of fire and explosion.

- **Regulation 5** requires that an assessment of the likelihood and consequence of a fire and explosion event is carried out
- **Regulation 13** requires that the duty holder take appropriate measures on the installation during an emergency from the effects of such an event. Maintaining sufficient structural integrity to the key aspects of the installation is a fundamental part of this.

The Management of Health and Safety at Work Regulations 1999 provide detail on risk assessment and how health and safety is managed. This provides the basis for managing a major accident hazard.

- **Regulation 3** establishes the need for every employer to carry out an assessment of risks to health and safety to which their employees face. These include the risks associated with structural failure.

- **Regulation 5** sets out the key steps for any health and safety management system which would be visible in an effective Structural Integrity Management procedure.

Action

Inspectors should review relevant documentation Appendix 1: Pre-visit Information Request prior to the onshore and offshore inspections and seek compliance with the regulations and the "Success Criteria" given in Appendices 2 to 5.

By the conclusion of the inspection it should be possible to:

- Determine how the statements made in the safety case are applied to manage structural integrity
- Determine how Major Accident Hazards linked to structural integrity are being managed by the DH

When carrying out inspections covered by this IG inspectors should:

- Assess duty holder responses against the success criteria in Appendices 2 to 5.
- Use the performance descriptors in Appendix 8 to:
    - Determine the appropriate performance rating
    - The initial enforcement expectation
    - Consider how and when the issues raised during an inspection are to be closed out.

Background

Major accidents offshore have resulted from multiple failures in risk control measures such as barriers. In the UK these risk control measures have been defined in the Offshore Installations (Offshore Safety Directive) (Safety Case etc) Regulations 2015 (SCR15), as Safety and Environmental Critical Elements (SECEs) and includes several barriers provided by the main structures both above and underwater, fire and blast walls etc.

The appropriate identification of major accident hazards, risk control measures and performance standards are all required when considering controls and inherent safety in the design and operations of structures. A SIM system must be in place to ensure that the SECEs are effective and available, and that their operational status is known throughout the life cycle of the installation.

The assessment and inspection of SIM systems involves examining a broad range of elements. These include policy, organisation (including roles and responsibilities), hazard identification, risk analysis, risk control measures, monitoring, review and audit. Risk control is achieved through the inspection and maintenance of SECEs to ensure their correct operation, management of change, and management on occasions when SECEs are impaired.

A SIM system should capture degradation, changes in loading, accidental loading, changes in use, changes in design standards from the original basis of design of the installation, and through to decommissioning.

A SIM system should ensure that assumptions made in design and inherent safety, are controlled and managed throughout the life cycle of the structure. The assessments are continuous with interactions which broadly fall into four key areas:

- **Data:** *Records management and other relevant SIM data*
- **Evaluation:** *Evaluation of structural integrity and if necessary remedial actions*
- **Strategy:** *Inspection philosophy, strategy and criteria for in service inspections*
- **Programme:** *detailed inspection work scopes to gather quality data including trending to ensure fitness of purpose during the lifecycle.*

SCR15 requires the DHs of offshore installations to appoint Independent and Competent Persons (ICP) to verify the suitability of major hazard risk control measures. The process whereby ICPs ascertain the suitability of structural SECEs is known as verification and covered in another IG. The assessment and inspection of the verification arrangements involves ensuring that the activities undertaken by the ICPs to verify the SIM arrangements are fit for purpose and meet the performance standards.

This IG can be used by DHs to prepare for Structural Integrity inspections and to better understand the intervention plans drawn up for their operations. It can also be used as a tool to help DHs assess their own performance, for example, in carrying out gap analyses against the success criteria. This will enable DHs to proactively identify and take steps to rectify any potential weaknesses in their arrangements for SIM systems.

Other relevant Inspection Guides

A number of inspection guides interface with this document. These include but are not limited to:

- Temporary Refuge Integrity
- Safety and Environmental Critical Elements (SECEs) and Verification
- Evacuation, Escape and Rescue

Specialist Advice

Specialist advice should be sought from topic teams in the following circumstances:

- Fire, Explosion and Risk Assessment (FERA) – Whenever the structural integrity response to fire and explosion overpressures are being considered, FERA take the lead in determining the Dynamic Accidental Loadings (DALs) which the structure will be exposed to. They would also be contacted when quantitative risk assessments are being used as part of an ALARP justification
- Emergency Response, Marine and Aviation operations (ERMA) – When assessing vessel impact, helideck operations and escape routes joint working will be with ERMA.
- Pipeline Integrity – When assessing pipelines loads and how they are tied back to the main structure with anchor points and guides joint working will be with Pipeline Integrity Inspectors.
- Well Integrity – When assessing conductors integrity joint working will be with the Well Integrity inspectors. It will be appropriate to engage the Wells Technical Authority regarding the structural interface with the well.

Organisation

Targeting

Inspections should be planned within the timescales set out by ED divisional management. Although inspections may be carried out at with any duty holder, it is important these should be targeted on where it is considered the greatest risk gaps are. It is essential to ensure that DHs are robust in their assessment of the implications of these factors and that suitable mitigations are in place.

Timing

Inspectors should undertake Structural Integrity Management inspections as part of the agreed ED offshore intervention plan, when intelligence indicates this is necessary. DH overviews should be carried out within 5 year intervals with intermediate inspections focused on specific installations and topics as required during subsequent years.

Resources

ED4.2 (Offshore Structural Integrity) has ownership of this IG and takes the topic lead on inspecting Structural Integrity Management. Resource for the undertaking of Structural Integrity Management interventions will come from ED4.2 discipline specialist inspectors supported by Inspection Management Team inspectors as appropriate.

Recording and Reporting

DH performance ratings should be entered on the Inspection Rating (IRF) Tab of the relevant installation Intervention Plan Service Order. Findings should be recorded in the post inspection report and letter.

Health and Safety

A significant amount of a structural integrity inspection will take place onshore in the DH offices. When inspectors do attend offshore installations to inspect the structure, they will need to access large areas of the structure. As such, a number of health and safety issues need to be considered. These include but are not limited to:

- Confined spaces – Inspection of the inside of tanks, particularly on floating installations;
- Chemical exposure – Access required to all working areas of the installation;
- Radioactive sources including LSA Scale - Access required to all working areas of the installation.

Appendix 1: Pre-Visit Information Request

The information requested will vary depending on the type of installation being considered and the specific focus of the inspector. A specific list will be given in advance of each inspection however this is likely to include many of the documents stated below:

- Duty Holder Structural Integrity Management Procedure
- Annual Structural Summary Reports
- Structural Anomaly Registers
- Structural Performance Standards
- Structural SECE impairments
- Structural Analysis Reports including
    - Static analysis
    - Fatigue analysis
    - Pushover analysis
    - Airgap assessment
    - Weight control summary
- Classification Society Reports (Structural Aspects) - Mobile Installations
- IVB reports (Structural Aspects)
- Site Specific Assessment - Mobile Installations
- Justifications for Risk Based Inspections and trending

Appendix 2: Data

The most relevant and recent data is necessary for successful implementation of a SIM system. This would include, and not necessarily be limited to, the following:

- Original basis of design / periodic reassessments / performance standards
- Fabrication and installation data with modifications as installed
- Results of numerical analyses with SECEs being identified
- In-service periodic inspections based on a management strategy
- Engineering evaluations and structural assessments
- Hydrodynamic assessments
- Environmental metocean history (recorded conditions)
- Management of changes due to modifications / repairs
- Operational incidents and near misses
- Trending data where Risk Based Inspections are being used.

Change of ownership / duty holder - must ensure effective transfer of all data to the new DH.

Success Criteria

The DH should have the following available:

- The latest “As Built” drawings of all structures
- Basis of Design with recorded changes during the lifecycle
- Details of all repairs and a register including anomalies and criticality
- Changes made to the structure for any modifications
- Electronic recording systems must be regularly updated
- All data to prepare Work Packs
- The data systems must be audited for the validity of the data
- Inputs to KPI dashboards where appropriate, which should provide details of impairments such as SECEs
- Trending of SECEs including management of anomalies.

Appendix 3: Evaluation

Evaluation occurs throughout the lifecycle of an installation and is the process to establish whether structural re-assessment is required. The goals should include changes to the original Basis of Design and identification of new major accident hazards.

There will be several sources of inputs from data sources, including and not necessarily limited to, the following:

- Original Basis of Design and current age
- Design / fabrication changes and material substitution
- Analysis and basis of original design with assumptions to current status
- Results of subsequent re-assessments and gap analysis of codes
- Degree of uncertainty in metocean criteria
- In-service findings and corrosion performance
- Repairs / strengthening including changes to fatigue performance
- Consequences from damage: such as vessel impact and local structural failure

Evaluation does not automatically imply a structural re-analysis and generally industry utilises risk categorisation matrices for this purpose. Some of the most popular ones used are 3 x 3 or 5 x 5. These examine the Consequence of Failure vs Likelihood of failure.

A structural re-analysis is generally required when there are some changes identified in evaluation, and may not necessarily be limited to the following:

- Additional Living Quarters - Persons on Board (a reverse ALARP event)
- Additional process facilities
- Increased / decreased loading on the topsides structure
- Inadequate air-gap with possible inundation of the topsides fixed installations
- Inadequate air-gap for semi-submersibles
- Horizontal wave slam on the topsides of semi-submersibles
- Significant damage to the structure
- Original design life to include ageing and life extension
- FPSOs – refer to EI Guidelines on ALE for mono-hull FPSOs * (in draft 2019).

Structural SECE impairment must involve the Structural TA.

Success Criteria

The DH must have the following available:

- Performance Standards for SECEs are suitable, and changes approved by the Structural TA
- Changes to SECEs should not result in reverse ALARP
- Gap assessments between original codes and standards to current ones
- Anomaly management system with prioritisation to manage anomalies appropriately viz. through increased inspection frequency, or repair until close out
- Weight control procedure with Annual Weight Reporting
- Information management procedure
- Structural Models - for studies / in-place / pushover / fatigue / boat impact
- Results of analyses: strength / redundancy / air-gap / fatigue / pushover / risers and caissons / re-analyses based on inspection results / foundations reviews / hydrodynamic analysis
- 10,000 year metocean event assessment
- Topsides updates before modifications for changes of fire and explosion overpressure response
- Completed calculations before any offshore construction can proceed
- Installation Annual Summary Report
- Where appropriate an ageing installation review procedure when operating beyond the original design life

Appendix 4: Inspection Strategy

A definition of the overall inspection strategy must be provided. This can be either or a combination of:

- Risk Based SIM
- Consequence of failure
- Class Based RBI.

Inspection plans which will define the frequency and scopes should be based on previously collected data and requirements from the design.

Generally periodic inspection planning has focused on the following areas:

- Above water
- Underwater; and
- splash zone areas, which have been subjected to little attention
- FPSOs hull structure compartments with limited access viz. voids; cofferdams.

The risk matrices mentioned under evaluation are influenced by in-service inspection results, for both consequence based or risk based approaches.

Inspection planning should also consider enhancements for the following events:

- SECEs impact on the overall integrity
- Repairs / strengthening
- Post event integrity such as after storms; boat impact etc.
- Decommissioning – inspections must be undertaken by DHs until final removal.

Change of ownership / duty holder arrangements should ensure effective transfer of all data to the new DH. The new DH should review previous inspections and demonstrate why it is appropriate to continue with unchanged inspection programmes in their new organisation.
The new DH inspection programmes should take into account

- engineering support of the new DH whether in-house or contractor

- competencies of contractors undertaking and collating inspection results
- arrangements with the new Independent Competent Person

Success Criteria

The DH must have the following available:

- SIM Framework corporate document
- SIM Procedure corporate document
- SIM Framework and Procedure for the installation being inspected; and, where appropriate,
- gap assessments and changes from previous owners / duty holders

Appendix 5: Inspection Programme

A SIM system will have the main inspection inputs as follows:

- Above water - topsides and, where appropriate, drilling units
- Splash zone - conductors, caissons and J-tubes, pipelines and structures
- Underwater - substructures, mooring piles, under-water manifolds, mid-water arches / foundations
- Special inspections – post damage events
- FPSO hulls, moorings buoys and turrets

There will be some differences for concrete and steel substructures, including SECEs.

Due to the difficulties of inspecting the splash zone several failures have resulted from: caisson and conductor failures; failures of pipeline supports and conductor framing ladders. Caissons inspections should follow recommendations made in the HOIS - Guidance on in-service inspection and integrity management of caissons.

Additionally. mobile installations may be:

- Classed
- Temporarily un-classed
- Classed, then un-classed, and returned to Class.

Class has some of the requirements expected to be seen in good SIM systems for mobile units Appendix 6. For ageing units some type of enhanced inspection programme should be implemented, based on previous history of the unit and other sister units in the classification.

Success Criteria

The DH should have the following available:

- SIM Framework
- SIM system
- Inspection Philosophy

- RBI or Consequence based procedures
- Class based RBI
- Underwater Inspection Methodology
- Splash zone Inspection Methodology
- Topsides Inspection Methodology
- Inspection Plans for a minimum of 5 years with progress up to date
- A record of inspection Backlogs and supporting risk assessments
- Anomaly Management system with criteria and justifications for priorities
- SECE impairments Risk Assessments currently in place
- Where Class is being used and does not include the topsides appropriate arrangements should be available for the whole installation.

Appendix 6: Integrating Class and Risk Based Inspection

Currently some Classification Society Rules take into account Risk Based Inspection (RBI) to be applied to offshore structures at a fixed location. It is important to recognise that there are no provisions for RBI in IMO Conventions and Codes. Structural integrity requires special attention when an installation will not be subject to dry docking surveys for periods of 10 years plus.

A combination of the traditional periodical classification survey scheme and RBI assessments, can be used to demonstrate compliance with the expectations of the goal setting regulations. An approach integrating RBI techniques is appropriate to identify SECEs, as well as ALARP. The RBI approach should be used for both hull and topsides of MODU, semi-subs and jack-up installations.

A RBI plan should identify the following

- Failure modes and degradation mechanisms
- Inspection scope including identification of critical locations
- Inspection processes and techniques

This should allow DHs to integrate the RBI approach to wider risk management activities and demonstrate compliance with the safety case for FPSOs, semi-submersibles and Jack-ups.

Where DHs have Class which includes integrating an RBI approach inspectors should review the details for the installation, location site specific assessment and compliance with the safety case to demonstrate ALARP.

There should be a reasonable air gap between the deck structures and wave crests for all modes of operations, taking into account the predicted motion of the MODU and semi-submersible relative to the surface of the sea. Calculations, model tests results and field measurements or combinations of these methods may be used to determine the appropriate air gap. Where negative air gap has been identified, structures should be appropriately designed to resist the expected horizontal wave impact.

Appendix 7: Abbreviations

ALARP – As low as reasonably practicable

DH – Duty Holder

EER – Emergency Escape and Rescue

EPS – HSE Enforcement Policy Statement

EMM – HSE Enforcement Management Model

FPSO – Floating Production Storage and Offloading

ICP – Independent and Competent Persons

IG – Inspection Guide

KPI – Key Performance Indicator

MODU – Mobile Offshore Drilling Unit

RBI – Risk Based Inspection

SECE – Safety and Environmental Critical Elements

SIM – Structural Integrity Management

UKCS – United Kingdom Continental Shelf

Note:
Reference to SECE impairments in this IG is equivalent to Operational Risk Assessments (ORAs) frequently found in industry.

Appendix 8: Application of EMM and Duty Holder Performance Assessment

When inspecting Structural Integrity Management, duty holder compliance is to be assessed against the relevant success criteria. The success criteria have been determined from specific regulatory requirements, defined standards, established standards or interpretative standards.

This assessment will determine the: EMM Risk Gap, the associated topic performance score together with the Initial Enforcement Expectation as shown in the table below. The actual enforcement may differ depending on local factors, **however should this occur then the relevant local factors should be identified.**

Further guidance can be found at: http://www.hse.gov.uk/enforce/emm.pdf

EMM RISK GAP					
Extreme	**Substantial**	**Moderate**	**Nominal**	**None**	**None**
TOPIC PERFORMANCE SCORE					
60	**50**	**40**	**30**	**20**	**10**
Unacceptable	**Very Poor**	**Poor**	**Broadly Compliant**	**Fully Compliant**	**Exemplary**
Optional IG Specific Performance Score Guidance					
Unacceptably far below relevant minimum legal requirements. Most success criteria are not met. Degree of non-compliance extreme and widespread. Failure to recognise issues, their significance, and to demonstrate adequate commitment to take remedial action.	Substantially below the relevant minimum legal requirements. Many success criteria are not fully met. Degree of non-compliance substantial. Failures not recognised, with limited commitment to take remedial action.	Significantly below the relevant minimum legal requirements. Several success criteria are not fully met. Degree of non-compliance significant. Limited recognition of the essential relevant components of effective health and safety management, but demonstrate commitment to take remedial action	Meets most of the relevant minimum legal requirements. Most success criteria are fully met. Degree of non-compliance minor and easily remedied. Management recognise essential relevant components of effective health and safety management, and commitment to improve standards.	Meets the relevant minimum legal requirements. All success criteria are fully met. Management competent and able to demonstrate adequate identification of the principal risks, implementation of the necessary control measures, confirmation that these are used effectively; and subject to review.	Exceeds the relevant minimal legal requirements. All success criteria are fully met. Management competent, enthusiastic, and proactive in devising and implementing effective safety management system to 'good practice' or above standard. Actively seek to further improve standards.
EMM Initial Enforcement Expectation					
Prosecution / Enforcement Notice	Enforcement notice / Letter	Enforcement notice / Letter	Letter / Verbal warning	None	None

It should be noted that:

- the IG and hence the allocated scores may not cover all the matters that were considered during the intervention.
- the intervention may not necessarily have used every part of the IG – consequently the score only reflects what was inspected.

Use of performance scores

HSE uses the performance scores as one of the many inputs to prioritise and plan future regulatory interventions. Prioritising interventions is fundamental to ensuring HSE delivers its major hazards regulatory strategy whilst supporting businesses and the GB economy. HSE aims to ensure that regulatory activity is proportionate to the risk to people taking account a duty holder's performance in controlling risks. In general, this means HSE will inspect major hazard installations and duty holders with relatively poorer risk management performance more frequently and in greater depth than lower hazard installations and duty holders where there is evidence of higher risk management performance.

Appendix 9: References / Further Reading

Relevant Legislation

1) The Offshore Installations (Offshore Safety Directive) (Safety Case etc,) Regulations 2015 (SCR15)

2) The Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER)

3) The Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996 (DCR)

4) The Management of Health and Safety at Work Regulations 1999 (MHSWR)

5) A guide to the Offshore Installation and Pipeline Works (Management and Administration) Regulations 1995

6) Assessment Principles for Offshore Safety Cases (APOSC)

HSE Documents

1) A guide to The Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015 (L154)

2) Guidance on PFEER (L65)

3) Guidance on DCR (L85)

4) Guidance on MHSWR (L21)

5) Successful health and safety management (HSG 65)

6) Leadership for the major hazard industries (HSE INDG 277)

7) Effective implementation of offshore verification requirements HSE offshore information sheet 01/2012

8) Specialised Industries: major hazard leadership delivery guide

9) RCS 13 – Hazard Identification and Risk Assessment (HIRA)

10) Structural Integrity webpages www.hse.gov.uk/offshore/guidance-technical.htm

11) Research Report RR237 Maintenance System Guidance (2004)

Industry Guidance

1) Guidelines for the Management of Safety Critical Elements (2007) UKOOA

2) Oil & Gas UK Guidance on the Conduct and Management of Operational Risk Assessment Issue 1 (January 2012)

3) Oil & Gas UK – Well Life Cycle Integrity Guidelines Issue 3 March 2016 (being revised to include more on structural integrity of conductors)

4) HOIS Guidance on in-service inspection and integrity management of caissons HOIS(13)R6 Issue 2 July 2014 R J Lee and S F Burch and Health and Safety Executive

5) ISO 19901-9 FDIS December 2016- Petroleum and natural gas industries -- Specific requirements for offshore structures -- Part 9: Structural Integrity Management

6) For FPSOs as a minimum adoption of the IACS: Common Structural Rules for Double Hulled Oil Tankers

7) BS EN ISO 19904-1: 2006 Petroleum and natural gas industries – Floating offshore structures – Part 1: Mono-hulls, semi-submersibles and spars

8) BS EN ISO 19905-1: 2016 Petroleum and natural gas industries -- Site-specific assessment of mobile offshore units -- Part 1: Jack-ups

9) Energy Institute – Guidelines for the Management of Structural ALE Issues for Mono-hull FPSOs (currently in draft 2019)

10) Oil & Gas UK – Guidance on the Management of Ageing and Life Extension for UKCS Production Installations – Issue 1 (May 2014)