The Offshore Pipeline Integrity Management Inspection Guide

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Fully Open

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08/09/2014	First approved issue.
17/03/2021	Revised and reissued

Target Audience

ED Specialist Inspectors

Contents

Summary

This inspection guide (IG) outlines the approach to the inspection of duty holder's arrangements with respect to offshore pipeline integrity management, and the key areas that inspectors should consider when inspecting this topic. It describes the four core inspection topics and sets 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. It provides a consistent framework for judging compliance, assigning performance ratings and determining follow up actions.

Introduction

The purpose of this IG is to provide information and guidance to inspectors to support the delivery of consistent and effective inspection of duty holder arrangements to comply with offshore pipeline integrity management.

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.

For offshore pipeline systems transporting hydrocarbons, the consequences of poor integrity management, yielding in hydrocarbon releases (HCRs), have the potential to be catastrophic for the resident workforce on offshore installations and other users of the sea.

A principal aim in HSE's Sector Plan for Offshore Energy is to ensure that the integrity of offshore installations, wells, well control equipment and pipelines are ensured throughout their life cycle, in order to prevent HCRs and major hazard incidents. Targeted inspections based on this operational guidance will support HSE's strategy by

- systematically evaluating the adequacy of pipeline operators' arrangements for pipeline integrity management against a consistent set of criteria; and
- ensuring that appropriate enforcement action is taken in cases where legal minimum standards are not met

The core topics, covered by an offshore pipeline integrity management inspection, are as follows

- pipeline design compliance and the identification and assessment of integrity management arrangements
- pipeline safety management system (SMS)
- implementation of the pipeline integrity management process
- emergency planning and preparedness

Relevant Legislation

Relevant legislation and a summary of relevant key requirements is provided in Appendix 6.

Action

Inspectors should review relevant documentation, see Appendix 3 for details on Pre-visit Information Request, prior to the installation visit and test compliance during the installation visit against the “success criteria” given in Appendix 2.

Prior to undertaking inspections, inspectors should prepare inspection agendas. These agendas, covering both the onshore and offshore part of the inspection, should follow the example given in Appendix 3, amended as appropriate. All four topic areas may not be included during each inspection.

During offshore pipeline integrity management inspections, inspectors should

- compare standards of performance for the four core topics, see Appendix 1, against the relevant success criteria, see Appendix 2
- use performance descriptors, see Appendix 4, to determine the appropriate performance rating and initial enforcement expectation
- consider how and when any issues raised during the inspection are to be closed out, making use of the COIN issues tab, and taking formal enforcement action where appropriate

Background

Pipelines can be subject to a range of degradation mechanisms, e.g. corrosion, erosion, and embrittlement. This progressive deterioration is known as ageing. The issue of pipeline ageing and integrity is particularly significant for the UK offshore oil and gas industry because many hydrocarbon pipelines within the United Kingdom Continental Shelf (UKCS) are over 30 years old. Oil and gas supplies continue to be sourced from existing UKCS infrastructure and via interconnector pipelines from Europe. These pipelines may need to operate for many more years to meet UK energy demands. It is vital that these pipelines, some of which exceed their original design life, continue to operate with minimal risk to people, the environment and the security of the UK's energy supplies.

Pipelines can also fail through damage mechanisms that are not age-related, e.g. dropped object damage, trawl gear interaction or accidental overpressure.

In order to comply with their legal duties, pipeline operators need to identify, assess, and properly control significant potential threats to their pipelines. They should also make appropriate use of

technical advances (e.g. in inspection technology; defect assessment and repair methods), to ensure that the risk of pipeline failure continues to be as low as reasonably practicable (ALARP).

Poor subsea pipeline integrity management also poses risks to the environment.

The Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), which sits within the Department for Business, Energy and Industrial Strategy (BEIS), is responsible for environmental matters and HSE and OPRED operate under a memorandum of understanding (MOU) to effectively co-ordinate their regulatory activity on the UKCS. Under the MOU, HSE and OPRED may share relevant information following inspections or investigations. This may include aspects associated with pipeline ageing and integrity where UKCS pipeline infrastructure or security of supply may be compromised.

Linked with ageing pipeline and infrastructure is decommissioning which is another challenge for North Sea operators. A decommissioning programme is initiated by the operator some time before the end of life is reached, and this must be approved by OPRED and the Oil and Gas Authority (OGA) before the system can be shut in and decommissioning commenced. OPRED consult HSE in this process. The operator is required to look at a number of possible approaches to decommissioning and carry out a comparative assessment (CA) of the main options in order to arrive at the preferred decommissioning programme. Consideration will be given to leaving pipelines in situ if they are buried, or the requirement to remove to leave a clear seabed. Consideration needs to be given to the environment and the safety of other users of the sea. Notification under Pipeline Safety Regulations 1996 (PSR) Regulation 22(2) will be required with the possibility of a material change to the safety case under the Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015 (SCR2015) Regulation 24 prior to the submission of a dismantling safety case under SCR2015 Regulation 20.

OPRED also manage the interim pipeline regime (IPR) which allows operators to enter pipelines which are no longer required for production but where the field decommissioning programme has not yet commenced. OPRED also consult HSE in this process. The IPR is intended to ensure ‘out of use’ pipelines do not pose a risk to other users of the sea or the environment and, during this period, they must be covered by an appropriate survey and maintenance regime from the point when they are taken out of use until approval of the formal decommissioning programme, which is usually at the end of field life. Any interim solution should not prejudice the final decommissioning options for that line, including complete removal.

Appendix 5 gives further details about environmental considerations and the role of OPRED.

Appendix 6 gives further information about relevant legislation and provides references to technical standards and other useful resources.

Organisation

Targeting

Pipeline integrity management is a strategic priority topic and inspections should be included in HSE Energy Division's (ED) Offshore Intervention Plans (IPs). Where other topics have been identified as local priorities, inspectors should take this into consideration when preparing their IPs. ED5's risk ranking arrangements should also be used to assist inspectors when determining intervention frequencies and targeting.

Timing

Inspectors should undertake offshore pipeline integrity management inspections as part of the agreed ED Offshore Intervention Plan; when intelligence indicates intervention is necessary, or as part of an investigation following an incident.

Resources

Resource for the undertaking of offshore pipeline integrity management interventions will be agreed as part of the ED Offshore Work Plan or by agreement between discipline specialist team-leaders and inspection management team-leaders, as appropriate.

Recording and Reporting

The duty holder 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.

Appendix 1 describes the four core topics and Appendix 2 describes the associated success criteria that inspectors should consider during inspections of offshore pipeline integrity management. Not all of the success criteria will apply in every case and inspectors should only consider those that are relevant at each inspection. If any success criteria are not met, inspectors should assess how serious the consequences could be using HSE's Enforcement Management Model. This will determine the performance ratings that they should assign and the enforcement action to be taken, if any.

Appendix 1 Core Topics

Pipeline design compliance and the identification and assessment of integrity management arrangements

The design of the pipeline and any modifications to it must take into account the operating regime, the fluid to be conveyed and the external environment. Pipeline design is also the starting point for inspection, testing and maintenance, for example the pipeline design determines the ease with which it can be pigged, or pressure tested.

Another key design consideration is the pipeline's safety features. For instance

- the location, in which a riser emergency shut down valve (ESDV) is installed, is critical in isolating the pipeline and riser inventory from the effects of riser damage at as many as possible inboard (of the ESDV) locations
- the installation and operation of a subsea isolation valve (SSIV) reduces the severity of the consequences of a riser failure outboard of or below the riser ESDV

This inspection topic is not only relevant for new pipeline construction. Retrospective inspection of the design of existing pipelines can provide important information on how integrity management arrangements relate to the original design. For example, if evidence is found that the pipeline is being operated outside of its original design parameters, this may cast doubt on the assumptions that underpin the integrity management arrangements going forward.

Any design life extension should contain detailed safety evaluation, including systematic consideration of ageing effects, and demonstration of continued safe operation. For instance

- evidence of risk-based design life extension process or formal design life extension assessment being implemented before pipeline reaches end of design life
- the assessment includes a review of the design premise of pipeline including a review of construction and operational history
- use of risk assessment as part of design life extension process to identify new threats to pipeline as a consequence of ageing and any additional measures required to control the risk
- consideration to all parts of the pipeline system e.g. valves, pig traps, control systems, as per PSR Regulation 3
- evidence that condition monitoring assessments and modelling as part of design life extension work are backed up by inspection e.g. in-line inspection (ILI) or NDT at representative sample locations, particularly where there are gaps in process and operational data during service life of pipeline

- it is recognised that degradation mechanisms and failure modes for unbonded flexibles are inherently complex, so evidence is required that personnel with sufficient competence in flexibles have been involved in the detailed safety evaluation

Pipeline safety management system (SMS)

For major accident hazard pipelines (MAHPs), PSR define 'safety management system' (SMS) as the organisation, arrangements and procedures established by the operator for ensuring that the risk of a major accident is as low as is reasonably practicable (ALARP). The pipeline SMS needs to consider the interfaces between pipeline design, construction, operation and maintenance. Key elements of the SMS are leadership, commitment, accountability and competence. Both adequate organisation and sufficient resource are necessary to implement the operator's policy with respect to the effective control of major accident hazards.

Traditional SMSs tend to focus on occupational health and safety and are unlikely to be fit for purpose for delivering safe pipeline operations. The major accident prevention document (MAPD) required by PSR for MAHPs must demonstrate that the pipelines SMS is adequate. This can be verified during inspections.

Implementation of the pipeline integrity management process

This topic concerns the ongoing routines, processes and procedures that need to be in place to successfully deliver pipeline integrity. A range of equipment, instruments, devices and techniques have been developed for the protection, operation, inspection, testing and maintenance of subsea pipelines. Inspectors will expect pipeline operators to consider and, where appropriate, utilise improved techniques and technologies.

Accidental damage is a continuing risk to the integrity of offshore pipelines, e.g. anchor damage, vessel collisions, dropped objects. Inspectors will expect offshore pipeline operators to take steps to minimise the risk of accidental damage occurring to their pipelines.

Emergency planning and preparedness

MAHP incidents can be very serious and warrant a carefully planned and rehearsed multi-agency emergency response. Planning for emergencies at MAHPs is therefore an explicit requirement of PSR.

PSR requires that the operators of MAHPs prepare adequate emergency procedures for dealing with the consequences of a major accident involving a pipeline/riser. These procedures need to cover a range of issues, from safe shut down of operations to liaison with emergency responders

and communication with the media. These procedures must be tested by the pipeline operator to ensure that individuals with a role in emergency response are properly prepared to act in a real emergency. Emergency procedures should also be reviewed and if necessary revised in the light of any lessons learned from tests.

Appendix 2 Success Criteria

Core topic	Success criteria
1. Pipeline design compliance and the identification and assessment of integrity management arrangements	**General** □ Design of the pipeline and support systems meets appropriate standards and takes into account potential damage/deterioration □ Design incorporates suitable safety systems to protect against overpressure, damage, over temperature (e.g. in flexible risers) and other hazards □ Design allows for adequate inspection (In-line inspection (ILI) is considered industry good practice) □ Checks are made to ensure that pipeline safety features remain effective as specified in the design parameters □ Any proposal for design life extension contains detailed safety evaluation including systematic consideration of ageing effects and demonstration of continued safe operation. Evidence of risk based design life extension process or formal design life extension assessment being implemented before pipeline reaches end of design life. The assessment includes a review of the design premise of pipeline including a review of construction and operational history. Use of risk assessment as part of design life extension process to identify new threats to pipeline as a consequence of ageing and any additional control measures to be implemented/actions to be taken (e.g. reduction in safe operating limits) to ensure continued safe operation. Evidence that inspection is carried out to validate condition monitoring assessments and modelling. **ESDVs and SSIVs** □ ESDVs installed as far down the risers as is reasonably practicable for all MAHPs □ Consideration given to fitting SSIVs, particularly for gas pipelines and/or pipelines connected into major trunk pipeline systems with large connected inventories. Where a decision has been made not to install an SSIV then a suitable and sufficient risk assessment should be available to support this decision. The decision as to whether

an SSIV is to be fitted should have been taken based upon an analysis of the potential consequences and risks of a riser and/or pipeline release, and of damage due to escalation from another riser. The risk of the riser ESDV failing to operate on demand should be considered in the assessment. The cost of an SSIV must be compared to the far greater cost if one is not fitted but is needed in an emergency.

Risers

- □ Review of flexible riser annulus venting system design to ensure that annulus is positively vented away and no communal venting systems with other risers which could result in back flow of fluids from one riser annulus to another
- □ For risers contained within caissons and I/J tubes, design should consider ongoing management of the caisson and installation of automatic functions such as closure of the riser ESDV (and/or SSIV where fitted) in the event of riser failure. Design should also consider means for confirming integrity of risers
- □ For caissons and I/J tubes containing hydrocarbon risers: The top of the caisson or I/J tube should be sealed and any hydrocarbons accumulating inside the caisson or I/J tube vented off to a safe place on the installation. The selected sealing should ensure that hydrocarbons are not able to escape from the caisson or I/J tube undetected. The bottom of the caisson or I/J tube should be designed to prevent sea water from going in and out. Where there is a need to chemically treat water inside a caisson or I/J tube, suitable access for chemical injection should be provided and maintained
- □ Riser design minimises number of small-bore tubing outboard of the ESDV that may be potential failure points
- □ Riser ESDV control panels are located as close as reasonably practicable to the riser location
- □ Riser ESDV local controls should be clearly labelled and readily accessible in an emergency
- □ Design of installation (riser routing) minimises the risk of impact damage to the riser

Pig traps

- □ Design allows double block isolation to be achieved for key operations, e.g. at pig traps

	□ Bonding of pig trap body and door closure to ensure electrical continuity and prevent sparking □ Suitable safety systems in place to prevent the closure door from opening before the pig trap has been isolated and depressurised
2. Pipeline Safety Management System	**Plan** □ Effective leadership and commitment to continuous improvement in management of major hazard risks □ Up to date MAPD that identifies risks to pipeline and control measures and describes arrangements, behaviours and systems that exist in practice (NB: only required for MAHPs) □ Organisational responsibilities documented e.g. via an organogram □ People with key responsibilities in the SMS understand their role and are resourced to carry it out effectively □ Competency management system in place □ Effective communication and co-operation at pipeline operator interfaces □ Ownership and responsibilities for all lengths of pipeline clearly understood and documented □ Arrangements in place to ensure that pipeline regulatory notifications are made as required by PSR **Do** □ Pipeline operated to an appropriate codes or recommended practices e.g. BS EN 14161 and DNV-RP-F116 □ Procedures exist for: safe operation of plant; permit to work, management of change and modifications, safe isolation of plant and equipment, selection and control of contractors, non-routine operations □ Human factors considered and steps taken to minimise the risk of human failure **Check** □ SMS includes process to test and review the performance of the management system and keep senior, management informed regarding safety performance, e.g. via key performance indicators (KPIs) □ Accidents/incidents/near misses investigated, lessons learned and shared within the organisation

	□ Programme of SMS audits carried out **Act** □ Audit findings, KPI data and other information regarding safety performance reported to a senior level and acted upon
3. Implementation and maintenance of pipeline integrity management process	**Corrosion management** □ Suitable corrosion management programme implemented with suitable monitoring and review, e.g. cathodic protection, use of inhibitors (internal), coatings, corrosion probes, control of product quality etc. □ Where cathodic protection is used, it is monitored, and prompt remedial action taken where problems identified e.g. exhausted sacrificial anodes □ Steps taken to address risks of corrosion under insulation on topside sections of the risers and ESDVs □ Inhibitor (corrosion, scale, biocide) injection systems maintained in good working order i.e. topside pumps, injection metering (injecting at required dose) etc. **Inspection and Maintenance** □ Evidence that inspection is used to validate condition monitoring assessments and modelling during life of pipeline □ ILI regarded as the norm but if not used, alternative arrangements in place and feasibility of future ILI considered □ ILI protocols justified by previous ILI data and degradation assessment □ Results of ILI feed into remedial action plans □ Pressure vessel inspections carried out on relevant equipment e.g. pig launchers □ Flexible pipelines inspected using appropriate techniques, e.g. annulus pressure monitoring/testing □ Risers subject to suitable inspection/testing/maintenance, including those within caissons and I/J tubes where integrity assessment by means other than inspection should be explored

	□ Effective caisson management i.e. monitoring and sampling of caisson fluids to ensure the environment remains suitable and does not threaten the integrity of the riser □ Documented defect assessment and repair policy in place for all deterioration and damage to pipeline **ESDVs** □ Implementation of a suitable and adequate inspection and maintenance strategy for ESDV and actuators including all components with the associated system □ ESDV inspection covers all elements necessary to ensure valve closure, e.g. actuator and hydraulic lines, in addition to valve assembly itself □ ESDV performance standards set for closure times and passage rates, ESDVs inspected and tested to these standards □ Riser ESDVs are identified as safety and environmental critical elements (SECEs) in the verification scheme □ Maximum ESDV leakage rates determined according to the installations ability to safely control the hazard arising from such a leak □ Any ESDV bypass locked shut in normal operation, adequate controls for unlocking in place **SSIVs** □ SSIVs are identified as safety and environmental critical elements (SECEs) in the verification scheme □ Implementation of a suitable and adequate inspection and maintenance strategy for SSIVs and associated system □ SSIV performance standard set for closure times and leakage rate and SSIVS inspected and tested to these standards at suitable intervals □ Maximum SSIV leakage rates to be determined according to the installations ability to safely control and prevent escalation of any pipeline incident, outboard of the Riser ESDV on pipeline/riser close to the installation **Pig traps** (where fitted)

	□ Implementation of a suitable and adequate inspection and maintenance strategy for all valves on pigging facilities □ Pigging operations carried out to suitable written procedure to include purging, proving isolations and use of interlocks **Damage prevention** □ Pipeline anchor hazards considered and risk controls in place where appropriate □ Riser and ESDV protected from fire, impact (including vessel impact) and explosion □ Lifting over pipelines, risers and associated equipment is controlled □ Spans monitored and remedial action taken where necessary **Decommissioning** □ Adequate systems in place to ensure the safe isolation from live plant, to include prior testing of valves and the ongoing monitoring of the effectiveness of the valve's performance (where applicable) □ Purging/cleaning of oil and gas pipelines has been undertaken to satisfy environmental requirements □ Consideration given to adjacent live pipelines in bundles/piggybacks etc. □ Establish adequate surveying and maintenance regime of pipelines in IPR until approval of the formal decommissioning programme □ Ensure pipelines are either dismantled and removed or left in a condition where they will be not become a source of danger to people, as per the decommissioning programme and the requirements of PSR □ Ensure that work done in carrying out the final decommissioning of a pipeline is done in a safe and controlled manner **Other** □ Key operating parameters (e.g. operating pressure and temperature excursions) monitored, logged and acted upon where appropriate

	□ Effective integrity and damage assessment and appraisal process in line with industry good practice □ Coherent and ongoing mechanism for ensuring effective oversight and decision making in relation to the integrity management arrangements □ Effective management of the verification process associated with pipeline SECEs □ System in place to conduct suitable investigations into loss of integrity incidents, implement any remedial actions and track any evidence of recurring root causes
4. Emergency planning and preparedness	□ Adequate pipeline emergency procedures detailing organisation and arrangements are in place for dealing with the consequences of a major accident involving a pipeline □ Availability of pipeline emergency procedures in control room □ MAHP emergency plans and procedures tested, reviewed and revised periodically and in the light of lessons learned from tests. Regulation 8 of the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER) requires the installation operator to draw up an emergency response plan for the installation, and this should cover the arrangements in place for emergencies which may affect the connected pipeline □ Effective emergency communication arrangements in place between installation operator, operators of any interconnecting platforms and pipeline operators □ Competence of key personnel in emergency procedures is assured □ Adequate consideration of emergency response in control room design e.g. alarm handling □ Consideration given to how pipeline depressurisation can be achieved safely in an emergency □ Effective procedures in place to monitor for evidence of loss of integrity/release/spill to sea and respond to minimise safety/environmental impact

Appendix 3 Sample Inspection Agenda, including pre-visit information request

Onshore	**Detailed Pipelines Specific Agenda prior to going offshore** The key issue is to make sure that the duty holder is identifying and managing hazards arising to/from pipelines to support maintaining safe operations. Records should be provided (preferably electronically) to allow for the following activities prior to offshore trip **Pipeline and Riser Design** □ Number of MAH pipelines □ Date of commissioning for pipelines and liquids being transported □ Status of pipelines – operational/IPR/decommissioned □ Riser configuration, including riser caissons and J-tubes □ Water depth and pipeline configuration, including bundles □ Pipeline SECEs **Riser ESD valves** □ Review of records for inspection and testing going back for a reasonable period, including seat leakage testing results, trending, and procedure(s) □ Review of maintenance records for ESDV including actuator and control system □ Performance standard, selection of closure times and leak rate □ Written scheme of examination □ Corrosion under insulation (CUI) inspection results **SSIVs** (as applicable) □ Review of records for inspection and testing going back for a reasonable period □ Performance standard, selection of closure times and leak rate □ Written scheme of examination **HIPPS** (as applicable) □ Review of records for inspection and testing going back for a reasonable period □ Performance standard □ Written scheme of examination **Pig traps** (as applicable) □ Review of technical and procedural risk controls

	□ Review of records for inspection and maintenance going back a reasonable period □ Review of pig launch/receive procedures **P&IDs and PFDs** □ Review of current piping and instrumentation diagrams for each pipeline riser, ESD valve and pig trap □ Review of process flow diagrams (or P&IDs) for subsea systems (as applicable) **Flexible risers** (as applicable) □ Review of test records for flexible riser annulus vacuum testing □ Review of records from vent gas monitoring (where applicable) **Riser caisson / J-tube / I-tube** (as applicable) □ Review of measures in place for maintenance, including seal monitoring, and leak detection and P&IDs **Pipeline/riser integrity** □ Pressure and temperature: Identification of set points □ Identification of alarms and trips on P&IDs □ Review of ILI results □ ROV inspections findings □ Sample external inspection reports of risers/ESDV/HIPPS □ Who reviews inspection reports? Process for initiating rectifications □ Marine/lifting procedures to avoid pipeline / riser damage □ Risk based inspection assessment reports going back a reasonable period **Age and life extension studies** □ Review age and life extension approach (risk based design life extension process or formal design life extension assessment) □ Review that assessment includes consideration of design premise of pipeline including construction and operational history □ Review risk assessment to check that consideration has been given to new threats to pipeline as a consequence of ageing; any additional control measures identified have been implemented and actions taken to ensure continued safe operation □ Evidence that inspection is carried out to validate condition monitoring assessments and modelling **Corrosion management**

	□ Review procedures (e.g. corrosion management strategy, corrosion monitoring and control programme) and records **Operational risk assessments (ORAs)** (as applicable) □ Review of any relevant ORAs (present and historical) To ease the onshore inspection the duty holder should prepare a review (e.g. by PowerPoint) of the following items □ Field layout, operational status of pipelines (including bundles, gas lift, water injection) and production levels □ Battery limits of pipeline ownership and operatorship. Evidence of integrity data exchange with 3rd parties. Is gas being exported or imported? If gas is being imported, where does it come from and who controls it? □ Operation, inspection, and maintenance strategy, including ROV/ILI inspection findings and external riser/ESDV/HIPPS/SSIV inspections □ Riser, ESDV, I/J-tube, SSIV (as applicable) and pipeline testing, inspections and maintenance □ Internal and external corrosion management □ Organogram, who deals with pipeline issues and what are the lines of communication

Offshore	**Detailed Pipelines Specific Agenda** The key issue is to make sure that the duty holder is identifying and managing hazards arising to/from pipelines to support maintaining safe operations. The objective is to confirm that the safety management system is being implemented and this is achieved by sampling elements of the system. The offshore inspection will cover this by addressing pipelines and riser operation, inspection and maintenance as follows **General** □ Review of current P&IDs for pipeline riser, ESD valve and pig trap available on installation □ Review of topside (pig trap) P&IDs, and PFDs for subsea systems (as applicable)

	□ Any other pipelines issues **General visual inspection** of: □ Riser (going as far down the risers as possible subject to access / weather) □ Riser ESDV, including condition of actuator body □ Location (visibility and access), labelling and condition of local emergency controls □ General condition of PFP and monitoring of corrosion under insulation (CUI) □ Pig traps / connection points for temporary pig trap □ Potential dead legs □ HIPPS □ Location and labelling of pressure and temperature transmitters □ Condition of relevant topside pipe work □ Injection points for chemicals and chemical skids **Riser ESD valve** inspection and testing □ On-site demonstration of relevant procedure execution, e.g. by production technician □ Retrieval of test records and review hereof **SSIV** inspection and testing (as applicable) □ On-site demonstration of relevant procedure execution, e.g. by production technician □ Retrieval of test records and review hereof **HIPPS** inspection and testing (as applicable) □ On-site demonstration of relevant procedure execution, e.g. by production technician □ Retrieval of test records and review hereof **Flexible riser** annulus venting/monitoring and vacuum testing (as applicable) □ On-site demonstration of relevant procedure execution □ Retrieval of test records and review hereof □ Flexible riser annulus venting arrangement to ensure that annulus is positively vented and no communal venting system with other risers **Riser caisson /J-tube/I-tube** maintenance and leak detection (as applicable) □ On-site demonstration of relevant procedure execution □ Retrieval of test records and review hereof

	Pig trap operation and maintenance (as applicable) □ On-site demonstration of pigging procedure □ Bonding on pig trap body and door closure to ensure electrical continuity □ Cleaning KPIs □ Valve isolations and purging process □ Inspection and maintenance records for pig traps **Corrosion management** □ Monitoring of chemical injection, including injection rates and tank refill □ What fluid testing is done, and how often? How is testing recorded? Identification of sampling points. KPIs □ Retrieval of records, e.g. maintenance routines for chemical injection pumps □ Online monitoring (BS&W; iron counts; inhibitor residuals; corrosion coupons; electrical resistance (ER) probes) **Operational protection** of pipeline integrity: □ Pressure alarms and extraction of historical data □ Temperature alarms and extraction of historical data □ What alarms are visible in central control room (CCR)? □ Where are the sensors causing the trips located? Are they currently functioning? □ Damage prevention / crane / marine operations **Procedures for pipelines response to installation emergencies, including shutdown of interconnected installations** □ MAH scenario and bow ties □ Cause and effect diagrams □ Interplatform operations □ Check the availability of current pipeline emergency procedures offshore in control room and check control room operatives knowledge of emergency arrangements □ Check if emergency exercises are conducted with pipeline riser scenarios To assist the inspection a camera permit should be available.

Appendix 4 Application of EMM and Duty Holder Performance assessment

When inspecting the Offshore Pipeline 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 initial enforcement expectation criteria differ slightly from the EMM for a 'Nominal' risk gap. This is because in practice '30' scores have been found to cover a wide range of risk gaps and a verbal warning would be an inappropriate enforcement response in many cases.

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
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 and the risk gap associated with the inspection findings.

- Where compliance gaps are found in two or more areas the overall score should not be less than the most significant risk gap identified. In addition, risks are cumulative, therefore risk gaps found in several areas need to be ‘added’ to ensure the overall risk is accounted for in the score. For example, two or three substantive scores of ‘30’ will point strongly to an overall score of ‘40’. There is currently no mathematical or other systematic process for doing this and inspectors must therefore use their judgement to allocate an appropriate score that best represents the overall inspection findings against this IG. The judgements made will be reviewed over time with the aim of establishing improved guidance for this activity.

Appendix 5 Environmental Considerations and the role of OPRED

It is important that operators consider effects on the environment at all stages in the life cycle of a pipeline. A loss of pipeline integrity resulting in an oil release to sea may have an environmental impact. Under the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 (as amended) a person is guilty of an offence if they release any oil, or allow such a release to continue. Pipelines must also be included within the scope of an Oil Pollution Emergency Plan (OPEP) as required by the Merchant Shipping (Oil Pollution Preparedness, Response and co-operation Convention) Regulations 1998 and associated guidance.

The Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) is the offshore environmental regulator for enforcement of these regulations and for approval of offshore installation OPEPs, including pipelines. OPRED may seek information from operators on the actions being taken to prevent releases to sea and may conduct investigations into any releases of oil to sea that occur.

Appendix 6 References / Further Reading

1. Relevant legislation

Pipelines Safety Regulations 1996

The Pipelines Safety Regulations 1996 (PSR) place a range of duties on pipeline operators, many of which relate directly to offshore pipeline integrity management. Of these, the following are key requirements which have been the subject of HSE enforcement activity, or where failure to comply has been a significant factor in the causation or escalation of pipeline incidents.

Regulation 3 provides the meaning of a pipeline for the purposes of the regulations.

Various requirements of Regulations 5 - 11 relate to pipeline design aspects which will be critical for subsequent pipeline integrity.

Regulation 6 requires the operator to ensure that suitable safety systems are provided to protect people from risks to their health or safety. This includes e.g. emergency shut-down valves which operate on demand or fail safe in the closed position so minimising the loss of containment of pipeline inventory, subsea isolation valves (SSIVs) where appropriate, or interlock systems on pig traps.

Regulation 13 requires the operator to ensure that a pipeline is maintained in an efficient state, in efficient working order and in good repair.

Regulation 14 requires the operator to ensure that a pipeline which has ceased to be used for the conveyance of any fluid is left in a safe condition and that work done in discharging of this duty is performed safely.

Regulation 15 requires that no person shall cause such damage to a pipeline as may give rise to a danger to persons. This includes the operator during other works, such as lifting operations.

Regulation 19 requires the operators of offshore MAHPs with an internal diameter of 40mm or more to install ESDVs in the pipelines.

Regulation 20 to 22 requires operators of offshore MAHPs to notify HSE prior to construction and use, and any pipeline modifications that affect the level of risk. Notification acts as a trigger for more detailed discussion between HSE and the operator regarding proposals for the design, construction and safe operation of the pipeline during its projected life.

Regulation 23 requires the operator of an MAHP to prepare a major accident prevention document (MAPD).

Regulations 24 and 12 requires operators of MAHPs to establish and record arrangements and procedures for emergencies. These need to be subject to revision and testing.

The Provision and Use of Work Equipment Regulations 1998

Regulation 6 of the Provision and Use of Work Equipment Regulations 1998 (PUWER) imposes duties relating to the inspection of work equipment (including pipelines) and record keeping for these inspections.

Regulation 17 on Controls requires that all controls for work equipment are clearly visible and identifiable, including by appropriate marking where necessary.

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

Regulation 5 of the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER) requires the installation operator to carry out an assessment of the major accident hazards involving fire or explosion, and to identify appropriate arrangements to deal with them. The information about major accident hazards and the measures taken to reduce risks in this regulation can be used to demonstrate that the ESDV is capable of adequately blocking the flow of fluid within the pipeline riser to meet the requirements of Regulation 19 and Schedule 3 of PSR.

Regulation 8 requires the installation operator to draw up an emergency response plan for the installation and this should cover the arrangements in place for emergencies which may affect the connected pipeline.

The Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015

Regulation 17, Schedule 6 of the Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015 (SCR2015) requires the installation safety case to contain details of pipelines with the potential to cause a major accident and descriptions of arrangements to comply with provisions of PSR, including a summary of the MAPD.

Regulation 20 requires the installation operator to prepare a safety case for dismantling a fixed installation.

Regulation 24(2) requires the installation operator to submit a revision that makes a material change to the safety case, for example, when a new well is tied back to the installation resulting in new activities on the installation; decommissioning a production installation and connected pipelines prior to dismantling or during the early stages of dismantling activities before the submission of a specific dismantling safety case.

2. Standards and other reference documents

American Petroleum Institute (API) Standards

- API RP 17J Specification for Unbonded Flexible Pipe
- API RP 17B Recommended Practice for Flexible Pipe
- API 17L1 Specification for Flexible Pipe Ancillary Equipment
- API 17L2 Recommended Practice for Flexible Pipe Ancillary Equipment
- API 17TR1 Evaluation Standard for Internal Pressure Sheath Polymers for High Temperature Flexible Pipes
- API 17TR2 The Ageing of PA-11 in Flexible Pipes

American Society of Mechanical Engineers (ASME) Standards

- ASME B31.8 Gas Transmission and Distribution Piping Systems
- ASME B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
- ASME VIII Boiler and Pressure Vessel Design Code

British Standards

- BS EN 14161+A1 Petroleum and natural gas industries. Pipeline transportation systems.
- BS PD 8010-2+A1 Pipeline systems. Subsea pipelines. Code of practice
- BS PD 8010-4 Pipeline systems. Steel pipelines on land and subsea pipelines. Code of practice for integrity management
- BS PD 8010-5 Pipeline systems. Subsea pipelines. Guide to operational practice
- BS ISO 13628-11 Petroleum and natural gas industries. Design and operation of subsea production systems. Flexible pipe systems for subsea and marine applications
- BS EN ISO 13628-2 Petroleum and natural gas industries. Design and operation of subsea production systems. Unbonded flexible pipe systems for subsea and marine applications
- BS PD 5500+A1 Specification for unfired fusion welded pressure vessels

DNV GL

- DNVGL-ST-F101 Offshore Standard: Submarine Pipeline Systems
- DNVGL-RP-F116 Integrity Management of Submarine Pipeline Systems
- DNVGL-RP-206 Riser Integrity Management
- DNVGL-RP-F107 Risk assessment of pipeline protection
- DNVGL-RP-F101 Corroded pipelines
- DNVGL-RP-F113 Pipeline subsea repair
- DNVGL-RP-F105 Free spanning pipelines
- DNVGL-RP-F103 Cathodic protection of submarine pipelines

- DNVGL-RP-B401 Cathodic Protection Design
- DNVGL-RP-F110 Global Buckling of Submarine Pipelines
- DNVGL-RP-F111 Interference between trawl gear and pipelines

Energy Institute

- Guidelines on integrity management of subsea facilities
- Guidance on the inspection, testing and maintenance of pipeline emergency shutdown valves incorporating guidance regarding aspects common to non-closure-critical valves

Oil and Gas UK Guidance

- OPO10 State of the Art Report on Flexible Pipe Integrity and Guidance Note on Monitoring Methods and Integrity Assurance for Unbonded Flexible Pipes
- Guideline on Ageing and Life Extension of Subsea Pipelines and Risers
- Supplementary Guidance on the Reporting of Hydrocarbon Releases, Issue 3

HSE publications - guidance

- HSG65 Managing for health and safety
- HSG48 Reducing error and influencing behaviour
- HSG250 Guidance on permit-to-work systems: A guide for the petroleum, chemical and allied industries
- HSG253 The safe isolation of plant and equipmentHSG254 Developing process safety indicators: A step-by-step guide for chemical and major hazard industries

HSE publications - legislation

- L82 A guide to the Pipelines Safety Regulations 1996
- L65 Prevention of fire and explosion and emergency response on offshore installations
- L70 A guide to the Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995
- L22 Safe use of work equipment

Web guidance

- Hydrocarbon Risers in Caissons and I/J Tubes – Inspection issues and recommendations
- Further guidance on emergency plans for major accident hazard pipelines
- Guidelines on anchor hazards for pipeline operators
- Pipelines Safety Regulations 1996: Guidance on 'Pipeline Operator'
- Reporting of offshore pipeline incidents - Additional HSE guidance
    - Reporting incidents to OSDR

    - Dangerous occurrences
- Pipeline Pressure Limits - Pipelines Safety Regulations 1996
- Pipeline riser emergency shut down valves: inspection issues and recommendations
- Unbonded flexible pipe: inspection issues and recommendations
- Use of pipeline standards and good practice guidance