PIPELINE INTEGRITY MANAGEMENT SYSTEM (PIMS) FRAMEWORK

Amendment Details

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<th>Rev. No</th>
<th>Date</th>
<th>Purpose</th>
<th>Prepared by</th>
<th>Reviewed by</th>
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<td>30.05.2017</td>
<td>Draft</td>
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1.0 Introduction

1.1 The objective of this GAIL Pipeline Integrity Management System (PIMS) Framework document is to define the processes, management control and documentation of pipeline integrity management in line with GAIL’s overall corporate policy on safety and business performance. It provides a system for managing the integrity of all GAIL pipelines and demonstrates GAIL’s commitment to ensure that the pipelines are available for safe and reliable operation throughout their entire life cycle.

1.2 The framework document is primarily concerned with the mechanical integrity of the pipelines and associated structures/critical safety equipment with the objective to ensure that hazardous products are contained within the pressurized pipeline systems and leak/ruptures are prevented; in line with government regulations and the contractual, operational, environmental and societal obligations of GAIL.

2.0 Document Scope

2.1 PIMS framework shall apply to all stakeholders who play a role in planning, design, engineering, material procurement, construction, testing, commissioning and Operation & Maintenance of pipelines. They could be individuals and/or business units within GAIL who are given management responsibilities and to those who are tasked with ensuring that day-to-day pipeline activities are properly executed. This PIMS framework is to be used by all persons involved in the operation and maintenance of existing pipelines, including the valves and control systems that lie within the physical limits defined for each pipeline section. It also applies to personnel involved in the planning, design / engineering, construction, commissioning, and decommissioning of pipelines.

2.2 This PIMS policy and framework document provides the essential elements of the following responsibilities, policies and procedural documentation:

- Management and Organization Structure
- Document and Data Management System
- Design / Engineering, Construction and Commissioning
- Pipeline Integrity Management System (IMS)
- Integrated Quality Management System (IQMS) for Operation & Maintenance
- Corrosion Management System
- Pipeline Risk Assessment and Management
- Pipeline Anomaly Management
- Emergency Response and Disaster Management
- Management of Change
- Audit & Review

2.3 All the above sections are either elaborated in this framework document itself or where necessary a separate document is available as referenced in the concerned sections.
3.0 Management and Organization Structure

3.1 This section identifies all key stakeholders within GAIL that have a role in integrity assurance of its pipelines. The organization structure conforms to the following key principles outlined in integrity management;

- The organization structure shall have a clearly defined framework
- Roles and responsibilities shall be defined for individuals
- There shall be defined operations processes
- There shall be clearly spelt out delegation of powers.

3.2 Planning and Development of a pipeline project is undertaken by ‘Project Development’ Department headed by Executive Director (PD) functioning in Business Development Directorate. During this process, they interface with different departments such as Marketing, Projects and O&M in finalizing the project scope and commercial aspects.

3.3 Design, Construction and Commissioning of pipeline assets are undertaken by Corporate Projects Department headed by Executive Director (Projects) functioning under Director (Projects).

3.4 O&M function comprises of Corporate O&M and Region-wise Asset management under the Project Directorate, headed by Executive Director or General Manager functioning as Regional Heads. Under each Regional Head, pipeline networks are organized as distinct entities. At present 13 inter-state or regional networks as below are thus administered by a DGM / GM level officer from the Network Head Quarters:

<table>
<thead>
<tr>
<th>Region</th>
<th>Network Code</th>
<th>Network</th>
<th>Head Quarter</th>
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<tbody>
<tr>
<td>Northern</td>
<td>102</td>
<td>NCR</td>
<td>Noida</td>
</tr>
<tr>
<td>Northern</td>
<td>104</td>
<td>Maharashtra</td>
<td>Mumbai</td>
</tr>
<tr>
<td>Northern</td>
<td>109</td>
<td>Tripura</td>
<td>Agartala</td>
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<tr>
<td>Northern</td>
<td>110</td>
<td>Rajasthan</td>
<td>Jaipur</td>
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<tr>
<td>Northern</td>
<td>111</td>
<td>Assam</td>
<td>Agartala</td>
</tr>
<tr>
<td>Northern</td>
<td>221</td>
<td>JLPL (LPG)</td>
<td>Jaipur</td>
</tr>
<tr>
<td>Central</td>
<td>101</td>
<td>HVJ-DVLP-VDPL</td>
<td>Vijaipur</td>
</tr>
<tr>
<td>Central</td>
<td>103</td>
<td>Gujarat</td>
<td>Vadodara</td>
</tr>
<tr>
<td>Southern</td>
<td>105</td>
<td>DBPL</td>
<td>Bengaluru</td>
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<tr>
<td>Southern</td>
<td>106</td>
<td>KG Basin</td>
<td>Rajahmundry</td>
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<tr>
<td>Southern</td>
<td>107</td>
<td>Cauvery Basin</td>
<td>Puduchery</td>
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<tr>
<td>Southern</td>
<td>108</td>
<td>KKMBPL</td>
<td>Kochi</td>
</tr>
<tr>
<td>Southern</td>
<td>222</td>
<td>VSPL (LPG)</td>
<td>Vizag</td>
</tr>
<tr>
<td>Eastern</td>
<td>112</td>
<td>JHBDPL</td>
<td>Ranchi</td>
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3.5 Corporate O&M function typically comprises of the following principal functions and responsibilities as below:

<table>
<thead>
<tr>
<th>Head (O&amp;M)-CO</th>
<th>Responsible for overall Corporate O&amp;M functions reporting to ED(O&amp;M)-CO</th>
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<tbody>
<tr>
<td>Group Head-NGMC</td>
<td>National Gas Management Center operating round the clock (Responsible for management of supply / receipt of Natural Gas and LPG flowing through entire network, operation coordination, emergency reporting and monitoring)</td>
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<tr>
<td>Group Head – Corporate O&amp;M functions</td>
<td>Responsible for monitoring &amp; reporting O&amp;M activities of all networks, Budgeting, MOU monitoring, coordination with external agencies, Audit &amp; Reviews, Root Cause Analysis, Competency Development and Learning</td>
</tr>
<tr>
<td>Group Head - CIMG</td>
<td>Responsible for formulating policies / procedures, Integrity assessment monitoring &amp; reporting and special projects concerning Pipeline Integrity Management</td>
</tr>
<tr>
<td>Group Head – Central Coordination Group</td>
<td>Responsible for Integrity Management of Rotating Equipment, Coordination for Central Contracts, Major Modification in Pipeline, Compressor &amp; GPUs, Monitoring &amp; Analysis of Metering related issues, Gas Reconciliation, New Technology Application, Coordination with SCADA &amp; Telecom Group</td>
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3.6 The above organization structure is subject to change depending on the expanding network operations and manpower positioning. Hence they shall be maintained as live documents in the O&M Intranet Portal.

3.7 Central Integrity Management Group (CIMG) has been mandated to coordinate the activities of Pipeline Integrity Management at Corporate level, mainly focusing on policy, procedures, guidance and tools required for Regional Integrity Management Groups (RIMG) and Pipeline Maintenance Bases (PMB) as per this PIMS framework and the Integrity Management Plan document for the specific network. A Charter of activities of CIMG with interfacing activities of RIMG is available at O&M Intranet Portal.

3.8 Regional Integrity Management Groups (RIMG) established at each of the Network Head Quarters and Pipeline Maintenance Bases (PMB) at strategic locations within a network caters to Integrity Management activities for a defined extent of pipelines and facilities.

3.9 The Directory of Pipeline Maintenance Bases, RIMG and CIMG along with role descriptions and responsibility matrix are listed at O&M Intranet Portal.

4.0 Principal Roles & Responsibilities

4.1 CIMG

4.1.1 Role: Establishing & Maintaining ‘Pipeline Integrity Management System (PIMS)’ Framework in GAIL, interfacing with RIMGs in implementation of PIMS Framework
across GAIL and assistance to sites in network specific IMS for each network and assisting Corporate Management in monitoring performance of PIMS Framework and IMS of each pipeline network.

4.1.2 RESPONSIBILITIES:

- Codification of all pipeline sections and maintaining a Master list of pipelines including reviewing / updating pipeline asset database for all pipeline assets.
- Review, Updating and coordination in approval of O&M Policy & Guidelines in respect of Pipelines and Compressor / Booster Stations.
- Preparation, Review / Update and Coordination in Approval of PIMS framework documents and associated Guidance Documents, Standardized Work Scope & Technical Specifications and specific guidance on issues encountered from time to time.
- Development, Maintenance and Review of Web application facilitating collection, monitoring and analyses of various pipeline integrity data such as Integrity Activity Scheduling, Risk Assessment, Cathodic Protection, Cleaning Pigging, ILI, DA, Anomaly Management, Internal Corrosion Monitoring etc.
- Acquisition of Standards, tools and software in support of monitoring and analysis of integrity data.
- Arranging technical support to all pipeline integrity personnel through integrity consultancies on special needs and subject matter experts.
- Coordination with RIMGs and Maintenance Bases
- On-site review of Integrity activities, data and issues for each network at least once a year.
- Follow-up meeting of CIMG-RIMG with ED (O&M)-CO and concerned regional ED on a monthly basis.
- Query – Clarification to sites.
- Learning and Competency development of all personal in CIMG, RIMG and Pipeline Maintenance Bases.
- Participation in reputed pipeline integrity forums and technical conferences to imbue current concepts and technology development.

4.2 RIMG

4.2.1 Role: Assisting OIC in implementing and monitoring the GAIL Board approved IMS of the pipeline network concerned.

4.2.2 RESPONSIBILITIES:

- Coordination with CIMG
- Reviewing / Updating Pipeline Asset Database
- Preparation, Monitoring & Updating of schedule of all activities covered under the IMS of the network and incidental thereto.
• Tendering / Award of all works & services for risk & integrity assessment, mitigation and other related areas.
• Monitoring that pipeline integrity related data are updated / uploaded in relevant databases & records.
• Review of pipeline integrity data and identifying action required.
• Coordination with Pipeline Maintenance Bases for execution of pipeline integrity activities.
• Interface with CIMG for centralized tendering, integrity database, guidelines, procedures and practices, ensuring the compliances to identified actions by CIMG.
• IMS documentation & records
• Internal / External audits pertaining to IMS
• Review / Revision to IMS
• Local, regional & corporate review meetings on IMS.
• Other jobs related to pipeline integrity not covered herein above but essential for IMS as deemed by OIC, concerned.

4.3 PIPELINE MAINTENANCE BASES

4.3.1 Role: Execution of all activities in monitoring, survey, maintenance, repair / rectification / replacement on pipelines and ROU towards integrity management of pipelines within the coverage area of Pipeline Maintenance Base concerned.

4.3.2 RESPONSIBILITIES:
• Coordination with RIMG in implementation of IMS for the sections of pipelines within the coverage area of Pipeline Maintenance Base.
• Routine, Preventing and Breakdown maintenance of all equipment on pipelines.
• Monitoring and logging of all data pertaining to pipeline integrity and uploading the same in the integrity portals.
• Execution and Supervision of all surveys (CP, ILI, DA etc.) and patrols on pipelines, intermediate stations and terminals.
• Execution of dig verifications, repairs, remediation, modification and replacement on pipelines, intermediate stations and terminals.
• Coating, Painting of pipelines and pipeline facilities at installations and terminal buildings.

5.0 Document and Data Management System

5.1 Management Control Documentation with respect to Pipeline Integrity Management has the following hierarchy:
5.2 All the documents relevant to Pipeline Integrity Management System referred in this document are linked together by a framework reference, which links to the individual documents hosted in O&M Intranet Portal.

5.3 A master database of pipelines, maintenance bases, pipeline maintenance / integrity group personnel, gas / LPG sources, gas / LPG customers shall be maintained on the O&M Intranet Portal by CIMG. The database will be reviewed & updated periodically but not later than once a year by the respective RIMG for their specific area.

5.4 RIMG is responsible to ensure that all the data required for carrying out the necessary integrity assessment of pipelines within their scope are compiled and updated. The following documents for each pipeline shall be maintained:

(a) Design Basis
(b) As built Route Alignment (GIS) and P&IDs for the pipeline.
(c) As built P&IDs and Piping General Arrangement Drawing for stations
(d) As built pipe book
(e) As built pipeline crossings (River, Road, Railway etc.) drawings
(f) CP system design and as built details with base line survey data.
(g) Soil Resistivity Survey data along the pipeline
(h) Pipeline Construction Inspection Reports including Hydrostatic Test reports
(i) Approvals from concerned authorities for pipeline crossings
(j) Statutory Approvals for operation (PESO, OISD and PNGRB clearances)
(k) Material Test Certificates for the pipes, valves, fittings and safety critical equipment installed for pipeline.

5.5 Pipeline physical parameters such as pressure, flow & temperature and gas source quality such as Water & Hydrocarbon dew points, H2S, Total Sulfur, CO2, O2 etc., shall be recorded and managed through O&M Intranet Portal viz., Source Quality Monitoring
System based data application for quick retrieval.

5.6 Other Operations & Maintenance, Inspection Data should be recorded and managed through ERP (SAP) or O&M Intranet Portal in accordance with the specific Guidance Document or SOP forming part of IMS / IQMS.

5.7 Paper prints of data as at 4.3, 4.4 & 4.5 may be kept for reference although the electronic form residing in the applicable systems shall be the main repository.

6.0 Design, Construction and Commissioning

6.1 It is essential to ensure proper planning and correct design of the pipeline system or any modification thereof for assuring its integrity over its operating life. It is essential further that the pipeline system is constructed strictly as per the design specifications and applicable quality standards.

6.2 The essential requirements of planning, design, construction and commissioning are documented separately as Guidance Document “Pipeline Integrity Assurance during Design, Construction & Commissioning” Ref CIMG-GD-1-2016-0001 and available at O&M Intranet Portal. Project Development / Execution Departments shall prepare a Design Basis for Project and Process including a specific design basis for Corrosion Management, Construction Quality Assurance Plan and Testing & Commissioning Procedures for specific pipeline projects or replacement / modification thereof, based on the essential requirements given in this document.

6.3 All pipeline projects to be implemented for GAIL shall conform to the requirements of the above and design elements / construction procedures specific to individual EPC contractors / PMCs which do not meet the requirements herein shall not be permitted.

6.4 Subsequent to commissioning, handover of pipeline system for operations shall provide a smooth transition of ownership of the new pipeline / modification from Projects Department to O&M. Handover/Takeover (HOTO) process shall include following elements as a minimum:

- Pipeline Operating Philosophy
- Corrosion Management System (CMS)
- Inspection and Maintenance Philosophy
- Manufacturers’ Maintenance Procedures
- Emergency Procedures
- Asset Register (Updating)
- Critical Spares

7.0 Integrated Quality Management System (IQMS) for Operation & Maintenance

7.1 It is crucial that the pipelines be operated in a manner as defined during the original design. Monitoring and control measures should ensure that critical operating parameters are kept within the specified operating envelope. Operational procedures must be clearly established with Work Instructions and SOPs for activities to be
performed during both normal and abnormal operations. Maintenance of each component of the system shall be rigorously conducted in accordance with documented procedures and records scrupulously kept of the same.

7.2 All the individual network headquarters shall implement a comprehensive Quality Management System under ISO 9001 / 14001 / 18001 covering all the activities to be performed in safe operations, maintenance and integrity management of the pipeline system under their care. Incorporation of new pipelines within the existing network / region or establishing Operation & Maintenance procedures for new network / region shall be completed within one year of commissioning of such pipelines or network.

7.3 All operating parameters & maintenances which affect the integrity of pipelines shall be monitored & recorded and shall be made part of the Quality Manual.

7.4 The Operations manual as per ISO 9001 shall have the written procedures that shall include clearly defined safety interlocks, set points of alarms and trips of the equipment in operation. This also includes standard operating procedure (SOPs) manual for each station of pipeline network containing Operating Work Instructions (OWI’s) & Maintenance Work Instructions (MWI’s) for all the associated equipment.

8.0 Pipeline Integrity Management System (PIMS)

8.1 Pipeline Integrity Management System provides a comprehensive and structured framework for assessment of pipeline condition, likely threats, risk assessment and mitigation actions to ensure safe and incident free operation.

8.2 Petroleum and Natural Gas Regulatory Board (PNGRB) of India through its regulation ‘Integrity Management System of Natural Gas pipelines 2012’ has mandated development and implementation of an effective and efficient Integrity Management Plan for natural gas system. A similar regulation is also in draft stage for liquid pipelines.

8.3 An Integrity Management System Document which is in accordance with PNGRB regulations and this framework document shall be prepared and implemented for each network by the concerned network headquarters after the due approval of the PNGRB and GAIL Board of Directors.

8.4 IMS Structure

8.4.1 The IMS document shall be prepared in line with the requirements of PNGRB Regulation and requirements of this framework. The following structure with explanation may be considered as basis while preparing this document for each network / region. Wherever IMS document already exists as per PNGRB regulation, modifications may be effected in line with the following structure in the next scheduled review with due consultation with the accredited certification agency of PNGRB. A Pipeline Integrity Management system document template is available in the O&M Intranet Portal. Essential and additional elements are indicated in this document for all the RIMGs to keep the IMS document updated, approved and valid.
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Schedule</th>
<th>Topics</th>
</tr>
</thead>
</table>
| 1       | Introduction | Short title & Commencement  
|         |           | Definitions & Terms  
|         |           | Applicability  
|         |           | Scope  
|         |           | Objective  
|         |           | Integrity Management System  
|         |           | Default and Consequence  
|         |           | Requirement under other laws  
|         |           | Miscellaneous  
|         |           | Power to remove difficulties |
| 2       | Schedule-1 | Objective of Integrity Management System (IMS) |
| 3       | Schedule-2 | Introduction to IMS |
| 4       | Schedule-3 | Description Pipeline Network |
| 5       | Schedule-4 | Selection of appropriate IMS |
| 6       | Schedule-5 | Integrity assessment & tools |
| 7       | Schedule-6 | Designing applicable IMS for pipeline network |
| 8       | Schedule-7 | Approval for IMS |
| 9       | Schedule-8 | Implementation schedule of IMS |
| 10      | Schedule-9 | Review of Integrity Management System |
| 11      | Schedule-10 | Adequacy of Manpower |
| Appendix-I | References | |
| Appendix-II | Critical activity implementation schedule | |
| Appendix-III | Chart for selection of Integrity Assessment Method with respect to specified threat | |
| Appendix-IV | Minimum Qualification and Experience for Field Personnel in Project Phase as well as O&M Stage | |
| Annexure-I | List of applicable IQMS documents and records | |
| Annexure-II | List of living Documents – To be updated periodically | |
| Annexure-III | Detail of Pipelines | |
### Chapter Schedule

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Schedule</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annexure-IV</td>
<td>Details of Despatch &amp; Receiving Terminals</td>
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<tr>
<td>Annexure-V</td>
<td>Details of Stations (CS / SV / IP / RR / TOP etc.)</td>
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<tr>
<td>Annexure-VI</td>
<td>List of Gas Customers</td>
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</tr>
<tr>
<td>Annexure-VII</td>
<td>Details of Key Personnel for IMS</td>
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#### 8.4.2

It shall be recognized that the status of pipeline and associated facilities may change over time owing to factors such as increase in customer base, expansion or modification in pipeline network, stoppage of gas drawl by customers etc. As such, the details given at the Annexures listed under Annexure-II as Living Documents shall be reviewed periodically, at least once in a year. Changes if any upon each review shall be approved by the Officer-in-Charge of the Pipeline Network and updated documents will be maintained at Pipeline Network Head Quarters and copy of the same will be filed with PNGRB.

#### 8.5

Though the regulations apply to both prescriptive and performance based type of IMS, the prescriptive aspects mentioned in the regulation shall be complied with, as a minimum. Further, based on requirements, risk based or performance based adjustments shall be made to advance the assessment intervals or ensure mitigation measures that are better than those prescribed.

#### 8.6

It shall be the responsibility of the concerned Head of the network / region that the integrity of the pipeline network falling within their scope are managed strictly in accordance with the approved IMS document in such a way that compliances are reported, performance is demonstrated and audited at the required frequencies.

#### 8.7

The IMS for a specific network shall be owned by the Head of the Pipeline Network, i.e., OIC of the concerned headquarters. Concerned OIC shall further ensure the following:

- **8.7.1** Nominate a function specific authority who shall be designated as Head of RIMG with the sole responsibility of day to day management of PIMS process.
- **8.7.2** Clear roles and responsibilities are established for operating and delivering the IMS responsibilities.
- **8.7.3** Competency of personnel is managed and developed to meet the PIMS requirement.
- **8.7.4** Active engagement and regular communication of personnel across all areas on issues relating to integrity and PIMS process within the network.
- **8.7.5** Budgeting for sufficient funds and resources to develop and operate PIMS.
- **8.7.6** PIMS organization is highly focused on the delivery of pipeline integrity.
- **8.7.7** Monthly review of action vs plan and monitoring progress of activities.
**Pipeline Integrity Management System Framework**

**Type:** Master Framework

**Reference:** CIMG-FW-1-2015-0001

8.7.8 Annual Assessment of PIMS status for continued operation of individual sections / segments of pipelines.

8.7.9 Annual Audit of the PIMS process (Internal & External as per schedule).

8.7.10 Compliance reporting to PNGRB & other statutory bodies.

8.8 For the pipeline sections which have crossed the design economic life, all the applicable integrity assessment methods shall be carried out before the end of the said design economic life. However if any of the inspections / assessments have been conducted within the previous two years, the same need not be repeated. After completing a complete assessment and mitigation including Residual Life Assessment (RLA), a re-inspection interval for such lines shall be adopted in line with OISD SOP.

8.9 **Facility Integrity Management System (FIMS)**

8.9.1 Sound integrity management program will not be complete without inspection, integrity assessment, repair or mitigation for the piping, equipment, valves and support structures stalled in pipeline installations such as compressor/pumping stations etc. With this objective, a Guidance Document “Facility Integrity Management System” Ref: CIMG-GD-4-2016-0007 is developed and hosted in O&M Intranet portal specifying the inspection and condition monitoring program that is needed to determine the integrity of piping and its components like valves and flanges, pressure vessels, equipment and structure constituting the facility such as Compressor/Pumping Stations, Despatch / Receiving Terminal, SV/ RR/IP etc.

8.9.2 All the pipeline facilities / installations such as Dispatch Terminal, Receiving Terminal, Sectionalizing Valve (SV) stations, Intermediate Pigging Stations (IP), Tap-off points (TOP), Compressor / Pump Stations etc. shall be brought under a documented integrity management system and plans.

8.9.3 Each Pipeline Maintenance Base (PMB) shall prepare a Facility Integrity Management Plan (FIMP) for all the stations / facilities under their care duly reviewed by respective RIMG and approved by the Head of the Network / Region.

8.9.3.1 The FIMP shall as a minimum cover the following essential elements:

8.9.3.2 Component-wise break-up of facilities (for e.g., above ground piping, pipe rack/supports (including offsite pipe racks / bridges & other structures if any for the pipeline), valves/isolation devices, safety protective equipment (PSVs / TSVs / Rupture Discs), Flanged connections, Insulating Joints / Flanges, vessels, rotating equipment, flare stacks / cold vents, heat exchangers, metering stations, pressure regulating stations, instruments and monitoring devices etc.). While preparing the list of such components, the same shall be categorized in to those that are governed by OEM recommended Maintenance, equipment / vessels falling under statutory inspection requirements and all other falling under GAIL’s Integrity Management requirements.
8.9.3.3 Risk Assessment of the components / categories of components and identification risk mitigation measures.

8.9.3.4 Integrity Assessment Methods and Frequency

8.9.3.5 Data & Document Management

9.0 Corrosion Management System (CMS)

9.1 Corrosion is one of the main drivers in compromising asset integrity. GAIL unequivocally requires that proactive and cost-effective corrosion management is implemented throughout its operational networks in order to minimise and prevent asset degradation and uncontrolled failures resulting from internal and external corrosion.

9.2 To specifically address the challenges of asset deterioration from corrosion-related mechanisms, **Corrosion Management System (CMS) document** is in place (available at O&M Intranet Portal).

9.3 The purpose of the CMS is to provide and support the different components (e.g. risk assessments, mitigation plans, inspection and monitoring plans) within the Integrity management Systems of the present framework with the necessary concepts, processes, tools and procedures / practices to address the corrosion-related damage mechanisms.

9.4 The CMS document shall comprise the following items:

- Corrosion mechanisms and key parameters
- Mitigation philosophies
- Corrosion risk modelling and methodology for evaluation
- Corrosion monitoring methods
- Fluid sampling and testing methods
- Inspection methods and technologies

9.5 The CMS identifies and references all the procedures and practices necessary to implement the necessary corrosion management activities in-line with accepted industry standards and guidelines.

9.6 The CMS and associated procedures shall be reviewed on an annual basis by CIMG to ensure they remain in-line with accepted industry codes and regulatory requirements.

9.7 In order to achieve effective implementation of corrosion management throughout its assets at a regional level, GAIL requires that a specific Regional Pipeline Network - Corrosion Management Plan (CMP) shall be developed and implemented by each of its Regional Integrity Management Groups (RIMG).

9.8 The purpose of the CMP is to translate the overall corrosion management philosophies into practical strategies / plans, controls and targets designed to minimise internal and
external degradation mechanisms throughout the service life of the pipelines at a regional level.

9.9 All corrosion control, monitoring and inspection activities defined within the CMP shall strictly adhere to the appropriate GAIL procedure as identified within the CMS.

10.0 Risk Assessment & Management

10.1 Risk Assessment & Risk Based planning is very important part of overall Pipeline Integrity Management System (PIMS) to ensure the integrity of the pipelines.

10.2 Risk assessment process identifies the location specific events or conditions or combination of events and conditions that could lead to loss of pipeline integrity and provides an understanding of the likelihood and consequences of these events. The risk assessment has the following objectives:

- Prioritization of pipeline sections / segments for scheduling integrity assessment and mitigation
- Assessment of the benefits derived from mitigation actions
- Determination of the most effective mitigation measures for the identified threats.
- Assessment of the integrity impact from modified inspection intervals.
- Assessment of the use of or need for alternative inspection methodology.
- More effective resource allocation.

10.3 Following approaches for risk assessment and prioritization are prescribed by the PNGRB regulation:

- Utilizing the services of Subject Matter Experts (SMEs)
- Relative Assessment Model
- Scenario based Model
- Probabilistic Model

10.4 Risk Assessment is a continuous process. As per PNGRB (Integrity Management System (IMS) for Natural gas Pipelines) Regulations-2012, Risk Assessment has to be carried out at least every year. The same may be performed earlier if any new threat is perceived.

10.5 A Quantitative Pipeline Risk Assessment Methodology (QPRAM) has been developed centrally through an external agency with corresponding software implementation in the Centralized Pipeline Integrity Management System (CPIMS). This is available as a module (RA module) in ROAIMS.

10.6 A simplified Risk Model has also been developed specifically for GAIL pipelines and the same is hosted as a web application in O&M Intranet Portal.

10.7 Each network headquarter shall arrange to conduct the Risk Assessment of all the pipeline sections within their jurisdiction every year or more frequently (if new threats are identified) either in-house using RA Module of CPIMS / simplified Risk Assessment
Web Application or through external agencies using any of the model mentioned in 10.3.

10.8 The primary objective of Risk Management System is to ensure that all the identified risks are mitigated to a level As Low As Reasonably Practical (ALARP):

11.0 Anomaly Management

11.1 Health of a pipeline gets affected by the defects present in it. These defects may arise from damage introduced at the time of manufacturing and construction, through to in-service damage due to corrosion or external interference. The effect of these defects on pipeline’s health is assessed through an integrity assessment program.

11.2 Defects are revealed through monitoring and inspection activities first identified as ‘anomalies’. When such anomalies are further assessed and verified as ‘defects’, then action is called for in removal / addressing of such defects.

11.3 Anomalies will emanate from field inspections, patrols, various other surveys and incidents reported. Anomaly management is the structured process of documentation, verification, categorization of verified defects, screening and detailed assessment of defects, repair / remediation and root cause analysis. Guidance Document on “Anomaly Management” Ref: CIMG-GD-5-2016-0001 detailing the various processes and procedures to be adopted is available at O&M Intranet Portal.

11.4 An on-line Anomaly Register is available in O&M Intranet Portal within the In-Line Management Portal to record the emergence of anomaly and further action taken to evaluate it and repair, if required or monitor otherwise.

12.0 Emergency Response & Disaster Management System, Investigation, Evaluation & Lessons Learned

12.1 An emergency is any unusual event or incident which may occur, that can pose a danger
to life, property or the environment if not contained or controlled immediately. GAIL is committed to responding promptly and effectively to all emergencies which may affect Pipelines Network and facilities posing a danger to the safety of company personnel or the public, or posing a hazard to property or the environment if not contained or controlled immediately.

12.2 To meet the above in an effective way in different scenarios, each network shall develop and implement the Emergency Response & Disaster Management System as per PNGRB Code of Practices for Emergency Response & Disaster Management Plan (ERDMP) Regulations, 2010 and approved by GAIL Board of Directors.

12.3 Incident Reporting System:

12.3.1 An Incident Reporting System covering all different scenarios has been developed and available at O&M Intranet Portal. A copy of the same shall be kept at every installation of GAIL for ready reference and compliance.

12.3.2 Incident Reporting System covers all aspects of reporting to GAIL Management, OISD, PNGRB and MoPNG. However reporting to other statutory authorities i.e. State Government Authorities, CCOE / PESO, Factory Inspectorate, Electricity Authorities etc. which may differ from state to state, based on various regulations shall be complied by respective sites.

12.3.3 Incident Reporting system covers all the Pipeline networks and employees at NGMC’s, RGMC’s and other control respective Control Rooms of Pipeline Maintenance bases are being regularly updated & trained for the effective use as per their defined responsibilities of the Incident Reporting system. This is part of the ERDMP.

12.3.4 Any information received from internal or external sources on any incident shall be immediately directed to the concerned control room / RGMC, to then activate the appropriate stream of incident reporting.

12.4 Emergency Response & Disaster Management System:

12.5 Each Pipeline Network / Region shall have Emergency Response & Disaster Management Plan (ERDMP) document, duly certified by accredited agencies and approved by GAIL Board of Directors, in accordance with the PNGRB Code of Practices for Emergency Response & Disaster Management Plan (ERDMP) Regulations, 2010.

12.5.1 Following are the essential elements which shall be included in the ERDMP for each Pipeline Network:

a) Classification of emergencies
b) ERDMP Implementation schedule
c) Consequences of defaults or non-compliance
d) Statutory requirements
e) Pre-emergency planning
f) Emergency mitigation measures
12.5.2 Approved ERDMP document for each Pipeline Network / Region shall be available in O&M Intranet Portal. It shall be responsibility of each Network / Region to keep ERDMP up-to-date and carryout stipulated activities as per timelines given.

12.6 Incident Investigation, Evaluation, and Lessons Learned

12.6.1 All incidents and near misses that led, or could have led, to a loss of life or serious injury or loss of property, shall be investigated. Incident investigations shall be initiated as promptly as possible considering the need to secure the incident scene, protect people and the environment, and maintain and recover important evidence and testimony.

12.6.2 The investigation of an incident shall include the following:

(a) Identification of the cause of the incident and any contributing factors;
(b) Investigation findings and lessons learned;
(c) An evaluation and review of the effectiveness of all emergency response procedures and processes implemented as relevant to the incident;
(d) Any recommendations for pipeline safety performance improvement, including changes to processes and procedures that are identified as a result of the investigation; and
(e) Any recommendations for transferring lessons learned from the investigation to the risk assessment and control processes, including a review of the consequence and likelihood of failure, current procedures, training, and resource allocation.

12.6.3 All the responses to each finding and lessons learned from the incident investigation shall be documented and it shall be ensured by the respective Network/Regions that the pipeline safety performance improvement recommendations are tracked and
completed. Records of the investigation and resulting actions shall be maintained for possible use in subsequent risk assessments.

12.6.4 CO (O&M) shall ensure that the cause, contributing factors, recommendations to prevent recurrence, and lessons learned are communicated to all Pipeline Maintenance Engineers across the organization. The “Incident Investigation, Evaluation, and Lessons Learned records” shall be also maintained in **O&M Intranet Portal**.

13.0 Management of Change (MOC)

13.1 Pipelines and its associated facilities are subjected to repair and modifications time to time for addressing integrity and other requirements such as achieving higher efficiency, operational flexibility, capacity augmentation, changes in product specification improving operability and safety, improving reliability, improvement of the plant machineries and equipment and to accommodate technical change. Any changes in the Pipelines / facilities may have the potential to affect the Integrity of the Pipelines. The threats associated with any change are to be identified and controlled efficiently through an appropriate change in the Integrity Management plan.

13.2 For each MOC, respective Pipeline Network/ Region shall identify the potential risks associated with the change and obtain required approvals from the Competent Authority prior to the introduction of such changes. Application of MOC may trigger use of risk assessment to evaluate the impact of change on overall risk. Management of change ensures that the integrity management process remains viable and effective as changes to the system occur and/or new, revised, or corrected data becomes available.

13.3 The types of changes that a MOC procedure addresses shall include the following, whether permanent or temporary:

   (a) Technical
   (b) Physical
   (c) Procedural, and
   (d) Organizational

13.4 A management of change process includes the following:

   o Reason for change
   o Authority for approving changes
   o Analysis of implications
   o Acquisition of required work permits
   o Documentation
   o Communication of change to affected parties
   o Time limitations
   o Qualification & training of personnel
13.4.1 MOC may require changes in the integrity management program and, conversely, results from the program can cause system changes.

13.4.2 If a change in land use would affect either the consequence of an incident, such as increases in population near the pipeline, or a change in likelihood of an incident, such as subsidence due to underground mining, the change must be reflected in the integrity management plan and the threats re-evaluated accordingly.

13.4.3 If the results of an integrity management program inspection indicate the need for a change to the system, such as changes to the CP program or, other than temporary, reductions in operating pressure, these shall be communicated to operators and reflected in an updated integrity management program.

13.4.4 If there is some plan to increase pressure in the system from its historical operating pressure to, or closer to, the allowable MAOP, that change shall be reflected in the integrity plan and the threats shall be re-evaluated accordingly.

13.4.5 If a line has been operating in a steady-state mode and a new load on the line changes the mode of operation to a more cyclical load (e.g., daily changes in operating pressure), fatigue shall be considered in each of the threats where it applies as an additional stress factor.

13.4.6 The application of new technologies in the integrity management program and the results of such applications should be documented and communicated to appropriate staff and stakeholders.

14.0 Audit & Review

14.1 Audit of each pipeline network with respect to the approved IMS document for the network shall be carried out once every year by concerned network by a cross-locational team.

14.2 In addition to the above, IMS audit by an agency accredited / authorized by PNGRB shall be conducted once every three years.

14.3 Immediately after the audits, the concerned RIMG shall prepare Audit Action plan with schedule. The same shall be reviewed by the local management (OIC level) and approved at the regional level (ED / GM) within 15 days. Thereafter, progress of liquidation of issues shall be reviewed by the OIC of the Network and ED concerned on a regular basis.