دبي للبترول
Dubai Petroleum

هيئة دبي للتجهيزات
Dubai Supply Authority

Guidelines for
Onshore Pipeline Integrity Management

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1 INTRODUCTION

1.1 General

Dubai Supply Authority (DUSUP) provides energy supply (Natural Gas) to the Emirate of Dubai to meet the needs of electricity generation and water desalination through its pipeline network. Through the production of natural gas (which is processed into gas and condensate products), the purchase of pipeline gas and LNG (and its regasification), gas storage and the operation of the pipeline network, DUSUP plays a key role in the growth and development of Dubai.

DUSUP has assigned Dubai Petroleum Establishment (DPE) the responsibility for operating DUSUP assets and authorized DPE to manage all emergency events occurring on its own operated facilities, pipelines and assets within pipeline corridors in liaison with other governmental entities.

DUSUP-DPE designs, operates and maintains DUSUP's onshore pipelines and related facilities to International Standards in order to ensure an uninterrupted flow of gas and other hydrocarbons across Dubai. The onshore hydrocarbon pipeline network consists of approximately 750 kilometres of pipelines ranging from 48" high pressure gas pipelines down to 10" condensate lines. The gas pipelines operate at high-pressure up to 960 psig and transport highly explosive and flammable natural gas.

The majority of the onshore hydrocarbon pipeline network is laid-out in designated DUSUP corridors that are secured by fences and controlled access gates. Some parts of the onshore pipeline network run in the Right of way, Public way and in unfenced corridors - due to the close proximity of road infrastructure.

A number of other operators pipelines share DUSUP corridors, including jet fuel and fuel oil pipelines in the Emirate of Dubai.

1.2 Purpose

This guideline provides recommended practices aimed at assuring integrity of pipeline assets and sets the minimum requirements of a pipeline integrity management system to be put in place and followed by operators whose pipelines share DUSUP corridors and routes or whose pipelines crosses DUSUP pipelines to maintain the integrity of their assets / pipelines.

1.3 Scope

The scope of this guideline includes onshore pipelines operated in designated DUSUP corridors that are secured by fences and controlled access gates. It also includes pipelines, or sections thereof, operated in the Right of way, Public way and in unfenced corridors due to the proximity of road infrastructure.

1.4 References

SNo.	International Standards	
[1]	ASME B31.8	Gas Transmission and Distribution Piping Systems
[2]	ASME B31.8S	Managing System Integrity of Gas Pipelines
[3]	NACE MR0175/ ISO 15156	Petroleum and natural gas industries—Materials for use in H2S-containing environments in oil and gas production
[4]	49 CFR Part 192 & 195	Code of Federal Regulations
[5]	ISO 15589-1	Petroleum, petrochemical and natural gas industries — Cathodic protection of pipeline systems
	DPE / DUSUP IMS Documents	
[6]	DP-OPSON-0144	DUSUP Guidelines for Land Use Planning
[7]	DPE-OPSON-0150	Guidelines for Hydrocarbon Pipeline Protection
[8]	DP-OPSON-0140	DUSUP Guidelines for Pipeline Owners Work on their Pipeline
[9]	DP-OPSON-0156	DUSUP Guidelines for DEWA Work within HC Pipelines NOC Zone & DUSUP Corridor
[10]	DP-OPSON-0307	Guidelines for GIS Data Transfer Minimum Requirements

1.5 Abbreviations

Abbreviation	Description
ALARP	As Low As Reasonably Practicable
ASME	American Society of Mechanical Engineers
BVS	Block Valve Station
CFR	Code of Federal Regulations
CIPS	Close Interval Potential Surveys
CP	Cathodic Protection
CVI	Closed Visual Inspection
DCVG	Direct Current Voltage Gradient
DPE	Dubai Petroleum Establishment
DUSUP	Dubai Supply Authority
EPRS	Emergency Pipeline Repair System
ESDV	Emergency Shut-down Valve
GCS	Gas Control Station
GIS	Geographic Information Systems
HSE	Health Safety And Environment
ILI	In-Line Inspection
IR	Infrared
MCDR	Material Corrosion Defect Report
MFL	Magnetic Flux Leakage
ORA	Operational Risk Assessment

PIMS	Pipeline Integrity Management System
POF	Probability of Failure
RAM	Risk Assessment Matrix
ROW	Right of Way
SCE	Safety Critical Equipment
TA	Technical Authority
TRA	Task Risk Assessment
UT	Ultrasonic Testing

1.6 Definitions

ALARP	ALARP is a principle in the management of risk involved in the systems. The principle is that the mitigated or residual risk shall be reduced as far as reasonably practicable.
CUSTOMER	Organization that receives gas from DUSUP at an agreed delivery point.
DPE	DPE is the government entity that operates DUSUP assets as Onshore Operations Team and has authority to manage all emergency events occurring on its own operated facilities, pipelines and all crisis occurring within pipeline corridors in liaison with other governmental entities.
DUSUP	DUSUP is the legal commercial entity that own Margham Field, Margham Plant Facilities, Gas Control Station, LNG Platform and Onshore Pipelines within pipeline corridors and has given to DPE full operatorship of all its facilities.
DUSUP Corridor	DUSUP Corridor is the land allocated by Dubai Municipality or other statutory government authority to DUSUP for the construction, operation and maintenance of gas and fuel pipelines in the emirate of Dubai.
GIS	Geographic Information System (GIS Software) is designed to produce graphic displays of geographic information for analysis and presentation. It is widely used in pipeline engineering for producing pipeline route maps.
OnshoreHydrocarbon Pipelines Network	Approximately 700 kilometres of onshore hydrocarbon pipelines operating in Dubai. The network consist of gas, condensate, jet fuel and fuel oil pipelines. The gas pipelines operate at high-pressures up to 960-psig and transport highly explosive and flammable natural gas. The jet fuel and fuel oil pipelines operate at 653-psig share the same corridors. The condensate pipeline operate at 1000-psig and also share corridor with other pipeline.
Pipeline	Those components of a pipeline system connected together to convey fluids between stations and/or plants, including pipe, risers, pig traps, components, appurtenances, isolating valves, pipeline end manifolds (PLEMs) and sectionalising valves.
Onshore Pipeline	Pipeline laid on or in land, including lines laid under inland water courses.

Pipeline system	Pipelines, stations, supervisory control and data acquisition system (SCADA), safety systems, corrosion protection systems, and any other equipment, facility or building used in the transportation of fluids.
Pig	A device, which can be propelled through a pipeline by fluid flow and is normally used for cleaning, batching, inspection or other activities.
Pipeline Integrity	Pipeline integrity is achieved when, under specified operating conditions, the risk of failure which could endanger the safety of personnel, the environment, or asset value is tolerable and has been reduced to a level that is as low as reasonably practicable (ALARP).
RAM	Risk Assessment Matrix (RAM) is a matrix used to rank and assess the risk by considering the probability or likelihood against the consequence severity.
Risk	Risk is a combination of the consequence of failure and the likelihood of the consequence occurring.
Risk Assessment	Risk Assessment is the process of identifying the consequences of the worst case credible scenario arising from the occurrence of a hazardous event together with estimating the likelihood of that scenario occurring.
Threat	An unfavourable condition or situation that can lead to a risk.

2 PIPELINE INTEGRITY MANAGEMENT

2.1 Objective of Pipeline Integrity

Pipelines are designed to suit particular service conditions which are defined in the basis of design. These include materials of construction, pressure, temperature, product composition, flow, fluctuations, etc. The pipeline must be operated within these defined boundaries to ensure that the design life is successfully achieved.

Inspection, monitoring and remediation must be undertaken throughout the service life to ensure pipeline integrity and that any deterioration observed during the pipeline life cycle remains within safe limits so that risks are minimised / reduced to ALARP (as low as reasonably practicable) within acceptable risk to public as defined as a minimum in DUSUP Guidelines for Land Use Planning [6].

Subsequent sections describe the minimum requirements to be followed to achieve the objectives of the pipeline integrity management.

2.2 Pipeline Integrity Management System (PIMS)

A Management System (MS) combined with Integrity Management Program is called a Pipeline Integrity Management System (PIMS). The pipeline owner shall have developed and published a PIMS which is the first step of pipeline integrity management.

The overall objectives of pipeline integrity management systems are:

- To maximise asset availability and its net present value
- To minimise health, safety and environmental risk
- To safeguard and be able to demonstrate technical integrity throughout the asset life.

The PIMS document shall include the following elements as a minimum

- An identification and registration of the Pipeline network and its associated equipment
- An identification of possible threats, a risk assessment review and a documented list of risk mitigations
- An integrity strategy which is a key element of the risk mitigation
- A documented pipeline inspection programme
- A system to report, manage anomalies and failures, and perform integrity assessment
- An Emergency Response Plan, including emergency repairs
- A system to investigate incidents and communicate learnings

A process or management review and assessment of the continued suitability of the PIMS in managing pipeline integrity risks.

Each of these elements is considered in detail in the following sections.

The PIMS document itself has to be reviewed on a regular basis to ensure it remains appropriate in the light of findings or changes to operations. The review is an important aspect of the pipeline integrity management scheme to ensure continuous improvement and is a means of:

- Confirming compliance of the PIMS with legislative and company requirements
- Confirming that the PIMS is effectively implemented

The maximum review interval for PIMS document shall be 5 years, however interim reviews shall be made in case of major change or based on findings and learnings if necessary.

2.3 Pipeline Network Identification

Prior to starting any pipeline integrity activities, it is important to clearly identify pipeline boundaries, route, length, associated equipment, design parameters, operating parameters and any other associated piece of information which is deemed critical for the technical review of the pipeline and susceptible to change the pipeline risk profile.

Pipeline owners shall gather this information into a unique and controlled database (typically called an Asset Register) so that the information remains as a unique, trusted and auditable source of information that can be edited by authorised personnel only.

This register shall be reviewed periodically and any change shall be updated accordingly.

Pipeline route data shall be kept in GIS format. The pipeline owners shall share with DUSUP-DPE and keep up to date their complete pipeline route details to update the DUSUP Hydrocarbon Pipeline GIS Information. Point of contact details for sharing the GIS data / asset register etc are provided in Section 5 of this guideline. Pipeline Owners shall refer to DUSUP Minimum Requirement for GIS Data Transfer Ref. DP-OPSON-0307[10].

2.4 Integrity Programme

An integrity programme requires to be developed to evaluate pipeline condition and ensure pipeline integrity. The integrity programme can either be risk based or time based. In both approaches, hazard identification shall be carried out to ensure the adequacy of the integrity programme.

Like most oil & gas operators, DUSUP and DPE prefer and recommend the use of risk-based integrity programmes so that integrity resources are prioritised to address areas where risk is identified. When risk based integrity approach is utilised, pipeline risk assessment shall be

performed for developing pipeline integrity management plans. Risks to the pipelines shall be identified and assessed in accordance with ASME B31.8S [2] or similar proven industry standard.

The risk assessment shall be based on either qualitative assessment or quantitative assessment of likelihood and consequence or semi-quantitative assessment of likelihood and consequence. For all type of assessment, it is recommended to use Risk Assessment Matrix (RAM) to categorise risk.

The risk assessment shall result in the development of integrity plans that control, mitigate or monitor the identified risks, using maintenance, inspection and testing activities. Examples of risk mitigation include:

- Control and monitoring of operating parameters, e.g. pressure, temperature and flow rates
- Control and monitoring of process fluids, e.g. water dew point, H2S, chlorides etc.
- Equipment testing, e.g. ESDVs, and cathodic protection surveys etc.
- Preventive Maintenance (Servicing), e.g. maintenance pigging, batch pigging, etc.
- Pipeline inspection, e.g. visual inspection, survey techniques and non-destructive testing

Pipeline risk reassessment shall be carried out after completion of any major inspections such as CP survey, IL inspection etc. Summary of the pipeline risk assessment shall be shared with DPE-DUSUP. Point of contact details for reporting summary of risk assessment are provided in Section 5 of this guideline.

If the pipeline owner choose a time based integrity programme, the selected intervals shall not exceed the maximum intervals recommended by the international codes and standards ([1], [4]) or industry best practices.

The integrity programme shall be entered into a computerised maintenance and inspection management system with each activity being assigned a target completion date. All inspection and monitoring activities shall be executed as per planned schedule. However, practical considerations including operational constraints can affect the schedule and priority of inspections and monitoring. In such circumstance, deferrals shall be created to postpone the activities with supporting risk assessment. Inspection deferral shall be communicated to DUSUP-DPE so that a risk review can be immediately carried out to put in place a mitigation plan at corridor level if required.

2.5 Pipeline Inspection

Pipeline inspection is essential to confirm the condition of the pipeline and provide data for assessing current and future integrity. Hence, the pipeline inspection strategy shall identify the type of inspections required, their coverage and inspection interval. If a risk based inspection approach is used the inspection technique, inspection coverage and interval shall be proportionate to the risk level.

There are various mechanisms or threats that can compromise the integrity of a pipeline, which are assessed in the risk-based integrity programme development in 2.4, above. These include but are not limited to:

- Internal corrosion
- External corrosion
- Third party damage
- Fatigue

- Mechanical overload
- Crack-like flaws
- Manufacturing defects

Several inspection techniques must therefore be used depending on the location of the pipeline section under consideration and the threats that are being assessed and the inspection strategy shall identify the inspection tool / technique requirement for each failure mechanism / threat.

Inspection coverage and interval may be based on a risk assessment or time based or ad-hoc basis. As part of the PIMS, it is required to identify the type of inspection(s), the coverage (e.g. 100% of pipeline length over full circumference) and inspection interval and basis for the specified inspection interval.

As a minimum the following inspection activities shall be carried out for detecting threats in pipelines operated in an environment such as the one experienced in the Emirate of Dubai:

2.5.1 ROW Patrols

Patrolling along the pipeline is a general visual inspection activity used to observe surface conditions, indications of leaks, construction activity, and other factors affecting safety, integrity and security. Patrolling shall be carried out along the onshore pipelines and laterals.

Methods of patrolling include walking, driving, flying or other appropriate means for inspecting the right-of-way.

When performing ROW patrols, the patrollers should be cautious of anything that appears to be out of the ordinary. Patrollers shall establish a list of observations which, if seen on the ROW, would be considered “reportable observations.”

Records of ROW Patrols (location, timing, duration) shall be retained for audit purposes.

2.5.2 Visual Examination and Ultrasonic Survey

Above ground pipelines and laterals and block valve stations which are above the ground require Closed Visual Examination (CVI) and ultrasonic wall thickness inspection survey to confirm the absence of significant external or internal corrosion or other anomalies such as mechanical or coating damages.

The depth of any identified external corrosion shall be quantified using a pit-depth gauge, or other suitable instrumentation. Checks to quantify the extent of internal corrosion, or verify the wall thickness of the pipe may be carried out using ultrasonic tools. A special attention shall be given to external corrosion underneath clamps, supports, sleeves and insulations.

Visual inspection for onshore pipelines shall also inspect the coating/ paint peel off, blistering or deposits on the pipe surface, pipe support condition and any sign of mechanical damage for both pipeline and supports.

2.5.3 In-line Inspections (ILI)

In-line inspections (intelligent pigging) of pipelines shall be carried out using a magnetic flux leakage (MFL) and/or an ultrasonic technique (UT) inspection tools. Preference shall be given to UT tool if pig driving medium is water. However, it is recommended to perform a technical assessment based on available data and operating conditions for selection of an IL tool / technology. In addition to the metal loss tool (MFL / UT) additional tool shall be considered for obtaining the coordinate mapping and the pipeline geometric details such as bends, dents, ovality, etc of the pipeline(s). ILI frequency shall be either risk based or time based but shall not exceed half of the pipeline remaining life with a maximum inspection interval of 10 years.

2.5.4 Unpiggable Pipelines / Pipeline Laterals

Unpiggable pipelines for which pipeline geometry prevents conventional pigging, which may include connection to a different diameter pipeline, thick walls or physical damage i.e. dents, must be assessed using alternative methods typically including but not limited to:

- Direct assessment
- Tethered pigging
- Automated or manual UT
- Correlation with similar pipelines
- Hydrotest
- Coupons and probes

These techniques can be used in isolation or in combination, with the main objective to assure that a reasonable level of confidence in the integrity of the pipeline / pipeline laterals is reached.

2.5.5 Leak and Depth Survey

Above ground pipelines and laterals require leak survey using Infrared Radiation (IR) for detecting leaks at flanged connections. Burial depth (depth of cover) survey shall be carried out for underground pipelines. Minimum depth of cover as specified in construction drawing shall always be maintained.

2.5.6 Cathodic Protection (CP) Monitoring and Direct Current Voltage Gradient (DCVG) Survey

Cathodic Protection ON-OFF, CIPS and DCVG surveys shall also be performed for evaluating the level of protection, the external condition of the buried pipelines and their protective coatings. If anomaly is detected, excavation may be required to physically check the external condition (dig verification) of the pipeline and understand the reason for the localised damages. In case of dig verification, a written dig verification procedure shall be prepared and followed by the operator.

CIPS and DCVG survey frequency shall be either risk-based or time based but shall not exceed 5 years. ON-OFF survey shall be carried out on yearly basis.

CP monitoring facilities along the pipeline route to allow measurement of the performance of the cathodic protection shall be installed in accordance with ISO 15589-1[5].

Pipeline owners shall consider more frequent CP inspection intervals if pipelines are exposed to DC stray current interference. An assessment of the level of stray current corrosion risk on the pipeline shall be carried out to determine the inspection frequency. If a pipeline is exposed to significant levels of DC stray current interference, then the pipeline owner shall also review the inline inspection interval and increase the frequency at which inline inspection is carried out.

2.5.7 Emergency Shutdown Valves (ESDVs) Function Testing

Pipeline ESDVs are considered safety critical equipment (SCE) for the isolation of the pipeline inventory or part of it. Emergency shutdown valves shall be periodically tested to ensure that they will be functioning on demand and that valve closure time is compliant with the safety design requirements. Seal leak testing shall also be carried out to ensure that the closed valve is holding tight and does not allow fluid to pass through. Testing shall be conducted in accordance with a defined Performance Standard which contains quantified pass / fail criteria.

2.5.8 Isolation Valves (Offtake and BVS) Maintenance

Offtake valves are essential for carrying out maintenance and repair activities at receiving stations and for emergency isolation of downstream customers. Block valve stations (isolation valves)

divide long pipelines into manageable sections and limit the volume of gas or liquid released in the event of a rupture.

The owners of the pipeline in which offtake / isolations valves are installed shall be responsible for ensuring that the valves are fully operable and capable of holding pressure.

The integrity of these valves shall be periodically verified by carrying out the following tests:

- Partial stroke test every 6 months
- Full stroke test annually
- Verify torque and actuator performance
- Confirm local and remote operation (SCADA)

The isolation valves may be either buried or installed within a valve pit. In both cases, the pipeline owner shall be responsible for ensuring the integrity of the valve, i.e., that it remains fully operable and capable of holding pressure, by conducting the tests specified above.

If offtake valves are failed to meet the integrity requirements, Customers shall provide a shutdown window to allow pipeline owner to maintain, repair and/or replace the offtake valve.

In case isolation valves are installed on the Customer's pipelines, Customers shall:

- Ensure that the valves are fully operable and capable of holding pressure by conducting the tests specified above
- Share the offtake valve test reports with the pipeline owner
- Allow pipeline owners to access and operate the offtake valve in case of emergency

The owner of the offtake valves shall maintain an updated list of non-functional and passing valves and shall share this list with the Corridor Authority.

If the offtake valves have failed to meet integrity requirements and repair or replacement is delayed, the pipeline shall be operated under an Operational Risk Assessment (ORA) with additional mitigation measures and controls in place. The ORA details shall be shared with the corridor authority and the pipeline operator or customer, as applicable.

2.6 Anomaly / Failure Management

An anomaly is characterised by any condition that may impair the pipeline's fitness for purpose when measured against the design intent of the pipeline. Anomalies may be discovered during inspection, monitoring, or as a result of routine operations and maintenance activities.

The objective of the anomaly management process is to perform a thorough evaluation of all such anomalies and their possible impact on the safe operation of the pipeline, in order to determine the appropriate response (either mitigation or corrective action).

The anomaly management process applies to any unwanted pipeline condition that could significantly impact the integrity of the pipeline or the pipeline system. This may include, for example:

- Corrosion (internal / external)
- Deficiencies in corrosion protection systems
- Dents
- Gouges / Cracks
- Unsupported lengths / free spans
- Global buckling both lateral and upheaval
- Exposed pipelines in case of buried pipelines

The level at which anomalies become reportable (T-Anomaly) shall be defined and documented for each type of defect. The inspection team shall use these definitions and acceptance criteria for raising the anomalies. This will ensure consistency in identification and reporting.

Anomalies and corrective actions shall be documented and managed using controlled in-house / 3rd party software or excel spreadsheet. The status of any anomalies shall be maintained live and up-to-date and available for the corridor authority review.

2.6.1 Pipeline Anomaly Management and Reporting

As soon as any inspections have been completed, inspection report shall be issued to the pipeline operator's integrity team for the assessment. Inspection report shall include following as a minimum:

- Asset details, such as Tag identification, equipment type, location as defined in asset register
- Operating parameters at the time of the inspection
- Inspection findings, including anomalies, along with detailed description and pictures.

Reportable anomalies identified during an inspection shall be uploaded into the anomaly management system. An assessment of the anomalies shall be performed and appropriate corrective actions shall be raised based on nature of defect and failure mechanism. Target completion date for corrective actions shall be agreed and document.

Anomalies that could have an imminent effect upon the safety of personnel or cause damage to the environment or other operator's assets shall be reported immediately to Corridor Authority as an "alert" so that a risk review can be immediately carried out to put in place a mitigation plan at corridor level with no delay.

Point of contact details for reporting anomalies are provided in Section 5 of this guideline.

2.6.2 Pipeline Integrity Assessment

Pipeline Integrity Assessment refers to determining whether the pipeline has adequate remaining life to prevent leaks or ruptures under normal operation and upset conditions. Pipeline integrity conditions for pipelines shall be established. Generally acceptable methodologies (in order of preference) are:

- Fitness-for Service Assessment (FFS) / Remaining Life Assessment;
- Hydrostatic pressure tests; and
- Direct Assessment.

In-line Inspection can detect and report the size and location of pipeline anomalies. FFS assessment followed by remaining life assessment shall be performed based on IL inspection results. However, if the pipeline has varying diameters, tight bends, or other restrictions, it might not be possible to use this inspection technique. In this case hydrostatic pressure tests can be used to demonstrate the strength of pipelines. The validity of hydrostatic testing has to be established, based on damage mechanisms and rate of degradation.

Direct Assessment methodology shall be considered if IL inspection and hydrostatic testing are not possible.

Following IL inspection and subsequent FFS / remaining life assessment, if the age of the pipeline is close to its design life (e.g. next ILI date crosses design life), life extension studies shall be performed to identify the mitigations associated with the ageing of the pipeline for extending its life

to the Company desired date. The mitigations proposed in life extension studies shall be recorded and executed.

2.6.3 Pipeline Failure Management and Reporting

Due to the large inventory of fluid / content they contain and transport, pipeline failures (or loss of containments) are always considered as reportable incidents and could result in Major Accidents such as:

- Fire or explosion
- Disruption of gas supply

As a direct consequence, in the event of a confirmed pipeline failure, appropriate emergency measures including depressurization and isolation of the pipeline system shall be implemented immediately. All available methods shall be utilized for failure localization, assessment, and repair.

A failure record shall be created and documented in the Operator anomaly management system as soon as the treatment of the emergency is completed. The failure record shall be updated alongside the completion of the investigation actions taken for understanding the pipeline failure: Inspection Report, Failure Analysis Report, Root Cause Analysis Report and Repair / Replacement Dossier shall be referenced in the failure record.

In case of failure, an incident report (date, time, place, what happened and initial actions taken) shall be communicated immediately (not later than 24 hours) to Corridor Authority so that a condition assessment can be immediately carried out on other pipelines present in the same corridor.

Post incident inspection report, failure analysis report, root cause analysis report and repair / replacement dossier shall also be shared with Corridor Authority no more than 4 weeks after the completion of the repair.

Point of contact details for reporting incident and post incident reports are provided in Section 5 of this guideline.

2.7 Pipeline Emergency Response

Different emergency scenarios could occur from pipeline incidents. In all circumstances priorities shall be given to the protection of People, Environment, Asset and Reputation.

Emergency Response Procedures and Incident Management Guidelines that deal with the pipelines related emergency situations shall be developed and reviewed yearly to ensure that they comply with the industry standards and pipeline integrity management system requirements.

The pipeline emergency response procedures shall be tested on a regular basis during emergency drills where the Site Emergency Response Team reactiveness and ability to control the emergency are monitored, reported and analysed for continuous improvement. Emergency drills shall be carried out at reasonable intervals and no longer than three years. Emergency drills shall also be planned when key personnel of the Site Emergency Response Team has been renewed.

The objective of emergency drills is to identify the problems encountered during emergency drills (e.g. inadequacy of existing procedures, man-power training) and take necessary actions to improve the emergency response.

Pipeline owners within the corridor may also be invited to take part in emergency response drills.

2.8 Pipeline Emergency Repair

An Emergency Pipeline Repair System (EPRS) shall be developed to ensure that a pipeline failure, and whatever caused it, is rectified in a timely manner. The repair equipment and necessary spares shall be maintained in order to provide cost-effective capability to minimise production losses and impact on the environment.

Critical spares/stock shall be documented and should be reviewed and updated on a yearly basis. All intervention work shall be fully documented and records retained for auditable purposes. The pipelines as-built records and asset records shall also be updated.

2.9 Incident Investigation & Learning

When a pipeline failure occurs, incident investigation shall be carried out for determining incident root causes.

The outcome of the investigation shall determine:

- Pipeline incident sequence of events, including response and notification
- What the pipeline incident was (failure cause analysis)
- Why the incident occurred (root cause analysis)
- What the remedial actions were
- Could the response be improved and how
- How can the incident be avoided in future

It is required to develop an incident lesson learned presentation and to roll it out to personnel of the organization that could benefit some key learnings for avoiding similar incidents in the future. Relevant contractor personnel shall also be invited to the lesson learned roll-out session.

Incident investigation report shall be shared with Corridor Authority and lessons learned shall be communicated to other corridor pipeline operators so that similar incidents can be avoided in future.

Point of contact details for reporting results of investigation and lessons learned are provided in Section 5 of this guideline.

2.10 Pipeline Corridor Integrity Management

As pipelines owned and operated by different companies are sharing the same corridor, maintaining pipeline integrity and ensuring transparency in integrity related matters is critical to prevent escalation or domino effects in the event of a failure. Where multiple pipelines occupy a common corridor, coordinated integrity management becomes essential to safeguard all assets within the corridor.

If pipelines are sharing the corridor with other operators, all pipeline owners within the corridor shall maintain and formally share the following information with the corridor authority:

- Asset register, including pipeline operational parameters (Ex: MAOP, operating pressure, product type, temperature) and dimensional details (Ex: diameter, wall thickness, grade, coating system, year of installation, burial depth)
- Critical inspection reports, such as IL, CIPS and DCVG inspection reports
- As a minimum, List of CAUTION and above risk anomalies or anomalies that impact other pipelines within the corridor, including, mitigation status, and precise locations (KP/coordinates), target completion date etc.

- Any incidents or non-standard anomalies such as 3rd party interference, operational upsets, environmental events etc or ALERT that may impact other pipelines in the corridor or public outside the corridor

The above information shall preferably be integrated into a common ArcGIS platform or a compatible ArcGIS based system to enable controlled visibility and spatial correlation by other pipeline operators within the corridor. This will facilitate better risk assessment, interface management, emergency response coordination, and prevention of common-mode failures.

In addition to the above, pipeline owners shall share a list of pipelines operating under Operational Risk Assessment (ORA) with temporary or additional mitigations/controls implemented due to various reasons, such as overdue risk anomalies, delayed inspections or maintenance, known leaks or weeps under monitoring, non-functional ESDVs, etc.

The ORA list shall include the following information:

- Pipeline details including defect / anomaly location (KP / coordinates)
- Description of the ORA
- Initial risk assessment
- Proposed mitigations and controls
- Residual risk
- Proposed permanent solution
- Target completion date

3 MANAGEMENT OF CHANGE

All temporary and permanent changes to the organisation, personnel, systems, procedures, equipment, conveyed fluids, materials, and substances associated with the pipeline shall be managed as per the company Management of Change processes.

Any major / significant engineering changes such as modification to facilities, technology or operating procedures impacting other pipeline shall be shared with the owners of the other pipelines used in the corridor. The engineering changes are anything different from original design i.e,, change in operational parameters, physical changes in existing equipment such as permanent repairs with spools, installation of additional spools, changes in CP protection system etc.

4 INTEGRITY REVIEWS

Periodic integrity review shall be organised on regular intervals between the pipeline operators using the DUSUP corridors and DUSUP-DPE. These reviews shall happen as and when necessary, with a maximum interval of three years.

The topics addressed in this document will be discussed and experience shared for the benefit of all parties with a special focus on risk management activities that could affect other DUSUP Corridor operators.

5 COMMUNICATION PROTOCOL

Communication protocol with DPE-DUSUP shall be exchanged for various activities. Any changes to the communication protocol shall be shared within a week from the effective date of changes.

Point of contacts for emergency and sharing the information with DPE-DUSUP are provided in Table 5.1. Any changes at DPE-DUSUP will be shared within a week from the effective date of changes.

Table 5.1 Point of Contact for Various Actions

SNo	Activity	Contact email ID
1	GIS data / Asset Register	GIS@dusup.ae
2	Pipeline Integrity	Integrity@dusup.ae
3	Pipeline Incident Investigation & Learning.	HSE@dusup.ae

In case of emergency, Contact GCS (Gas Control Station) Control Room on +971 4 880 1999

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