

GAS SAFETY CODE

**Issued by the Energy Market Authority
in accordance with the Gas Act (Cap.116A)**

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GAS SAFETY CODE

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1. INTRODUCTION

1.1 Gas Safety Regulatory Framework

1.1.1 The Energy Market Authority (“Authority”) of Singapore has a duty, under the Gas Act (Cap 116A) (“Act”), to protect the public from dangers arising from the production, processing, storage, conveyance, shipping, supply or use of gas. To perform its function as the Gas Safety Regulator, the Authority will implement the Gas Safety Regulatory Framework (“Framework”).

1.1.2 The broad objectives of the Framework are as follows:

- (a) protect the public from dangers arising from the production, processing, storage, conveyance, shipping, supply or use of gas;
- (b) minimise risks associated with gas pipeline rupture and gas leak incidents;
- (c) minimise risks associated with different operating pressures in various parts of the gas pipeline networks;
- (d) minimise risks associated with gas usage by consumers;
- (e) provide efficient and effective provisions to ensure emergency preparedness of all Licensees in responding to gas related emergencies; and
- (f) require the relevant Licensees to promote public awareness of gas safety.

1.1.3 In implementing the Framework:

- (a) the relevant Licensee shall demonstrate to the Authority how the Licensee will eliminate or reduce the inherent risks in the Licensee’s facilities or gas pipeline network to as low as reasonably practicable (“ALARP”), at periodic intervals or as and when there are material changes to the Licensee’s facilities or gas pipeline networks;
- (b) the relevant Licensee shall submit a gas safety case (“Safety Case”) comprising risk assessments of the Licensee’s facilities or gas pipeline networks and the activities the Licensee would be carrying out, and the measures adopted by the Licensee to effectively mitigate any identified risks to the public, gas consumers and the Licensee’s employees to such a level that can be deemed to be ALARP; and
- (c) the relevant Licensee shall comply with the Safety Case.

1.1.4 The Framework applies to onshore and offshore transmission pipelines, distribution gas pipeline networks, town gas production plants, onshore receiving facilities and LNG terminals, and addresses the safety risks that arise from the activities of the Licensees.

1.2 Definitions

1.2.1 In this Code, unless the context otherwise requires:

“ALARP” means as low as reasonably practicable;

“Code” means this Gas Safety Code;

“Licensee” means a gas licensee to whom this Code applies, as specified in clause 1.4.1 or clause 1.4.2;

“Material Change” means changes in ownership and/or operating responsibility; changes in risk levels; major organisational changes that impact key safety related roles and responsibilities; and changes to operating policies;

“Gas Network System” means the gas supply system and relevant Licensees’ gas plants and other related equipment for the purpose of production, processing, storage, conveyance, shipping, measuring, supply or use of gas;

“Major Incident” means a major incident where there is significant release of liquids or gases from a Gas Network System which results in or has the potential to result in:

- (a) death, serious injury or damage to the health of people, whether immediate or delayed;
- (b) significant damage to property; or
- (c) damage to the environment and requiring intervention to limit the consequences or to restore the environment.

“Validation” means the Licensee seeking an independent 3rd party to carry out a complete review of its Safety Case to verify compliance or non-compliance with its Safety Case;

“Verification” means the Authority’s audit and inspection exercise on a Licensee to ensure its compliance with the requirements of the accepted Safety Case.

1.2.2 Unless otherwise defined in this Code, words and phrases shall have the meaning ascribed to them in the Act.

1.3 Purpose of this Code

1.3.1 This Code is made pursuant to section 62(1) of the Act in order to implement the Framework.

1.3.2 This Code sets out the standards and procedures which a Licensee is required to comply with to ensure the safe operation of the Gas Network System and describes the rights and obligations of a Licensee in respect of its activities and the provision of a safe gas supply.

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1.3.3 This Code also sets out the technical, safety and procedural requirements to be met by those who intend to operate as Licensees.

1.4 To Whom this Code Applies

1.4.1 This Code is applicable to the following Licensees:

- (a) Onshore Receiving Facility Operator;
- (b) LNG Terminal Operator;
- (c) Town Gas Producer; and
- (d) Gas Transporter.

1.4.2 The Code shall also apply to other categories of Licensees as the Authority may from time to time specify by notice in writing.

1.5 Scope

1.5.1 The Authority as the Gas Safety Regulator will implement the Framework to address the safety risks that arise from the activities of the Licensees.

1.5.2 Licensees shall comply with the Framework and are required as part of the Framework to present a Safety Case to demonstrate that the Licensees have suitable management systems in place for managing the risks.

1.6 Territorial scope of this Code

1.6.1 This Code shall apply within the territory and territorial waters of the Republic of Singapore.

1.7 Compliance with all Relevant Statutes, Regulations and Code

1.7.1 All works undertaken by the Licensee in relation to the production, processing, storage, conveyance, shipping, measuring, supply or use of gas, and all assets, systems, facilities and equipment required to be owned or operated by the Licensee pursuant to this Code must comply with all relevant statutes and regulations, and all applicable standards and requirements set forth in this Code.

1.8 Modifications to this Code

1.8.1 In furtherance of the authority contained in section 62(2) of the Act, the process by which this Code may be modified from time to time by the Authority shall be as set out below.

1.8.2 Before making any amendments to the Code, the Authority will give notice to all Licensees and other persons likely to be affected by the proposed modification:

- (a) stating that the Authority proposes to make a modification in the manner specified in the notice;

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- (b) stating the reasons why the Authority proposes to make the modification, including whether the need for the modification was the subject of a prior representation made by a Licensee or 3rd party; and
 - (c) specifying the period from the date of the giving of notice (not being less than 28 calendar days) within which written representations with respect to the proposed modification may be made. For modifications that will affect system security and reliability of the gas pipeline network, the Authority may consider to shorten such period to less than 28 calendar days.
- 1.8.3 If no written representation is received by the Authority within the period specified in the notice referred in clause 1.8.2 or if all written representations made in response to such notice are subsequently withdrawn, the Authority may modify this Code as specified in such notice without giving further notice.
- 1.8.4 Where the Authority receives any written representation under clause 1.8.2, the Authority shall, except to the extent that such representation is withdrawn, consider such representation and may:
 - (a) reject the representation;
 - (b) amend the proposed modification in accordance with the representation; or
 - (c) withdraw the proposed modification,and the Authority shall, where clause 1.8.4(a) or 1.8.4(b) applies but subject to clause 1.8.5, modify this Code accordingly.
- 1.8.5 The Authority shall, before modifying this Code, respond to all written representations received in respect of the modification that were not subsequently withdrawn, with reasons, and advise all relevant parties of the outcome of the Authority's deliberations in respect of the modification.
- 1.8.6 Any modification made under clause 1.8.5 shall be published by the Authority in such manner as will secure adequate publicity.
- 1.8.7 A modification to this Code shall not come into force until such time as the Authority has complied with clause 1.8.5, where applicable, and 10 calendar days, or such longer period of time as may be specified by the Authority, have elapsed since the date on which the Authority published the modification pursuant to clause 1.8.6.
- 1.8.8 Nothing contained in this clause 1.8 shall prohibit any Licensee or any other party from notifying the Authority of suggested changes to this Code.

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2. SAFETY CASE

2.1 Pre-acceptance of Safety Case

2.1.1 The Licensee shall submit a Safety Case to the Authority in writing in accordance with the requirements set out in Appendix A – Appendix C (“Safety Case”), which apply as follows:

- (a) Appendix A - Gas Safety Case Guidelines for Gas Processing and Production Facility Operators which apply to Onshore Receiving Facility Operators, LNG Terminal Operators and Town Gas Producers;
- (b) Appendix B - Gas Safety Case Guidelines for Gas Transmission Network Operators which apply to Gas Transporters; and
- (c) Appendix C - Gas Safety Case Guidelines for Gas Distribution Network Operators which apply to Gas Transporters.

2.1.2 The Licensee shall submit two hard copies of its Safety Case endorsed by its senior management and one electronic copy of the Safety Case for each submission to the Authority.

2.1.3 The Safety Case shall be submitted to the Authority:

- (a) for a Licensee who is in operation immediately before the commencement of this Code, within a period specified by the Authority; and
- (b) for a Licensee who has yet to carry out the activity in respect of which it holds the gas licence, before the commencement of its operations.

2.1.4 The Licensee shall, where a Safety Case is rejected by the Authority following any assessment, make the necessary amendments to the submitted Safety Case and re-submit the amended Safety Case within the period stipulated by the Authority.

2.1.5 The Authority may at any time require the Licensee to provide additional information that the Authority deems fit in relation to a Safety Case submitted by such a Licensee. The Authority is not required to proceed with the assessment of Safety Case until such additional information is provided.

2.2 Gas Safety Standards

2.2.1 Licensees shall demonstrate to the Authority that safety arrangements and measures stated in the Safety Case are in place and controlled to a level such that safety risks are deemed to be ALARP.

2.3 Acceptance of Safety Case

2.3.1 The Authority shall notify the Licensee in writing of the acceptance of the Safety Case.

2.4 Post-acceptance of Safety Case

2.4.1 Following the acceptance of a Safety Case by the Authority, the Licensee shall:

- (a) ensure procedures and arrangements described in the current Safety Case are followed in practice;
- (b) review and submit a revised Safety Case on the 5th anniversary of the date when the Safety Case is first accepted, and thereafter, review and submit a revised Safety Case every 5 years or such other intervals as may be required by the Authority;
- (c) review its current Safety Case promptly in relation to such matters of concern as the Authority may notify in writing, and submit an amendment to its Safety Case addressing such matters of concern within 28 calendar days of the Authority's notification in writing;
- (d) in the case of any Material Change to the Safety Case, inform the Authority in writing as soon as practicable of the proposed change and in consultation with the Authority specify a period for assessing and implementing the required change;
- (e) in the case of any non-Material Change to the Safety Case, update the Authority in writing of the changes made in the Safety Case once in every 6 months; and
- (f) report to the Authority as soon as practicable on any amendment that was made to the Safety Case due to the following:
 - (i) significant audit finding;
 - (ii) incident or near miss;
 - (iii) advances in technology affecting the Licensee's operations; or
 - (iv) any other lessons learnt.

2.5 Safety Case Regular Audit and Inspection

2.5.1 Following the acceptance of the Safety Case, a structured programme of audit and inspection will be determined by the Authority. The Safety Case shall be subject to verification by the Authority from time to time, and on an ongoing basis.

2.5.2 The structured programme in clause 2.5.1 shall include but is not limited to:

- (a) Safety Case "higher risk" activities;
- (b) the outcome and findings of previous audit and inspection;
- (c) the implementation of recommendations following incidents and investigations; and
- (d) safety report requirements.

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2.5.3 The Licensee shall make available appropriate resources and access to its office, documents, technical codes and standards, standard operating procedures and any other documents (whether in electronic or other forms) that are necessary or required for the Authority's assessment of its Safety Case.

2.5.4 Where there is non-compliance found by the Authority following any audit or inspection, the Licensee shall take all necessary rectification measures, and report to the Authority on such rectification measures within the period stipulated by the Authority.

2.6 Validation of Safety Case

2.6.1 Licensee shall respond to all requisitions by the Authority for the validation of its Safety Case, including:

- (a) the Authority may at any time require the Licensee to obtain a Validation of the Safety Case or any part of the Safety Case;
- (b) the Licensee must establish to the satisfaction of the Authority that each person undertaking Validation activities has the necessary competence and ability and access to information on the matter to arrive at an independent opinion; and
- (c) if the Authority requires the Licensee to provide a Validation of a Safety Case or part of a Safety Case, the costs of that Validation must be borne by the Licensee.

2.7 Record-Keeping

2.7.1 The Licensee shall keep sufficient records to demonstrate that it is meeting its obligations under the Safety Case. Upon request by the Authority, such records shall be submitted to the Authority within a reasonable period.

2.8 Other Mandatory Requirements

2.8.1 In the event of a Major Incident, the Licensee shall ensure that the root causes of the incident are fully investigated and shall submit an incident investigation report to the Authority as soon as practicable and no later than 21 calendar days of the incident. Such incident investigation reports should include lessons learned and actions to be taken as a result of the investigations. Where necessary the Licensee may engage independent experts to assist with such investigations.

2.8.2 A Licensee shall be solely responsible for gas safety even if a Safety Case has been accepted by the Authority.

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APPENDIX A: GAS SAFETY CASE GUIDELINES FOR GAS PROCESSING AND PRODUCTION FACILITY OPERATORS WHICH APPLY TO ONSHORE RECEIVING FACILITY OPERATORS, LNG TERMINAL OPERATORS AND TOWN GAS PRODUCERS

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A.1 INTRODUCTION AND GENERAL REQUIREMENTS

A.1.1 Introduction

- (a) The purpose of these guidelines is to ensure that sufficient information is provided to assist Licensees in the development of Safety Cases for their respective operations and to ensure that gas safety risks have been appropriately managed and controlled to meet their Gas Licence obligations.
- (b) The aim of the Safety Case assessment is to examine the information provided to ensure that the Licensee has demonstrated to the satisfaction of the Authority that suitable safety arrangements and measures are in place and controlled to a level that is deemed to be ALARP. The Safety Case will be assessed and, where considered satisfactory, accepted by the Authority.
- (c) For the purpose of these guidelines, gas processing and production plant facilities include Licensees operating the Onshore Receiving Facilities, LNG Terminals and Town Gas Production Facilities.
- (d) In addition to the obligations under these guidelines, compliance with all other current legislation is still required by Licensees. All safety related conditions within the Gas Licences for Onshore Receiving Facilities will still apply including:

Condition : Preparation for Emergencies and Security Arrangements

Condition : Safety and Security of Onshore Receiving Facilities

Condition : Onshore Receiving Facility Technical and Safety Audits

Condition : Agreed Operating Procedures

Condition : Gas Network Code and System Entry Agreement

Condition : Attendance to Gas Escapes

Condition : Major Gas Incidents

Condition : Gas Safety Plan.

- (e) All issues related to occupational or workplace safety are covered within the Workplace Safety and Health Act (WSHA). The following sections refer to process safety matters in relation to the main activities of the Licensees.
- (f) All requirements relating to the Onshore Receiving Facility Operator Gas Licence Condition: Codes of Practices will still apply.

A.1.2 General Requirements (including Continual Improvement)

The Safety Case should contain an overview that provides the following information:

- (a) Business background of the Licensee and overview of the Safety Case.

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- (b) Identification of person responsible for the Safety Case (in this document referred to as “The Duty Holder”). The Duty Holder is the person in the Licensee who holds the ultimate accountability for gas safety and should be a senior level manager or director of the Licensee.
- (c) Name and appointment of the person who is responsible for the preparation and submission of the Safety Case. This is the person who is the key interface with the regulatory authority on all Safety Case matters.
- (d) Description of formal version control and change control procedures that will apply to a Safety Case.
- (e) Demonstration by the Licensee that management processes are in place and are appropriately implemented to provide a continual review and improvement of safety performance. This includes:
 - Safety Policy;
 - Safety Management Organisation;
 - Planning and Implementing Safety Targets;
 - Measurement against Safety Targets;
 - Audit; and
 - Review and Revise.
- (f) Provides a continuous cyclic route to improvement of safety processes and performance. An industry best practice example is shown in Figure A.1.

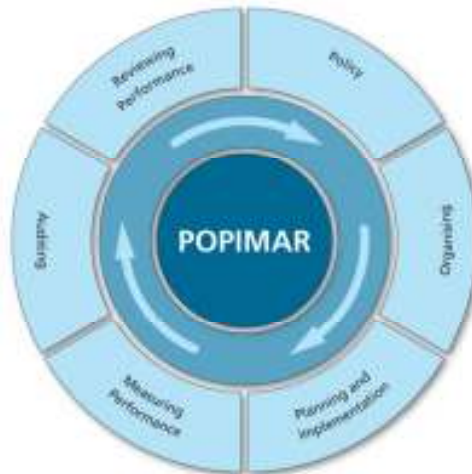


Figure A.1: Continuous Cycle

A.1.3 Safety Case Contents

The Safety Case requirements for the Licensees should be outlined in four key sections, described in detail in the following sections:

Section A.2 – Facility Description

Section A.3 – Formal Risk Assessment Process

Section A.4 – Safety Management System

Section A.5 – Emergency Planning and Response.

A.2 FACILITY DESCRIPTION

A.2.1 Overview of Facility

The Overview of Facility should provide sufficient information to enable the extent and scope of the assets, the operations of the Licensee in relation to the assets and the safety risks associated with the operation of the assets to be assessed. These include:

- (a) A description of the nature and the type of the facility.
- (b) The geographical coverage of the Licensee's assets and the downstream assets connected to it. For an Onshore Receiving Facility, the asset supplied will be the transmission pipeline.
- (c) The location of all the Licensee's offices, including that of subsidiary offices, and a brief description of the activities taken at each location.
- (d) If the Licensee is different from the asset owner or a joint venture is in place, the names and addresses of all the trading partners should be provided with a brief description under which the partnership operates.
- (e) A description of the processing or production process. The relevant process flow diagram (PFD) should be provided.
- (f) A detailed description of all the dangerous substances¹ stored or used at the facility in normal and worst cases. This should include:
 - detailed plot plan to show the location of dangerous substances within the facility;
 - the reason that the inventory of extremely dangerous substances cannot be reduced;
 - properties of the dangerous substances. Suitable information presented may include the flash points (by an identified method), ignition temperatures, flammable limits, vapour pressure, density, boiling point, data on reactions, rates of decomposition and data on sensitivity of explosives. Relevant physical and chemical data should be presented in a clear and concise form using appropriate and consistent units of measurement, preferably following the SI system;
 - behaviour of the dangerous substances during major accidents – e.g. the behaviour of LNG vapour cloud during a release or gas leak arising from town gas plant;

¹ There are nine classes of dangerous substances specified under the International Maritime Organisation (IMO) Classification and Identification of Dangerous Goods: Class 1 – Explosives; Class 2 – Flammable, non-flammable compressed gases & poison gases; Class 3: Flammable liquids; Class 4: Flammable solids, spontaneously combustibles & dangerous when wet; Class 5: Oxidising agents & organic peroxides; Class 6: Poison, harmful & infectious substances; Class 7: Radioactive substances; Class 8: Corrosives; and Class 9: Miscellaneous dangerous substances.

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- the formation of dangerous substance during process excursions or other unplanned but foreseeable events e.g. rapid boil-off gas generation in LNG rollover or dispersal of sulphuric acid aerosol due to the addition of water to sulphuric acid;
 - the Chemical Abstract Service (CAS) number and name under the International Union of Pure and Applied Chemistry (IUPAC) nomenclature for each dangerous substance; and
 - the physical, chemical, toxicological characteristics and indication of hazards, both immediate and delayed, for persons and the environment including irritation, asphyxiation, genetic alteration, carcinomas, and hazards that may arise due to fire and exposure. Safety Case should also identify the maximum permissible concentration at exposure and lethal concentrations. In addition to the above information, a Safety Case should also discuss the harm routes that the dangerous substances can take in the event of loss or contamination by any method, including air borne, water borne, seepage into ground water and entry into food chain through marine and aquatic route.
- (g) The Material Safety Data Sheets of all the dangerous substances.
- (h) A description of the operating conditions and safe operating limits, including details of:
- feed streams including gas used in the production, volumes and compositions of the input streams. Interfaces to ensure safe operations and emergency shutdown of the input streams; and
 - information on safe operating pressure and temperature limits of each unit operation and product storage.
- (i) A description of the methods used for hazardous area classification at the facility.
- (j) A description of the plant utilities such as electric power, instrument air, nitrogen, process water redundancy and backup in case of failure of primary supply that are required to maintain safe conditions, and the protective systems such as pressure relief venting and instrument protected system installed to prevent upset conditions.
- (k) Safety Case should clearly identify the location of activities where a major accident could happen, and provide an overall description of the mitigation systems available in the event of a major accident. Examples of the mitigation systems could include emergency shutdown, fire and gas detection, blast protection and firewater systems, and capacity and design codes of each system.
- (l) A description of on-site bunds, drainage and effluent control, absence of which could contribute to effects of a major accident on site or offsite.
- (m) Information should be supported by detailed plot plans, suitable maps, drawings, tables, charts and diagrams.

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- (n) A high-level description of neighbouring facilities, if available, handling dangerous substances and any known effect of a major accident at the Licensee's site on the neighbouring facilities and vice versa.
- (o) Details of the environmental features of the facility that could cause or contribute to a major accident such as its geographical location, meteorological, geological, hydrographical conditions, aircraft and other traffic movements.

It should be noted that that (o) does not intend to conflict with, duplicate or overlap with existing environmental legislative requirements. (n) is merely intended to provide the details of risk and mitigation measures which are also relevant to the gas safety regulations.

A.2.2 Roles and Responsibilities

This section of the Safety Case should provide a detailed description of the roles and responsibilities that exist within the management organisation structure for the Licensee.

- (a) The Licensee should describe the management organisation structure for the Licensee that highlights the gas safety management structure, departments and the key personnel in each department with gas safety responsibilities, and the key safety interfaces with operational staff.
- (b) The technical details for the activities listed below should be provided in Section A.4.3 on Asset and Operating Integrity Management of the Safety Case. This section should focus on the management roles and responsibilities and how the interfaces between design, construction, operation and maintenance work in practice. There should also be a clear description of the management systems that are used to gather, store and analyse asset data and work recording, the party responsible for the management of these systems and the way various management functions interface with the systems.
- (c) This should also include a description of the resource allocation and management plans for the operations of the Licensee – e.g. what activities are carried out in-house and what activities are outsourced.
- (d) The following example activities should be addressed in terms of who, what, how and when i.e. organisational structure and role description:
 - Design:
 - The design process for new production trains, modifications to the existing design and capacity expansion;
 - Design risk assessments and safety in design; and
 - Records management.
 - Construction:
 - Management interfaces between design and construction;

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- On-site construction and contractor management;
- Quality assurance during construction;
- Testing and commissioning;
- As-built construction drawings; and
- Records management.

- Operations & Maintenance:
 - Day-to-day running of the facility;
 - Shift structure, shift strength and duration;
 - Management and support staff for critical, non-critical and shutdown activities;
 - Management and support staff for routine reliability monitoring and condition monitoring e.g. cathodic protection, calibration of pressure safety valves, instrument analysers and other monitoring systems;
 - Management and staff for corrective maintenance;
 - Management and staff for decommissioning and abandonment;
 - Safety and emergency response management; and
 - Document control management.

A.3 FORMAL RISK ASSESSMENT PROCESS

A.3.1 General

A Safety Case should contain a Formal Safety Assessment in order to assess risks associated with the process, including a description of methodology, identification of hazards, risk identification and measures to reduce the risk.

- (a) An in-depth assessment of risks needs to be carried out by the Licensee, which in addition to covering the risks to the staff, should also cover risks posed to neighbouring population and the environment. Extent and depth of risk analysis should be proportional to the scale and nature of major accident hazards presented by the establishment and its installations and activities undertaken at the facility, along with the risks posed to neighbouring population and environment.
- (b) The risk assessment process adopted should demonstrate that risks are managed to ALARP principles.
- (c) The risk assessment process should take into account the safety risks inherent at each of the stages of design, construction, commissioning, operation and maintenance, modification and decommissioning of the facility. Approach to risk assessment needs to be quantitative.
- (d) A proper and adequate risk assessment will depend on the competence and expertise of those involved in the risk assessment. All Licensees are required to quantify the likelihood of hazards and their consequences. Identified consequences should include some estimate of the number of casualties and environmental effects.

- (e) Any qualitative arguments used in the risk assessment should be based on currently accepted good standards for engineering and safe systems of work. The Licensee's justification may include quality procedures, plant experience or other acceptable evidence. In this situation information should be provided on the methodology or process adopted.
- (f) The risk assessment section of a Safety Case is covered in the following sub categories:
 - methodology adopted to systematically identify and assess all reasonable and foreseeable hazards;
 - Hazards and Risk Identification (HAZID) and Assessment;
 - recording of risks; and
 - monitoring and review of hazards and risks.

A.3.2 Methodology Adopted to Identify Risks

- (a) The Safety Case should contain information on use of structural approaches to identify risks e.g. REALM (Risk Evaluation and Loss Methodology), STAR (Systematic Technique for Assessing Risk), HAZOP (Hazards and Operability Study), or other recognized risk assessment methodology. A risk assessment should be carried out for each stage of asset lifecycle i.e. Design, Construction, Operations, Maintenance, Modification/Repair and Decommissioning, and revalidated at periodic intervals during the lifecycle.
- (b) Risk assessment should be able to determine the severity of the accident, likelihood and consequences of risks present to persons and property at each stage of the asset lifecycle.
- (c) The methodology should also describe the criteria used to judge the significance of residual risks after considering the control measures to reduce the risk. The basis of decisions on all necessary measures should be clearly stated.
- (d) Additional information can also be provided such as internal standards and manuals being compliant to ISO 9001 or ISO 14001, ISO 17776, (Singapore Standard) SS 506: Part 3 on Occupational Safety and Health (OSH) Management System – Requirements for the Chemical Industry or other internationally accepted codes and standards.
- (e) This section should contain a listing of people involved in risk assessment and should prove that those involved are competent in addition to having knowledge of site specific circumstances.
- (f) Note that the above methods are not the only methods acceptable to the Authority for risk determination. They are mentioned herein to clarify the point of structural approach to risk assessment for the person(s) preparing the Safety Case.

A.3.3 Hazards and Risk Identification and Assessment

- (a) Hazards identification should be comprehensive to cover all the risks that arise from operation of the facility, presence and storage of dangerous chemicals, inventory of product, inventory of by-products, hazards arising from major equipment and equipment in other plant areas including utilities.
- (b) Hazard identification should cover all the possible outcomes from higher likelihood - lower consequences to lower likelihood - severe consequences. Hazard identification and risk evaluation needs to take account of the human factors.
- (c) A range of severities should be considered so that the corresponding 'Hazard Zones' defining the extent of affected areas can be mapped out. Range of potential harm to environment also needs to be considered. This includes maps, images or equivalent description highlighting areas that are likely to be affected.
- (d) The incident consequence assessment analysis should be exhaustive and systematic.
- (e) In order to make a reliable and realistic estimate it is important that diverse and extensive information is used for the risk analysis. The required detail should be process and location specific. Worst case scenarios should be considered.
- (f) The organisation should ensure that the results of these assessments are considered when determining controls. The following Risk Control Hierarchy to reduce risk to ALARP level should be considered when determining controls:
 - elimination or minimisation of hazards through inherently safer design, e.g. fail-safe design principles, appropriate plant lay out, materials of construction that are resistant to corrosion;
 - less hazardous processes should be considered. Substitution of dangerous toxic materials with appropriately less dangerous counterparts should be considered;
 - engineering controls including:
 - prevention measures: this includes management systems, features of design installation, secondary containment and measures taken to prevent equipment failure or human error;
 - control measures: measures that could prevent an event from escalating into a major accident; relief valves, safety control systems, deluge systems, venting to scrubber and manually initiated emergency shutdown procedures; and
 - mitigation measures: to reduce the consequences of a major accident once it has occurred e.g. bunding systems, safety refuges, fire-fighting facilities;
 - administrative controls such as safe work practices and workplace procedures; and

- personal protection equipment and emergency response arrangement.

A.3.4 Recording of Risks

- (a) The results of the hazard & risk assessment should be properly recorded in a Risk Register which should include the following details:
- identified hazards and their causes (initiating events);
 - existing safety controls that are used to manage the risk;
 - an assessment of the inherent risk based on the likelihood and consequence of the risk occurring and tolerability risk based on the likelihood and consequence of the risk occurring and tolerability of the risk according to the principle of ALARP;
 - a description of any additional control measures that are required to reduce the risk to ALARP;
 - a revised assessment of risk – i.e. residual risk – based on the implementation of the additional control measures to demonstrate ALARP; and
 - the job title of the person who is responsible for the day-to-day management of the risk(s).
- (b) Conclusions drawn from the scenarios used during the risk assessment should be representative and suitable for emergency planning purposes. The level of harm considered and the impact criteria/vulnerability models used need to be suitable for predicting the extent of areas where people might be fatally or seriously injured and require hospitalisation. For environmental impact assessment, corresponding levels of harm to the environment need to be considered. For releases resulting in environmental damage, the range of representative values need to be considered.

A.3.5 Monitoring and Review of Hazards and Risks

- (a) There should be a regular review to ensure that identified risks do not become redundant due to policy, management or change in operating philosophy. A description should be provided on how these risks are regularly reviewed and updated as a result of changes. Likewise the control measures need to be periodically reviewed to ensure they are properly applied and still appropriate. This will depend on technological progress, changes in society's perception of particular risks, changes in understanding of risk analysis, uncertainty attached to the risk estimates and new lessons from accidents and incidents. Such reviews should figure prominently in Safety Case updates to the Authority.

A.4 SAFETY MANAGEMENT SYSTEM

A.4.1 Technical Design and Specifications

- (a) The Safety Case should contain a list of all relevant international codes, technical standards and specifications (referred to collectively as “authoritative best practice”) that have been used

for design, engineering, construction, commissioning, operation, maintenance, modification and management of the Licensee's facility.

- (b) It is important that the Licensee has a system for assuring itself that the technical standards and specifications being used are current and the latest version. As such, the Safety Case should describe the process for ensuring that all amendments and new editions are recorded and an up to date list of standards and specifications is maintained and published such that all employees who require access to the standards and specifications are using the most recent copy.
- (c) It is important to ensure consistency between the different codes, standards and specifications specified in order to prevent incompatibility, e.g. between Hazardous Area Classification drawings and the type and certification of electrical equipment within the classified areas.

A.4.2 Operational Procedures

The Safety Case should describe what operating procedures are in place for the safe control of the operations that are undertaken on the facility. This should also extend to the associated management systems that are in place to support the operation and maintenance of the facility.

- (a) The Licensee should provide details of how operating procedures have been established and documented for normal start-up/shutdown, abnormal/upset conditions, emergency shutdown of equipment, isolation or part isolation of manifold systems and operating single trains of a multi train process.
- (b) There should be a description based on the following requirements:
 - the process for developing operating procedures;
 - the process for amending/modifying operating procedures;
 - the process for the management of procedures i.e. the person responsible for the operating procedures;
 - the process to ensure up to date versions of operating procedures are made available to those who require access to them; and
 - the repository for operating procedures.
- (c) It should also contain information regarding the authorisation process in place in order to control abnormal operations such as overriding of safety devices to allow for maintenance work and running automated systems in manual mode.
- (d) The operating procedures are the key control documents for mitigating the safety risks as identified in the Formal Risk Assessment and clear references to the relevant operating procedures should be made throughout the Safety Case, including the Risk Register, when describing how various activities are managed. A full list of operating procedures should also be included as an appendix to the Safety Case.

- (e) All requirements relating to the Onshore Receiving Facility Operator Gas Licence Condition: Agreed Operating Procedures will still apply.

A.4.3 Asset and Operating Integrity Management

A.4.3.1 General

The Safety Case should provide information on how the Licensee as the operator of the facility, ensures the safety operation of the facility for the duration of the lifecycle of assets.

This should also contain the methodology adopted to ensure that the design and construction of the facility has adhered to best practices of acceptable national and international codes and standards. Explanation will also be needed to prove how the methodology adopted in operation and maintenance in the facility can be regarded as safe.

A list of the international codes, technical standards and specifications used for the design, engineering, construction, commissioning, operation, maintenance, modification and management of the facility should be included. This is explained in Section A.4.1.

The Safety Case should describe the approach to managing asset safety from the perspective of the following issues.

A.4.3.2 Design

The Safety Case should provide a detailed description of the design principles applied to ensure that all identified hazards and risks are eliminated or reduced to a level ALARP during the life cycle of the network assets. Consideration should be given to:

(a) Design Inputs

- A list of identified hazards and risks.
- The Licensee should demonstrate that methodology in design includes risk identification and that HAZOP and mitigation factors have been considered for the safe design. The basis of the design should meet at a minimum, recognized and generally accepted good engineering practices, and these should be listed in the document.
- The Licensee should demonstrate that the design of all structures important to safety is based on sound engineering principles.
- Any deviation from the internationally accepted standards and specifications should be clearly highlighted and described in the report. For any in-house standards used, the Licensee should demonstrate equivalence of in-house standards to internationally acceptable standards.

(b) Design Process Controls

- All key structures in the facility whose destruction could lead to wide scale damage should be designed to be explosion proof, e.g. control room buildings, civil foundations of key structures, bund walls, barriers, field buildings etc.

Note: This requirement should be in line with current best industry practice prevailing regulations by the Ministry of Home Affairs (MHA).

- The section should highlight that adequate provisions of safety have been included in the design of the facility. The main areas of focus should be:
 - Containment Loss: demonstration of the design measures considered in preventing containment loss which may cause harm to environment and most importantly, humans.
 - Redundancy, Separation and Segregation: demonstration of how redundancy has been addressed to prevent common mode failure. It should also demonstrate how the behaviour of failed equipment will be addressed, including events that may disable protective systems.
 - Multiple Effects: internal and external events that can affect an entire site at once, such as power failure, flood etc, have to be considered from the view point of cumulative effects.
- The Licensee should demonstrate that construction plans and performance standards have been established after consideration of the associated risks and inclusion of mitigation factors.
- Any control systems required to limit or prevent the effects of a major accident should be designed according to appropriate codes, standards and specifications. Description to support the above should be thorough, detailing each element in the system including the software used. This would include any system which has a role in preventing operations of the plant to go outside normal operating envelope.
- It should be shown that the appropriate level of safety integrity has been incorporated in the design of these control and protective systems, and how this level of integrity was derived from risk assessment. The Licensee should also demonstrate how this level of integrity was achieved using codes, standards, diversity, redundancy etc.
- The Safety Case should demonstrate how safe operating limits, set points for safety functions, accuracy of instrumentation have been established during the design stage.

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- The Safety Case should demonstrate the independence of one system from the others and that the safety systems are failure proof with failure of any single component not affecting the overall performance of the entire facility such as:
 - operability of the safety systems in varied conditions such as start up and shut down; and
 - ruggedness of the safety system to survive and work in varied circumstances e.g. flammable atmospheres.
- The design stage of the asset provides the best opportunity for putting systems in place to reduce risk. However, prevention cannot be guaranteed in all circumstances. Therefore, it is extremely important to identify fall back measures to control and mitigate the consequences of any major accident to limit the risks to ALARP. The Licensee should strive towards continual improvement of safety systems taking advantage of the technological advances in the industry.
- For a facility that is already built, the Safety Case should provide details of work in progress with regards to the establishment of multiple lines of defence to improve the overall safety at the facility.
- The design validation and approval process should be documented.

(c) Design Outputs

The outputs from the design should include:

- construction plans and specifications;
- performance standards, both in terms of risks and operational performance; and
- specific operational procedures for safe operation.

A.4.3.3 Construction, Testing and Commissioning

The Safety Case should describe how the construction and modification processes on the facility are managed in accordance to the adopted codes, standards and specifications. The Safety Case should provide demonstration of the processes for:

- The competence of the personnel in terms of skills and training required for the job.
- Ensuring supervision and verifying that the construction work is undertaken safely and in compliance with the specifications.
- The verification to ensure that the construction work complies with the specifications, and pre- and post-commissioning checks to ensure that the piece of equipment is safe to be handed over to operations for subsequent service.

- The verification and approval of the as built records before they become part of Licensee's asset database.

A.4.3.4 Control of Operations

The Safety Case should describe how routine and non-routine operations are carried out at the facility, including:

- development of procedures for routine and non-routine operations;
- job hazard assessment;
- permit-to-work system; and
- description of supervisory controls to ensure that the activities are carried out by competent personnel only.

A.4.3.5 Asset Integrity Management

The Licensee should establish, implement and maintain procedure(s) to ensure on-going functionality, availability/reliability and survivability of all equipment, electrical systems and instrumentation whose failure could lead to a major accident hazard or whose purpose is to prevent or limit the consequences of a major accident hazard (collectively known as "Safety Critical Elements" or SCE). SCE can be divided into four main categories based on their respective functions:

- Prevention: Dangerous substance containment, structural integrity, interlocks;
- Detection: Fire & gas detection, alarms;
- Control: Relief and vent systems, emergency shut-down systems; and
- Mitigation: Fire protection system.

The procedure(s) should address:

- the establishment of written maintenance and examination procedures for all the SCE;
- implementing inspection and testing programme;
- training of maintenance and operator personnel who need to interface with these SCE;
- auditing of activities and procedures; and
- the review of inspection records.

These procedures should also comply with the requirements under SS 506: Occupational Safety and Health Management System Part 3: Requirement for the Chemical Industry, Section 4.4.6.6: Mechanical integrity and reliability.

A.4.3.6 Facility Maintenance

The Safety Case should describe in detail how the maintenance of the facility is carried out. The description should also include:

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- production support and safety support systems such as Document Control Systems (DCS), Maintenance Management System, isolation protocols, on-line data monitoring, Emergency Shut Down and Supervisory Control and Data Acquisition (SCADA);
- drawing plans and maintenance records; and
- spare parts & inventory management.

The Safety Case should provide demonstration of arrangements in place and processes for undertaking the following activities:

(a) Maintenance Prioritisation

The Licensee should describe the basis of characterisation of various maintenance activities and allocation of priorities such as:

- critical: requiring immediate attention;
- non-critical: can be attended to in due course; and
- shut down: maintenance activity is possible during shut down only.

(b) Preventive Maintenance

The Licensee should provide the details of the frequency and methodology used to carry out preventive maintenance to ensure that the facility is fit for service. This includes activities such as:

- integrity assessment of pressure vessels and piping;
- routine verification of functionality of safety systems such as Safety Instrumented machinery and other Systems and other safety related protective or control systems;
- condition monitoring and maintenance of rotating equipment with moving parts;
- calibration of pressure safety valves, instruments, analysers and other monitoring system used in making the decision for maintaining the safe operating limits for the plant;
- monitoring of cathodic protection and other corrosion control measures such as corrosion coupons; and
- monitoring of gas quality.

The Licensee should also demonstrate how maintenance activities aid in increasing the reliability of the plant equipment, which if otherwise neglected would present risk to safety.

(c) Corrective Maintenance

The Licensee should provide details of corrective maintenance system and methodology of response to various process upsets and breakdowns.

(d) Supporting System Maintenance.

The Licensee should describe how the maintenance records are maintained and how updating of the asset data base is done such as updating P&ID's etc.

A.4.3.7 De-commissioning and Permanent Removal

The Safety Case should describe in detail the processes it uses for partial de-commissioning of the gas processing and production facility/assets, including:

- methodology for decommissioning;
- assessment of the impact decommissioning an asset or any part thereof on other associated assets; and
- inclusion of the decommissioning records to the asset database.

Major de-commissioning or permanent removal of key infrastructure that has impacts on the safety of the operations would constitute a material change and should be subjected to the Change Management procedures (refer to Section A.4.12).

A.4.3.8 Modification, Repair and Replacement

There should be a detailed description of the processes that the Licensee uses for undertaking minor facility modifications, repair and replacement, including:

- identifying the need for modification, replacement and repair;
- developing a design and selecting the chosen approach to modification, repair or replacement;
- approving the selected design; and
- updating asset records.

Major modification, repair or replacement that has impacts on the safety of the operations would constitute a material change and should be subjected to the Change Management procedures (refer to Section A.4.12)

A.4.3.9 Related Systems and Facilities

The Safety Case should describe the interface between the facility and other parties responsible for delivering and receiving dangerous substances at the facility and how the safe conditions for operations are maintained e.g. receiving acid and alkali at the facility for regeneration for producing deionised water in town gas manufacturing units.

A.4.4 Gas Pressure Management

The Safety Case should describe the processes in place to ensure that the gas pressure injected into the transmission/distribution network is maintained within the allowable limits.

- (a) The following topics should be included in the Safety Case:
- the location and functionality of the system control facilities;
 - the location and functionality of back-up or standby system control facilities;
 - the processes to balance pressure with other inputs into the transmission system;
 - allowable maximum and minimum operating pressures of pipelines ;
 - the pressure alarm parameters used; and
 - communication methodology with the gas transporter, importer, shipper and retailer as appropriate.

A.4.5 Gas Quality Management

The Safety Case should describe the various sources of gas entering the facility and the gas quality injected into the transmission system. The monitoring and measurement equipment that is installed at the facility should be detailed. The gas quality parameters that are measured at the facility should also be included.

- (a) There should be a description of any gas processing/production activity e.g. ballasting, enrichment or blending, for the management of inappropriate gas quality related incidents. If any such activity is not present, justifications on why this is not required should be presented.
- (b) Information on various contaminants as agreed in the contracts with various buyers should be provided.
- (c) The quality of gas injected into the transmission pipeline system at entry point(s) should meet with the requirements as specified in the Gas specifications which is published in the Gas Network Code.
- (d) The Licensee should also provide information on ways to deal with the situations where gas of inappropriate quality has been received.
- (e) Significant and prolonged excursions in gas quality may constitute a ‘gas quality emergency’ and this should be addressed either in this section or separately in Section A.5 – Emergency Planning and Response, or in both.

A.4.6 Staff Competency and Training

The Safety Case should describe the policies and systems the Licensee has in place to address issues related to staff competency and training requirements. This is to ensure that the Licensee’s facility is designed, constructed and operated and maintained in a safe manner.

The areas to be addressed include:

- developing job specific competency matrix;

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- evaluating staff's competency based on the job specific competencies. Staff who do not meet the minimum requirements should be provided with the job-specific training immediately;
- ensuring needed training courses and certifications are maintained and renewed as specified by the certifying body;
- identifying safety critical roles, required qualification/experience, responsibilities and tasks at all levels in the organisation, including management, operational staff and contractors;
- ensuring adequate availability of competent staff or safe management of the facility (including contractors);
- providing resources and time to ensure staff in safety critical roles are adequately monitored in the course of their duties, and that a satisfactory team-working culture is maintained;
- demonstrating that the operation procedures are developed taking into account the staff competencies and are maintained as current and are used in practice;
- demonstrating that human factors and errors such as staff fatigue issues especially in shift type work have been taken into account in the control room and human-machine interface design; and
- that succession planning is taken into account in the training and development of staff.

A.4.7 Contractor Management

The Safety Case should provide information on the process for selection and management of contractors to ensure that any contractors engaged are competent and adequately resourced to undertake the activities assigned to them.

- (a) The process will include:
- assessing the risks involved in the type of work to be undertaken;
 - selection of appropriate contractors to work at the facility and undertaking pre-contract checks on competency and capability against the established standards;
 - assessing the overall safety management systems of the contractor;
 - developing key safety performance targets for the contractor to manage their operations;
 - undertaking audits and inspections of the contractors' work;
 - methodology adapted for induction and education to the contractors;
 - deciding the level of necessary communication and co-operation;
 - deciding the level of management and monitoring for the work; and
 - holding meetings to review the safety performance of the relevant contractor.
- (b) The job holder in the Licensee's business, who is responsible for the relationship management and the safety performance of the relevant contractor should be identified.

A.4.8 Failure and Incident Management

The Safety Case should document the procedures to be followed when there is a significant failure of a gas processing and production asset and describe what actions are taken to:

- ascertain the reasons for the failure;
 - determine the likelihood of future failures; and
 - ensure that the likelihood of future failures is eliminated or reduced to an acceptable level.
- (a) The Safety Case should provide evidence of appropriate arrangements for investigating gas safety related accidents and incidents, which should show that sufficient skill will be applied to ascertain not only the immediate cause(s) but also the ‘root cause’ of such accidents and incidents. The arrangements for carrying out accident and incident investigation should also describe how recommendations to prevent recurrence are made and how follow-up actions are managed.
- (b) Description should also include details regarding the methodology adopted for improving the safety culture within the organisation such as:
- human factors;
 - reporting near misses; and
 - reporting of non-compliances.
- (c) All requirements relating to the Onshore Receiving Facility Operator Gas Licence Condition: Major Gas Incidents will still apply.

A.4.9 Monitoring and Reporting

The Safety Case should provide details of the safety monitoring and reporting framework adopted by the Licensee to demonstrate that gas safety is being managed effectively, that safety trends are analysed and progress towards safety performance objectives and targets are being achieved. The monitoring and safety reporting framework should provide details of:

- the process for establishing safety performance targets and objectives;
- how monitoring of safety performance is undertaken and what specific aspects of safety are measured and how;
- the structure and contents of safety reports that the Licensee will be required to submit to the Authority (reporting frequency to be decided by the Authority). This should include a description and explanation of the safety key performance indicators that are used in measuring gas safety performance;

- the safety trends analysis that is undertaken and the comparators used to assess overall safety performance;
- the reporting regime for emergency incidents, a definition of the various categories of incident that may arise and the process and person interfaces involved in incident reporting and subsequent investigation; and
- how improvement actions are identified and implemented to ensure that there is a culture of continual improvement.

A.4.10 Business Continuity Management

The Safety Case should include a detailed description of the Business Continuity Plan (BCP), or its equivalent, to demonstrate that there are sufficient business back-up or standby facilities available to manage the business effectively in the event of an unexpected crisis. The BCP should address the arrangements for:

- alternate system control facilities;
- back-up records systems;
- redundancy of safety critical control systems;
- standby operational facilities; and
- roles and responsibilities of individuals during a crisis, etc.

There should also be a description in the BCP of how the back-up systems are regularly tested for their efficiency.

A.4.11 Regular Review and Audit Plan

The Safety Case should describe the arrangements for undertaking safety audits and inspections and the resources which will be applied to it.

- (a) The audit and inspections regime should be based on the assessment of risk as it applies to the asset or activity under consideration. There should be a description of the approach to undertaking audit and inspection, which should include:
 - development of an audit plan based on “assessment of risk”;
 - the timing of routine audits and inspections – daily, weekly, monthly, quarterly, annually;
 - the approach to non-routine audits and inspections;
 - the structure, methodology and frequency of all internal and external audits and inspections; and
 - competency requirements for persons undertaking audits and inspections.
- (b) There should be a description of how the results and outcomes of audits and inspections are fed back into the performance monitoring and review process.

- (c) All requirements relating to the Onshore Receiving Facility Operator Gas Licence Condition: Onshore Receiving Facility Technical and Safety Audits will still apply.

A.4.12 Change Management

The Safety Case should include information on the framework and procedures as to how changes to the organisation and/or operation of the Licensee's facility are assessed, implemented and controlled in an effective manner, both during the change process and after its completion.

- (a) Information that should be provided includes:
- methodology to identify potential impact to safety-related roles and responsibilities due to organisational changes;
 - the methodology to assess safety risks due to organisational changes;
 - steps to be taken to manage and minimise the risks as a part of change procedure;
 - the change documented and incorporated in the asset database;
 - the change to operating and management policies managed; and
 - the way in which major organisational change is managed and absorbed.
- (b) Such changes may be considered non-material or material. The Safety Case should include procedures for analysing proposed changes through the Formal Risk Assessment process to determine whether a change is deemed to be non-material or material. In the case of non-material changes, the overall risk to the safety of operations is unchanged. In the case of material changes, the Authority should be notified in advance of the change and a process and timeline agreed for assessing and implementing the required change.

A material change is likely to be one that changes the basis on which the original Safety Case was accepted. This would involve changes to the basis on which risk control decisions are made or which necessitate a review of the adequacy of major hazard control measures. It includes both physical modifications and operational management changes of sufficient significance.

To enable a greater understanding to be developed by the Licensees in advance of the process on the types of changes that may be regarded as material, Licensees will be encouraged to liaise with the Authority to determine what a material change in their Safety Case is.

What is classed as material may often differ depending on the size, nature and type of activity. Examples of material changes include:

- 'significant' changes to the configuration or capacity of the facility;
- major modifications or repairs to the plant and equipment that may result in major negative impact on safety;
- extension of asset life beyond its original design life;
- major changes to operating policies and procedures;

- outsourcing of key activities; and
- major organisational changes that impact key safety related roles and responsibilities.

A.4.13 Document Management

The Safety Case should provide information to ensure that a process is in place for the management of documents, data and records.

- (a) The Licensee should ensure that the methodology covers control, development, implementation, operation and review of documentation applicable to operations. This includes:
- providing information about the type and extent to which the data is collected;
 - the mechanism used to collect, record, interpret, analyse data;
 - accessibility and availability of the asset and operational data to personnel;
 - management of changes to documentation, data and records; and
 - removal of obsolete documentation from the asset database.
- (b) The process should be detailed to ensure that the documents are appropriate to the users and the approval mechanism is aligned to the appropriate level within the Licensee's business.

A.5 EMERGENCY PLANNING AND RESPONSE

The Safety Case should describe in detail how the facility identifies and responds to the emergencies.

- (a) The Safety Case should include details such as the response to emergencies that may range from minor incident with a potential to escalate into a major event or a full scale major event. The Licensee should have sufficient flexibility to cater for all scales of emergency.
- (b) The Safety Case should describe how the planning for and response to these emergency events is undertaken within the facility. The Safety Case should include details of:
- the name, appointment and contact details of the person who has overall managerial responsibility for the Licensee, normally the Chief Executive Officer or Managing Director;
 - the name, appointment and contact details of the day-to-day "controlling mind" of the asset .i.e. the person who makes day-to-day decisions on how to run the asset. This could be the Operations Manager or Production Manager of the asset;
 - a description of the likely events that could lead to an emergency;
 - the structure of the emergency response team. The person/appointment responsible for the facility for managing the response to the emergency – i.e. the Emergency Response Manager (ERM);

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- the resources that are available to the ERM in terms of the following to provide an effective emergency response:
 - operational staff;
 - office-based facilities and an incident room;
 - management information systems;
 - communication systems; and
 - corporate support;

- mode of communication between participants of emergency response team and people caught up in the emergency. Method of communication to neighbours and third parties that could be effected as a result of emergency situation;

- method of identification and declaration of emergency;

- drills and training identified for personnel to be able to effectively respond in time of emergency;

- means of ensuring regular checks to emergency response equipment in order to ensure its effectiveness during emergency;

- methods to deal with the release of dangerous substance or a gas release;

- general response to emergencies of various scales;

- notification to general public and other relevant third parties around the facility who should take appropriate action in the event of an emergency at the facility; and

- consultation and exchange of information with emergency services, government agencies and other third parties involved in emergency response.

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APPENDIX B: GAS SAFETY CASE GUIDELINES FOR GAS TRANSMISSION NETWORK OPERATORS WHICH APPLY TO GAS TRANSPORTERS

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 - B.4.14 Change Management
 - B.4.15 Document Management
 - B.4.16 Gas Safety Promotion and Public Awareness

- B.5 EMERGENCY PLANNING AND RESPONSE

B.1 INTRODUCTION AND GENERAL REQUIREMENTS

B.1.1 Introduction

- (a) The purpose of these guidelines is to ensure that sufficient information is provided to assist the Licensees in the development of Safety Cases for their respective operations and to ensure that gas safety risks have been appropriately managed and controlled to meet its Gas Licence obligations.
- (b) The aim of the Safety Case assessment is to examine the information provided to ensure that the Licensee has demonstrated to the satisfaction of the Authority that suitable safety arrangements and measures are in place and controlled to a level that is deemed to be ALARP. The Safety Case will be assessed and, where considered satisfactory, accepted by the Authority.
- (c) For the purpose of these guidelines, gas transmission networks cover onshore & offshore gas pipelines and installations operating at a pressure at or above 18 barg.
- (d) In addition to the obligations under these guidelines, compliance with all other current legislation is still required by Licensees. All safety related conditions within the Gas Licences for Gas Transporter will still apply including:

Condition : Codes of Practice

Condition : Preparation for Emergencies and Security Arrangements

Condition : Safety and Security of the Gas Pipeline Network

Condition : Independent Technical and Safety Audits

Condition : Provision of Expert Advice

Condition : Planning, Development, Maintenance and Operation of the Gas Pipeline Network

Condition : Safety and Security of Onshore Receiving Facilities

Condition : Onshore Receiving Facility Technical and Safety Audits

Condition : Major Gas Incidents

Condition : Gas Safety Plan.

- (e) All issues related to the occupational and workplace safety are covered within the Workplace Safety and Health Act (WSHA).
- (f) All requirements relating to the Gas Transporter Gas Licence Condition: Codes of Practice will still apply.

B.1.2 General Requirements (including Continual Improvement)

The Safety Case should contain an overview that provides the following information:

- (a) Business background of the Licensee and overview of the Safety Case.

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- (b) Identification of the person responsible for the Safety Case (In this document referred to as “The Duty Holder”.) The Duty Holder is the person in the Licensee who holds ultimate accountability for gas safety and should be a senior level manager or director of the Licensee.
- (c) Name and appointment of the person who is responsible for the preparation and submission of the Safety Case. This is the person who is the key interface with the regulatory authority on all Safety Case matters.
- (d) Description of formal version control and change control procedures that will apply to a Safety Case.
- (e) Demonstration by the Licensee that management processes are in place and are appropriately implemented to provide a continual review and improvement of safety performance. This includes:
 - Safety Policy;
 - Safety Management Organisation;
 - Planning and Implementing Safety Targets;
 - Measurement against Safety Targets;
 - Audit; and
 - Review and Revise.
- (f) Provides a continuous cyclic route to improvement of safety processes and performance. An industry best practice example is shown in Figure B.1.

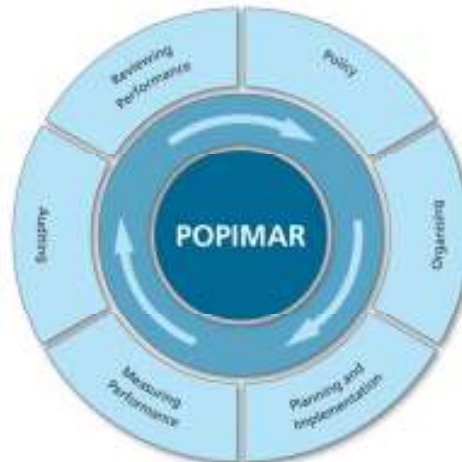


Figure B.1: Continuous Cycle

B.1.3 Safety Case Contents

The Safety Case requirements for the Licensees should be outlined in four key sections, described in detail in the following sections:

Section B.2 – Facility Description

Section B.3 – Formal Risk Assessment Process

Section B.4 – Safety Management System

Section B.5 – Emergency Planning and Response.

B.2 FACILITY DESCRIPTION

B.2.1 Overview of Facility

The Facility Description should provide sufficient information to enable the extent and scope of the assets, the operations of the Licensee in relation to the assets and the safety risks associated with the operation of the assets to be assessed. These include:

- (a) The geographical coverage of the gas transmission system and the downstream assets connected to it. For offshore pipelines, the assets supplied will be the Onshore Receiving Facility.
- (b) The locations of all of the Licensee's offices, including that of subsidiary offices and a brief description of the activities undertaken at each location.
- (c) A description of the activities carried out as part of the gas transmission business. This should be supported with suitable maps, drawings or plans wherever necessary.
- (d) A description of the gas transportation activities within the transmission network including details of:
 - locations where gas enters the transmission network from producers/importers, including inputs from other networks, subsea pipelines, onshore receiving facilities, LNG terminals and gas storage installations;
 - a diagram of the pressure tiers that are used to transmit gas throughout the geographic area;
 - the system control facility and the control systems used for managing pressures and flows within the system – e.g. SCADA;
 - a description of the transmission assets, for example:
 - the length, diameter, pipe specification and operating pressures of the transmission pipeline system;
 - the number and type of above-ground or subsea installations and compressor stations in the transmission network(s);
 - gas quality monitoring equipment; and
 - the various categories and numbers of meters installed for custody transfer.

- suitable maps, drawings, tables, charts and diagrams should be used to convey information wherever appropriate;
- a description of how gas quality is maintained within safe limits – e.g. blending and/or ballasting;
- the connected downstream systems and industrial installations with direct connections to the transmission system; and
- a description of how gas quality is monitored.

B.2.2 Roles and Responsibilities

This section of the Safety Case should provide a detailed description of the roles and responsibilities that exist within the management organisation structure for the Licensee.

- (a) The Licensee should describe the management organisation structure for the Licensee that highlights the gas safety management structure, departments and the key personnel in each department with gas safety responsibilities, and the key safety interfaces with operational staff.
- (b) The technical details for the activities listed below should be provided in Section B.4.3 – Asset and Operating Integrity Management of the Safety Case. This section should focus on the management roles and responsibilities and how the interfaces between design, construction and operation and maintenance work in practice. There should also be a clear description of the management systems that are used to gather, store and analyse asset data and work recording, the party responsible for the management of these systems and how the various management functions interface with the systems.
- (c) This should also include a description of the resource allocation and management plans for the operations of the Licensee – e.g. what activities are carried out in-house and what activities are outsourced.
- (d) The following example activities should be addressed in terms of *who, what, how and when*:
 - Design:
 - the design process for new transmission pipelines and above ground or subsea installations;
 - alterations and diversions to existing pipelines and modifications to existing above ground or subsea installations;
 - design risk assessments and safety in design; and
 - records management.

- Construction:
 - management interfaces between design and construction;
 - on-site construction of new pipelines and contractor management;
 - quality assurance during construction;
 - testing and commissioning;
 - as-built construction drawings; and
 - records management.

- Operations & Maintenance:
 - transmission pipeline surveillance and inspection;
 - pipeline leakage surveys;
 - 3rd party damage prevention;
 - ROV (Remotely Operated Vehicles) or divers surveys (offshore pipelines);
 - cathodic protection monitoring;
 - maintenance of above ground or subsea installations;
 - non-routine operations and permit-to-work systems;
 - emergency response management; and
 - records management.

B.3 FORMAL RISK ASSESSMENT PROCESS

The Formal Risk Assessment should be consistent with the activities described in the Overview of Facility and be based on a detailed and systematic assessment of risk.

- (a) The risk assessment process should take into account the safety risks inherent at each of the stages of design, construction, commissioning, operation and maintenance, modification and decommissioning of gas infrastructure assets. Risk assessments may be quantitative – (e.g. - 1×10^{-6} per year) or qualitative (e.g. - low, medium or high risk) in nature. Generally, transmission pipelines, which operate at higher pressures, can result in greater individual and societal risks and, wherever possible, risk assessments should be quantitative and be based on numerical modelling of likelihood and consequence. This is particularly the case where transmission pipelines and installations are constructed in high population density zones where societal risks are higher.

- (b) An important requirement of the Formal Safety Risk Assessment is that identified safety risks are mitigated to a level that is deemed to be ALARP, and adherence to recognised transmission codes and standards is a ‘starting point’ for ALARP considerations. However, most transmission codes and standards are, by their nature, generic in approach and there may be circumstances whereby additional risk mitigation measures are required that are over and above the requirements of the code or standard.

- (c) It is for the Licensee to demonstrate that the gas safety risks are being managed at a level that is ALARP. The Authority will make judgments as to whether it considers that risks are ALARP in its assessment of the Safety Case.

- (d) The Formal Safety Risk Assessment for a Transmission System should provide:
- a description of the methodology used and investigations undertaken for the Formal Safety Risk Assessment – e.g. workshop based, researched data, previous risk assessments etc;
 - an identification of all hazards and initiating events having the potential to cause a gas incident. It is important that experienced and competent personnel are involved in this process;
 - a detailed and systematic assessment of inherent risk, based on estimates of the likelihood and consequence of the risk;
 - a description of technical and other measures taken, or to be taken, to reduce that risk to a level that is ALARP;
 - a re-assessment of the residual risk following implementation of the mitigating measure(s);
 - a Risk Register with details of:
 - identified hazards and their causes (initiating events);
 - existing safety controls that are used to manage the risk;
 - an assessment of the inherent risk based on the likelihood and consequence of the risk occurring and tolerability of the risk according to the principle of ALARP;
 - a description of any additional control measures that are required to reduce the risk to ALARP;
 - a revised assessment of risk – i.e. residual risk - based on the implementation of the additional control measures to demonstrate ALARP;
 - the job title of the person who is responsible for the day-to-day management of the risk(s);
 - copies of any reports arising from the studies and investigations undertaken for the purposes of the Formal Risk Assessment; and
 - a description of the processes for regularly monitoring and reviewing the risks as described in the Risk Register and assessing any ‘new’ or ‘changed’ risks that arise.

B.4 SAFETY MANAGEMENT SYSTEM

B.4.1 Technical Design and Specifications

- (a) The Safety Case should contain a list of all relevant international codes, technical standards and specifications (referred to collectively as “authoritative best practice”) that have been used

for the design, engineering, construction, commissioning, operation, maintenance, modification and management of the Licensee's assets.

- (b) It is important that the Licensee has a system for assuring itself that the technical standards and specifications being used are current and the latest version. As such, the Safety Case should describe the process for ensuring that all amendments and new editions are recorded and an up to date list of standards and specifications is maintained and published such that all employees who require access to the standards and specifications are using the most recent copy.

B.4.2 Operational Procedures

The Safety Case should describe what operating procedures are in place for the safe control of the operations that are undertaken on the transmission assets. This should also extend to the associated management systems that are in place to support the operation and maintenance of the assets.

- (a) There should be a description of:
- the process for developing operating procedures;
 - the process for amending/modifying operating procedures;
 - the process for the management of operating procedures – i.e. the person responsible for the operating procedures;
 - the process to ensure up-to-date versions of operating procedures are made available to those who require access to them; and
 - the repository for operating procedures – e.g. an Operating Procedures Manual.
- (b) The operating procedures are the key control documents for mitigating the safety risks as identified in the Formal Risk Assessment and clear references to the relevant operating procedures should be made throughout the Safety Case, including the Risk Register, when describing how various activities are managed. A full list of operating procedures should also be included as an appendix to the Safety Case.
- (c) All requirements relating to the Gas Transporter Gas Licence Condition: Gas Safety Plan will still apply.

B.4.3 Asset and Operating Integrity Management

All requirements will still apply relating to the Gas Transporter Gas Licence Conditions:

- Safety and Security of the Gas Pipeline Network;
- Planning, Development, Maintenance and Operation of the Gas Pipeline Network; and
- Safety and Security of Onshore Receiving Facilities.

The Safety Case should describe the approach to managing asset safety from the perspective of:

B.4.3.1 Design

There should be a detailed description of the design principles applied to ensure that all identified hazards and risks are eliminated or reduced to an ALARP level during the life cycle of the network assets. The design requirements should include both the transmission pipelines, the above ground or subsea installations and the associated monitoring and control systems for the network.

Consideration should be given to:

(a) Design Inputs

Key inputs to the design process should include:

- identification of potential hazards & risks;
- a statement of the transmission network design policy;
- a description of the network design parameters for all network assets – e.g. pipelines, services, above-ground or subsea installations and compressor stations; and
- identification of the various codes, standards and recommendations adopted.

(b) Design Process Controls

Controls over the design process should include a description of:

- the policies and procedures used for network design;
- the risk mitigating measures adopted to deal with identified hazards & risks;
- the systems and tools used for network design and modelling, e.g. safety studies such as HAZOP studies, and studies to establish performance standards for safety critical equipment; and
- the design validation and approval process.

(c) Design Outputs

The outputs from the design should include:

- construction plans and specifications;
- performance standards, both in terms of risks and operational performance; and
- specific operational procedures required for safe operation.

B.4.3.2 Construction Testing and Commissioning

There should be a detailed description of how the Licensee manages the processes of network construction (includes pipeline replacement, reinforcement and alterations/diversions), testing and commissioning in accordance with the adopted codes, standards and specifications. The Safety Case should provide demonstration of the processes for:

- ensuring that construction activities are undertaken by staff and/or contractors who possess the requisite qualifications, training, skills and experience and competencies to undertake the work in a safe manner (see also Section B.4.8);
- ensuring supervision and verifying that the construction work is undertaken safely and complies with the specifications;
- ensuring that post-construction and pre-commissioning testing is undertaken in a safe and competent manner and is sufficient to prove that the installed asset is suitable for its intended use;
- ensuring that assets are commissioned as per an agreed procedure; and
- as-built records to be submitted, checked for accuracy and completeness and approved prior to being recorded on the Licensee's asset database.

B.4.3.3 Control of Operations

The Safety Case should describe how routine and non-routine procedures are carried out including:

- development of procedures for routine and non-routine procedures;
- job hazard assessment;
- permit-to-work system; and
- description of supervisory controls to ensure that the activities are carried out by competent personnel only.

B.4.3.4 Maintenance

There should be a detailed description of how the Licensee undertakes the operation and maintenance of the transmission assets taking into account the particular risks posed by the asset under consideration. This should also extend to the associated systems that are in place to support the operation and maintenance of the assets – e.g. drawings, plans, maintenance records, DCS or SCADA systems, permit-to-work etc. The Licensee should provide demonstration of the arrangements in place and processes for undertaking the following activities:

(a) Preventative Maintenance, which includes such activities as:

- pipeline surveillance and inspection;
- 3rd party damage prevention;
- leakage survey – vehicle and foot patrol surveys;
- ROV (Remotely Operated Vehicles) or divers surveys (offshore pipelines);
- pressure monitoring;
- gas quality monitoring (e.g. Wobbe Index, calorific value, water/hydrocarbon dewpoint, oxygen, sulphur compounds and other relevant compounds as necessary);
- ground movement surveys;
- cathodic protection monitoring;
- in-line inspection;

- maintenance of safety instrumented systems and other safety related protective or control systems;
- non-routine operations procedures; and
- permit-to-work systems.

(b) Corrective Maintenance, which includes such activities as:

- attending to ‘local’ incidents involving the transmission system, including reports of potential damage or pipeline contact, and other incidents where pipeline safety may be an issue;
- responding to gas system operating pressure related incidents – i.e. low pressure or high pressure in the network; and
- other asset-related emergency maintenance that may be required to be undertaken as identified in the formal Safety Risk Assessment.

(c) Supporting Systems Maintenance, which includes such activities as:

- storing and updating asset records – i.e. drawings, plans, databases etc; and
- maintenance of DCS or SCADA systems.

B.4.3.5 Modification, Repair, Replacement and Reinforcement

There should be a detailed description of the processes that the Licensee uses for undertaking pipeline modifications, repair, replacements, and reinforcements including the processes for:

- identifying the need for modification, replacement, repair or reinforcement;
- developing, designing and selecting the chosen approach to modification, replacement or reinforcement;
- approving the selected design; and
- updating asset records.

B.4.3.6 De-commissioning and Permanent Removal

There should be a detailed description of the processes that the Licensee uses for de-commissioning and permanent removal of the transmission assets including:

- identifying the need for de-commissioning and permanent removal;
- assessing the impact of the decision to de-commission and permanently remove an asset; and
- recording of de-commissioned and abandoned assets on the Licensee’s asset database.

The asset management systems that are utilised in the transmission business should be described particularly with respect to the collection, storage, retrieval and analysis of asset data so that appropriate and timely asset management decisions can be taken.

B.4.4 Gas Pressure Management

The Safety Case should describe how operating pressures in the transmission system are managed and by whom.

(a) There should be a description of:

- the location and functionality of the system control facilities;
- the numbers of staff utilised in pressure management;
- the location and functionality of back-up or standby system control facilities;
- how interfaces with connected 3rd party pipeline systems are managed;
- the pressure management of connected 3rd party pipelines;
- the extent of any pressure cycling (i.e. large variations in pipeline pressures throughout a 24 hour period) that is undertaken;
- how pipeline line pack is managed;
- how and where pipeline pressures are monitored;
- what pressure alarm parameters are used; and
- minimum pressure requirements at key points on the transmission system – e.g. connected 3rd party pipelines, inlet to Onshore Receiving Facilities, connected distribution systems, power stations, industrial process loads, etc.

(b) There should also be a description of the review process for deciding on the maximum operating pressure (MOP) for each pipeline due to encroachments and proximity infringements – e.g. pipeline risk assessments and MOP reviews.

B.4.5 Gas Quality Management

The Safety Case should describe the various sources of gas entering the transmission pipeline system and the gas quality monitoring and measurement equipment that is installed at each entry point and at other locations on the transmission system – e.g. custody transfer points or within network monitoring stations. The gas quality parameters that are measured at each location should also be included.

Note: further details of gas specifications may be obtained in the Gas Transporter document entitled “Injection Operating Procedures”.

Significant and prolonged excursions in gas quality may constitute a ‘gas quality emergency’ and this should be addressed either in this section or separately in Section B.5 – Emergency Planning and Response, or in both. In the event of a gas quality excursion, the process for communication with other key stakeholders in the gas industry should be described.

B.4.6 Gas Supply and Disconnection Management

In the case of onshore pipelines, the Safety Case should describe the control process that is in place for ensuring that gas is only supplied to downstream installations that are designed, constructed and tested in accordance with relevant regulations, codes of practice, approved standards and specifications. This is particularly important for typical industrial process loads that are connected to transmission systems.

- (a) There should also be a description of the communication process that takes place with other stakeholders in the event that a disconnection of gas supply is required for safety reasons, associated with the downstream installation.
- (b) Additionally, the communication process for restoring gas supply to premises that have been disconnected for reasons of safety should be described.

B.4.7 Gas Leak Management

The Safety Case should describe the processes in place for gas leak management on the transmission pipeline system.

- (a) Proactive Leak Management will include such activities as:
 - pipeline surveillance;
 - 3rd party damage prevention;
 - ROV or divers surveys (offshore pipelines);
 - cathodic protection monitoring;
 - leakage survey;
 - condition monitoring; and
 - maintenance of above ground installations e.g. pressure reduction stations.
- (b) Reactive Leak Management (i.e. responding to major pipeline leaks) will be addressed in Section B.5 – Emergency Planning and Response.

B.4.8 Staff Competency and Training

The Safety Case should describe the policies and systems the Licensee has in place to address issues related to staff competency and training requirements. This is to ensure that the transmission assets are designed, constructed and operated and maintained in a safe manner.

The areas to be addressed include:

- developing job specific competency matrix;

- evaluating staff's competency based on the job specific competencies. Staff who do not meet the minimum requirements should be provided with the job-specific training immediately;
- ensuring needed training courses and certifications are maintained and renewed as specified by the certifying body;
- identifying safety critical roles, required qualification/experience, responsibilities and tasks at all levels in the organisation, including management, operational staff and contractors;
- ensuring adequate availability of competent staff for safe management of the facility (including contractors);
- providing resources and time to ensure staff in safety critical roles are adequately monitored in the course of their duties, and that a satisfactory team-working culture is maintained;
- demonstrating that the operation procedures are developed taking into account the staff competencies and are maintained as current and are used in practice;
- demonstrating that human factors and errors such as staff fatigue issues especially in shift type work have been taken into account in the control room and human-machine interface design; and
- that succession planning is taken into account in the training and development of staff.

B.4.9 Contractor Management

The Safety Case should provide information on the process for selection and management of contractors to ensure that any contractors engaged are competent and adequately resourced to undertake the activities assigned to them.

The process will include:

- assessing the risks involved in the type of work to be undertaken;
- selection of appropriate contractors to work at the facility and undertaking pre-contract checks on competency and capability against the established standards;
- assessing the overall safety management systems of the contractor;
- developing key safety performance targets for the contractor to manage their operations;
- conducting audits and inspections of the contractors' work;
- methodology adapted for induction and education to the contractors;
- deciding the level of necessary communication and co-operation;
- deciding the level of management and monitoring for the work; and
- holding meetings to review safety performance of the relevant contractor.

The job holder in the transmission business, who is responsible for the relationship management and the safety performance of the relevant contractor, should be identified.

B.4.10 Failure and Incident Management

The Safety Case should document the procedures to be followed when there is a significant failure of a transmission asset and describe what actions are taken to:

- ascertain the reasons for the failure;
 - determine the likelihood of future failures; and
 - ensure that the likelihood of future failures is eliminated or reduced to an acceptable level.
- (a) The Safety Case should provide evidence of appropriate arrangements for investigating gas safety related accidents and incidents, which should show that sufficient skill will be applied to ascertain not only the immediate cause(s) but also the ‘root cause’ of such accidents and incidents. The arrangements for carrying out accident and incident investigation should also describe how recommendations to prevent recurrence are made and how follow-up actions are managed.
- (b) Description should also include the methodology for improving the safety culture within the organisation such as taking into account:
- human factors;
 - reporting of near misses; and
 - reporting of non-compliances.
- (c) If an incident is of an extremely serious nature e.g. involving injuries or loss of life, the Authority reserves the right to take part in internal investigations, conduct its own independent investigation or commission independent experts as required.
- (d) All requirements relating to the Gas Transporter Gas Licence Condition: Major Gas Incidents will still apply.

B.4.11 Monitoring and Reporting

The Safety Case should provide details of the safety monitoring and reporting framework adopted by the Licensee to demonstrate that gas safety is being managed effectively, that safety trends are analysed and that progress towards safety performance objectives and targets is being achieved. The monitoring and safety reporting framework should provide details of:

- the process for establishing safety performance targets and objectives;
- how monitoring of safety performance is undertaken, what specific aspects of safety are measured and how;

- the structure and contents of safety reports that the Licensee will be required to submit to the Authority (reporting frequency to be decided by the Authority). The safety key performance indicators should be included along with an explanation as to how they are used in measuring gas safety performance;
- the safety trends analysis that is undertaken and the comparators used to assess overall safety performance;
- the reporting regime in the event of gas emergency incidents. This should include a definition of the various categories of incidents that may arise and the process and person interfaces involved in incident reporting and subsequent investigation; and
- how improvement actions are identified and implemented to ensure that there is a culture of continual improvement.

B.4.12 Business Continuity Management

The Safety Case should provide a detailed description of the Business Continuity Plan (BCP), or its equivalent, to demonstrate that there are sufficient business back-up or standby facilities available to manage the transmission business effectively in the event of an unexpected crisis.

- (a) The BCP should address the arrangements for:
- alternate system control facilities;
 - back-up records systems;
 - redundancy of safety critical control systems;
 - standby operational facilities; and
 - roles and responsibilities of individuals during a crisis, etc.
- (b) There should also be a description in the BCP of how the back-up systems are regularly tested for their efficiency.

B.4.13 Regular Review and Audit Plan

The Safety Case should describe the arrangements for undertaking safety audits and inspections and the resources which will be applied to it. The audit and inspections regime should be based on the assessment of risk as it applies to the asset or activity under consideration.

- (a) There should be a description of the approach to undertaking audit and inspection, which should include:
- development of a yearly audit plan based on the assessment of risk on activities;
 - the timing of routine audits and inspections – daily, weekly, monthly, quarterly, annually;

- the approach to non-routine audits and inspections;
 - the structure of audits and inspections; and
 - competency requirements for persons undertaking audits and inspections.
- (b) There should be a description of how the results and outcomes of audits and inspections are fed back into the performance monitoring and review process.
- (c) All the following requirements relating to the Gas Transporter Gas Licence Conditions will still apply:
- Independent Technical and Safety Audits; and
 - Onshore Receiving Facility Technical and Safety Audits.

B.4.14 Change Management

The Safety Case should include information on the framework and procedures as to how changes to the organisation and/or operation of the Licensee's business are assessed, implemented and controlled in an effective manner, both during the change process and after its completion.

- (a) Information that should be provided includes:
- methodology to identify potential impact to safety related roles and responsibilities due to organisational changes;
 - methodology used to assess safety risks due to organisational changes;
 - steps to be taken to manage and minimise the risks as part of the change procedure;
 - the change documented and incorporated in the asset database;
 - the change to operating and management policies managed; and
 - the way in which major organisational change is managed and absorbed.
- (b) Such changes may be considered non-material or material (note: in this context "material" means significant). The Safety Case should include procedures for analysing proposed changes through the Formal Risk Assessment process to determine whether a change is deemed to be non-material or material. In the case of non-material changes, the overall risk to the safety of operations is unchanged. In the case of material changes, the Authority should be notified in advance of the change and a process and timeline agreed for assessing and implementing the required change.

A material change is likely to be one that changes the basis on which the original Safety Case was accepted. This would involve changes to the basis on which risk control decisions are made or which necessitate a review of the adequacy of major hazard control measures. It includes both physical modifications and operational management changes of sufficient significance.

To enable a greater understanding to be developed by the Licensees in advance of the process on the types of changes that may be regarded as material, Licensees will be encouraged to liaise with the Authority to determine a material change in their Safety Case.

What is classed as material may often differ depending on the size, nature and type of activity.

Examples of material changes include:

- ‘significant’ changes to the configuration of the network or the way in which the network is supplied with gas;
- major modifications or repairs to the network and equipment that may result in major negative impact on safety;
- extension of asset life beyond its original design life;
- major organisational changes that impact key safety related roles and responsibilities;
- significant changes to operating policies and procedures; and
- outsourcing of key activities.

B.4.15 Document Management

The Safety Case should provide information to ensure that a process is in place for the management of documents, data and records.

(a) The Gas Transporter should ensure that the methodology covers control, development, implementation, operation and review of documentation applicable to operations. This includes:

- providing information about the type and extent to which the data is collected;
- the mechanism used to collect, record, interpret, and analyse data;
- accessibility and availability of the asset and operational data to personnel;
- management of changes to documentation, data and records; and
- removal of obsolete documentation from the asset data base.

(b) The process should be detailed to ensure that the documents are appropriate to the users and the approval mechanism is aligned to the appropriate level within the Licensee’s transmission business.

B.4.16 Gas Safety Promotion and Public Awareness

The Safety Case should describe in detail the Licensee’s commitments to promoting gas safety and public awareness of the potential dangers of gas and, in particular, working in the vicinity of gas transmission pipelines.

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- (a) There should be clear demonstration of how the Licensee:
- develops standard procedures for “Safe Working in the Vicinity of High Pressure Gas Pipelines”;
 - establishes and maintains systems for communicating information to consumers regarding the safety of gas pipelines and associated installations on the network;
 - provides published material with information and adequate safety messages to warn about the potentially hazardous properties of gas, how to handle a gas leak and the gas emergency number to dial;
 - contractors are required to notify Gas Transporter of any earthworks in vicinity of gas pipes 7 days in advance;
 - conducts contractor briefings/inductions;
 - issues advice on safe working in the vicinity of underground gas pipelines and plant; and
 - for offshore pipelines and this will include liaisons with marine & harbour authorities, shipping companies, fishery organisations and other offshore pipeline operators.
- (b) All requirements relating to the Gas Transporter Gas Licence Condition: Provision of Expert Advice will still apply.

B.5 EMERGENCY PLANNING AND RESPONSE

The Safety Case should describe the arrangements that are in place for the management of:
(i) localised emergencies; and (ii) network emergencies.

- (a) Localised emergencies are usually ‘smaller-scale’ incidents whereby gas supplies to a relatively small number of customers are interrupted or could potentially be interrupted. These incidents can be managed with a relatively low level of resources – e.g. minor pipeline damage.
- (b) Network emergencies are ‘larger-scale’ emergencies whereby gas supplies to significant numbers of customers or the supply to an Onshore Receiving Facility are or could potentially be affected. In such a case, coordination of the resources of transmission and distribution businesses are required to manage the response to the emergency – e.g. major pipeline damage, plant failure or significant and prolonged excursions in gas quality.

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- (c) The Safety Case should describe how the planning for and response to these emergency events is undertaken within the Licensee. The Safety Case should include details of:
- the name, appointment and contact details of the person who has overall managerial responsibility for the Licensee, normally the Chief Executive Officer or the Managing Director;
 - the name, appointment and contact details of the day-to-day “controlling mind” of the asset .i.e. the person who makes day-to-day decisions on how to run the asset. This could be the Operations Manager or Production Manager of the asset;
 - a description of the likely events that could lead to a localised or network emergency;
 - the structure of the emergency response team, including the person/appointment responsible in the transmission business for managing the response to the emergency – i.e. the Emergency Response Manager (ERM);
 - the resources that are available to the ERM in terms of the following to provide emergency response:
 - operational staff;
 - office-based facilities and an incident room;
 - management information systems;
 - communications systems; and
 - corporate support;
 - the interaction with other organisations both upstream and downstream of the Licensee – e.g. distribution businesses, Onshore Receiving Facility management, power generators, etc;
 - the frequency and scope of emergency exercises to be undertaken to test the emergency preparedness and the effectiveness of the response; and
 - consultation and exchange of information with emergency services, government agencies and other third parties involved in emergency response.
- (d) All requirements relating to the Gas Transporter Gas Licence Condition: Preparation for Emergencies and Security Arrangements will still apply.

**APPENDIX C:
GAS SAFETY CASE GUIDELINES FOR GAS DISTRIBUTION NETWORK OPERATORS WHICH
APPLY TO GAS TRANSPORTERS**

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- C.5 EMERGENCY PLANNING AND RESPONSE

C.1 INTRODUCTION AND GENERAL REQUIREMENTS

C.1.1 Introduction

- (a) The purpose of these guidelines is to ensure that sufficient information is provided to assist gas companies in the development of Safety Cases for their respective operations and to ensure that gas safety risks have been appropriately managed and controlled to meet its Gas Licence obligations.
- (b) The aim of the Safety Case assessment is to examine the information provided to ensure that the Licensee has demonstrated to the satisfaction of the Authority that suitable safety arrangements and measures are in place and controlled to a level that is deemed to be ALARP. The Safety Case will be assessed and, where considered satisfactory, will be accepted.
- (c) For the purpose of these guidelines, the natural gas and town gas distribution networks cover pipelines operating at pressures below 18 barg and below 3 barg respectively.
- (d) In addition to the obligations under these guidelines, compliance with all other current legislation is still required by Licensees. All safety related conditions within the relevant Gas Licence will still apply including the following which are referenced later in the document:

Condition : Codes of Practice

Condition : Preparation for Emergencies and Security Arrangements

Condition : Safety and Security of the Gas Pipeline Network

Condition : Independent Technical and Safety Audits

Condition : Provision of Expert Advice

Condition : Planning, Development, Maintenance and Operation of the Gas Pipeline Network

Condition : Major Gas Incidents

Condition : Gas Safety Plan.

- (e) All issues related to the occupational and workplace safety are covered within the Workplace Safety and Health Act.
- (f) All requirements relating to the Gas Transporter Gas Licence Condition: Codes of Practice will still apply.

C.1.2 General Requirements (including Continual Improvement)

The Safety Case should contain an overview that provides the following information:

- (a) Business background of the Licensee and overview of the Safety Case.
- (b) Identification of the person responsible for the Safety Case (In this document referred to as “The Duty Holder”). The Duty Holder is the person in the Licensee who holds ultimate accountability for gas safety and should be a senior level manager or director of the Licensee.

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- (c) Name and appointment of the person who is responsible for the preparation and submission of the Safety Case. This is the person who is the key interface with the regulatory authority on all Safety Case matters.
- (d) Description of formal version control and change control procedures that will apply to a Safety Case.
- (e) Reference to the licence conditions within the Safety Case wherever applicable.
- (f) Demonstration by the Licensee that management systems are in place and are appropriately implemented to provide a continual review and improvement of safety performance. This includes:
 - Safety Policy;
 - Safety Management Organisation;
 - Planning and Implementing Safety Targets;
 - Measurement against Safety Targets;
 - Audit; and
 - Review and Revise.
- (g) Provides a continuous cyclic route to improvement of safety processes & performance. An industry best practice example is shown in Figure C.1.

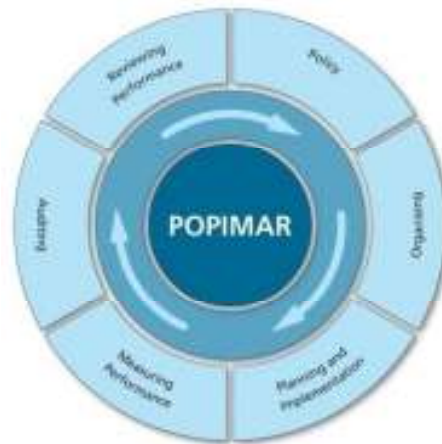


Figure C.1: Continuous Cycle

C.1.3 Safety Case Contents

The Safety Case requirements for the licensees should be outlined in four key sections, described in detail in the following sections:

Section C.2 – Facility Description

Section C.3 – Formal Risk Assessment Process

Section C.4 – Safety Management System

Section C.5 – Emergency Planning and Response.

C.2 FACILITY DESCRIPTION

C.2.1 Overview of Facility

The Facility Description should provide sufficient information to enable the extent and scope of the assets, the operations of the Licensee in relation to the assets and the safety risks associated with the operation of the assets to be assessed. These include:

- (a) The geographic area covered by the gas distribution of the Licensee.
- (b) The locations of all of the Licensee's offices, including that of subsidiary offices and a brief description of the activities undertaken at each location.
- (c) A description of the activities carried out as part of the gas distribution business. This should be supported with suitable maps, drawings or plans wherever necessary.
- (d) A description of the gas transportation activities within the distribution network including details of:
 - locations where gas enters the distribution network from gas transmission pipelines and other sources;
 - a diagram of the pressure tiers that are used to distribute gas throughout the geographic area;
 - the system control facility and the control systems used for managing pressures and flows within the system – e.g. SCADA;
 - a description of the distribution assets, for example:
 - the length, diameter, pipe specification and operating pressures of the distribution pipeline system;
 - the number and type of above-ground or and pressure reduction stations in the distribution network(s);
 - gas quality monitoring equipment; and
 - the various categories and numbers of meters installed for custody transfer;
 - suitable maps, drawings, tables, charts and diagrams should be used to convey information wherever appropriate;
 - a description of how gas quality is maintained within safe limits – e.g. blending;
 - the connected downstream systems and industrial installations with direct connections to the system; and

- a description of how gas quality is monitored, in particular, gas odorant levels.

C.2.2 Roles and Responsibilities

This section of the Safety Case should provide a detailed description of the roles and responsibilities that exist within the management organisation structure for the distribution business.

- (a) The Licensee should describe the management organisation structure for the Licensee that highlights the gas safety management structure, departments and the key personnel in each department with gas safety responsibilities, and the key safety interfaces with operational staff.
- (b) The technical details for the activities listed should be provided in Section C.4.3 – Asset and Operating Integrity Management (including Protection against 3rd Party Damage), of the Safety Case. This section should focus on the management roles and responsibilities and how the interfaces between design, construction and operation and maintenance work in practice. There should be also a clear description of the management systems that are used to gather, store and analyse asset data and work recording, the party responsible for the management of these systems and how various management functions interface with systems.
- (c) This should also include a description of the resource allocation and management plans for the operations of the Licensee – e.g. what activities are carried out in-house and what activities are outsourced.
- (d) The following example activities should be addressed in terms of *who, what, how and when*:
 - Design:
 - the design process for new distribution pipelines and above ground installations;
 - deviations and diversions for existing pipelines and modifications to existing above ground installations;
 - design risk assessments and safety in design; and
 - records management.
 - Construction:
 - management interfaces between design and construction;
 - on-site construction of new pipelines and contractor management;
 - quality assurance during construction;
 - testing and commissioning;
 - as-built construction drawings; and
 - records management.
 - Operations & Maintenance:
 - distribution pipeline surveillance and inspection;
 - pipeline leakage surveys;

- 3rd party damage prevention;
- cathodic protection monitoring (where applicable);
- maintenance of above ground installations;
- non-routine operations and permit-to-work systems;
- emergency response management; and
- records management.

C.3 FORMAL RISK ASSESSMENT PROCESS

The Formal Risk Assessment should be consistent with the activities described in the Facility Description and be based on a detailed and systematic assessment of risk.

- (a) The risk assessment process should take into account the safety risks inherent at each of the stages of design, construction, commissioning, operation and maintenance, modification and decommissioning of gas infrastructure assets. Generally, risk assessments for distribution systems are quantitative in nature and are based on estimates of likelihood and consequence.
- (b) An important requirement of the Formal Risk Assessment is that identified safety risks are mitigated to a level that is deemed to be ALARP and adherence to recognised distribution codes and standards is a 'starting point' for ALARP considerations. However, most distribution codes and standards are, by their nature, generic in approach and there may be circumstances whereby additional risk mitigation measures are required that are over and above the requirements of the code or standard.
- (c) It is for the distribution company to demonstrate that the gas safety risks are being managed at a level that is ALARP. The safety regulatory authority will make judgements as to whether it considers that risks are ALARP in its assessment of the Safety Case.
- (d) The Formal Risk Assessment for a Distribution system should provide:
 - a description of the methodology used and investigations undertaken for the Formal Safety Risk Assessment – e.g. workshop based, researched data, previous risk assessments etc;
 - an identification of all hazards and initiating events having the potential to cause a gas incident. It is important that experienced and competent personnel are involved in this process;
 - a detailed and systematic assessment of inherent risk, based on estimates of the likelihood and consequence of the risk;
 - a description of technical and other measures taken, or to be taken, to reduce that risk to a level that is ALARP;

- a re-assessment of the residual risk following implementation of the mitigating measure(s);
- a Risk Register with details of:
 - identified hazards and their causes (initiating events);
 - existing safety controls that are used to manage the risk;
 - an assessment of the inherent risk based on the likelihood and consequence of the risk occurring and tolerability of the risk according to the principle of ALARP;
 - a description of any additional control measures that are required to reduce the risk to ALARP;
 - a revised assessment of risk – i.e. residual risk - based on the implementation of the additional control measures to demonstrate ALARP; and
 - the job title of the person who is responsible for the day-to-day management of the risk(s);
- copies of any reports arising from the studies and investigations undertaken for the purposes of the Formal Risk Assessment; and
- a description of the process(es) for regularly monitoring and reviewing the risks as described in the Risk Register and assessing any ‘new’ or ‘changed’ risks that arise.

C.4 SAFETY MANAGEMENT SYSTEM

C.4.1 Technical Design and Specifications

- (a) The Safety Case should contain a list of all relevant international codes, technical standards and specifications (referred to collectively as “authoritative best practice”) that have been used for the design, engineering, construction, commissioning, operation, maintenance, modification and management of the Licensee’s assets.
- (b) It is important that the Licensee has a system for assuring itself that the technical standards and specifications being used in its distribution business are current and the latest version. As such, the Safety Case should describe the process for ensuring that all amendments and new editions are recorded and an up to date list of standards and specifications is maintained and published such that all employees who require access to the standards and specifications are using the most recent copy.

C.4.2 Operational Procedures

The Safety Case should describe what operating procedures are in place for the safe control of the operations that are undertaken on the distribution assets. This should also extend to the associated management systems that are in place to support the operation and maintenance of the assets.

- (a) There should be a description of:
- the process for developing operating procedures;
 - the process for amending/modifying operating procedures;
 - the process for the management of operating procedures is managed – i.e. the person responsible for the operating procedure;
 - the process to ensure up-to-date versions of operating procedures are made available to those who require access to them; and
 - the repository for operating procedures – e.g. an Operating Procedures Manual.
- (b) The operating procedures are the key control documents for mitigating the safety risks as identified in the Formal Risk Assessment and clear references to the relevant operating procedures should be made throughout the Safety Case, including the Risk Register, when describing how various activities are managed. A full list of operating procedures should also be included as an appendix to the Safety Case.
- (c) All requirements relating to the Gas Licence Condition: Gas Safety Plan will still apply.

C.4.3 Asset and Operating Integrity Management (including Protection against 3rd Party Damage)

All requirements will still apply relating to the Gas Licence Conditions:

- Safety and Security of the Gas Pipeline Network; and
- Planning, Development, Maintenance and Operation of the Gas Pipeline Network.

The Safety Case should describe the approach to managing asset safety from the perspective of:

C.4.3.1 Design

There should be a detailed description of the design principles applied to ensure that all identified hazards and risks are eliminated or reduced to ALARP level during the life cycle of the network assets. The design requirements should include the distribution pipelines, the above ground installations and the associated monitoring and control systems for the network.

Consideration should be given to:

- (a) Design Inputs
- Key inputs to the design process should include:
- identification of potential hazards & risks;
 - a statement of the distribution network design policy;
 - a description of the network design parameters for all network assets – e.g. pipelines, services, above ground installations; and
 - identification of the various codes, standards and recommendations adopted.

(b) Design Process Controls

Controls over the design process should include a description of:

- the policies and procedures used for network design;
- the risk mitigating measures adopted to deal with identified hazards & risks;
- the systems and tools used for network design and modelling, e.g. safety studies such as HAZOP studies, and studies to establish performance standards for safety critical equipment; and
- the design validation and approval process.

(c) Design Outputs

The outputs from the design should include:

- construction plans and specifications;
- performance standards, both in terms of risks and operational performance; and
- specific operational procedures required for safe operation.

C.4.3.2 Construction

There should be a detailed description of how the Licensee manages the processes of distribution network construction (includes pipeline replacement, reinforcement and alterations/diversions), testing and commissioning in accordance with the adopted codes, standards and specifications. The Safety Case should provide demonstration of the processes for:

- ensuring that construction activities are undertaken by staff and/or contractors who possess the requisite qualifications, training, skills and experience and competencies to undertake the work in a safe manner (see also Section C.4.8);
- ensuring supervision and verifying that the construction work is undertaken safely and complies with the specifications;
- ensuring that post-construction and pre-commissioning testing is undertaken in a safe and competent manner and is sufficient to prove that the installed asset is suitable for its intended use;
- ensuring that assets are commissioned as per an agreed procedure; and
- as-built records to be submitted, checked for accuracy and completeness, and approved prior to being recorded on the Licensee's asset database.

C.4.3.3 Control of Operations

The Safety Case should describe how routine and non-routine operations are carried out including:

- development of procedures for routine and non-routine procedures;
- job hazard assessment;
- permit-to-work system; and
- description of supervisory controls to ensure that the activities are carried out by competent personnel only.

C.4.3.4 Maintenance

There should be a detailed description of how the Licensee undertakes the operation and maintenance of the distribution assets taking into account the particular risks posed by the asset under consideration. This should also extend to the associated systems that are in place to support the operation and maintenance of the assets – e.g. drawings, plans, maintenance records, DCS or SCADA systems, permit-to-work systems etc. The Licensee should provide demonstration of the arrangements in place and processes for undertaking the following activities:

(a) Preventative Maintenance, which includes such activities as:

- pipeline surveillance and inspection;
- 3rd party damage prevention;
- leakage survey – vehicle and foot patrol surveys;
- pressure monitoring;
- gas quality monitoring (e.g. Wobbe Index, calorific value, odorant, water content);
- cathodic protection monitoring (where applicable);
- maintenance of safety instrumented systems and other safety related protective or control systems;
- non-routine operations procedures; and
- permit-to-work systems.

(b) Corrective Maintenance, which includes such activities as:

- attending to ‘local’ incidents involving the distribution system, including reports of potential damage or pipeline contact, and adjacent incidents where pipeline safety may be an issue;
- responding to gas system operating pressure related incidents – i.e. low pressure or high pressure in the network; and
- other asset-related emergency maintenance that may be required to be undertaken as identified in the Formal Risk Assessment.

(c) Supporting Systems Maintenance, which includes such activities as:

- storing and updating asset records – i.e. drawings, plans, databases etc; and
- maintenance of DCS or SCADA systems.

C.4.3.5 Modification, Replacement and Reinforcement

There should be a detailed description of the processes that the Licensee uses for undertaking pipeline modifications, replacements and reinforcements including the processes for:

- identifying the need for modification, replacement or reinforcement;

- developing, designing and selecting the chosen approach to modification, replacement or reinforcement;
- approving the selected design; and
- updating asset records.

C.4.3.6 De-commissioning and Permanent Removal

There should be a detailed description of the processes that the Licensee uses for the de-commissioning and permanent removal of the distribution assets including:

- identifying the need for de-commissioning or permanent removal;
- assessing the impact of the decision to de-commission or permanently removing an asset; and
- recording of de-commissioned and abandoned assets on the Licensee's asset database.

The asset management systems that are utilised in the distribution business should be described particularly with respect to the collection, storage, retrieval and analysis of asset data so that appropriate and timely asset management decisions can be taken.

C.4.4 Gas Pressure Management

The Safety Case should describe how operating pressures in the distribution system are managed and by whom.

- (a) There should be a description of:
- the location and functionality of the system control facility(ies);
 - the numbers of staff utilised in pressure management;
 - the location and functionality of back-up or standby system control facility(ies);
 - how interfaces with transmission pipelines supplying gas into the network(s) are managed;
 - the maximum and minimum operating pressures for each distribution network;
 - how and where network pressures are monitored;
 - what pressure alarm parameters are used; and
 - minimum pressure requirements at the extremities of the distribution network(s).
- (b) There should be a description of the process for identifying where network reinforcement(s) is required as a result of load growth on the network(s).

C.4.5 Gas Quality Management

The Safety Case should describe the various sources of gas entering the Distribution pipeline system and the gas quality monitoring and measurement equipment that is installed at each entry point and at other locations on the system.

Significant and prolonged excursions in gas quality may constitute a ‘gas quality emergency’ and this should be addressed either in this section or separately in Section C.5 – Emergency Planning and Response, or in both. In the event of a gas quality excursion, the process for communication with other key stakeholders in the gas industry should be described.

C.4.6 Gas Supply and Disconnection Management

The Safety Case should describe the control process that is in place for ensuring that gas is only supplied to downstream installations that are designed, constructed and tested in accordance with relevant regulations, codes of practice, approved standards and specifications.

- (a) There should also be a description of the communication process that takes place with other stakeholders in the event that a disconnection of gas supply is required for safety reasons, associated with the downstream installation.
- (b) Additionally, the communication process for restoring gas supply to premises that have been disconnected for reasons of safety should be described.

C.4.7 Gas Leak Management

The Safety Case should describe the processes in place for gas leak management on the distribution network(s).

- (a) Proactive Leak Management will include such activities as:
 - pipeline surveillance;
 - 3rd party damage prevention;
 - cathodic protection monitoring (where applicable);
 - leakage survey;
 - system treatment – gas conditioning etc;
 - maintenance of above ground installations; and
 - condition monitoring.
- (b) The arrangements for providing an emergency response to public reported escapes (PREs) of gas should be described and the level of resources allocated to this activity should be included. A record of the response times to PREs should be maintained and there should also be a log of outstanding escapes that are deferred for future repair action (where applicable).
- (c) Reactive Leak Management (i.e. responding to major pipeline leaks) will be addressed in Section C.5 – Emergency Planning and Response.

C.4.8 Staff Competency and Training

The Safety Case should describe the policies and procedures the Licensee has in place to address issues related to staff competency and training requirements. This is to ensure that the distribution assets are designed, constructed and operated and maintained in a safe manner.

The areas to be addressed include:

- developing job specific competency matrix;
- evaluating staff competency based on the job specific competencies. Staff who do not meet the minimum requirements should be provided with the job-specific training immediately;
- ensuring needed training courses and certifications are maintained and renewed as specified by the certifying body;
- identifying safety critical roles, required qualification/experience, responsibilities and tasks at all levels in the organisation, including management, operational staff and contractors;
- ensuring adequate availability of competent staff for safe management of the facility (including contractors);
- providing resources and time to ensure that staff in safety critical roles are adequately monitored in the course of their duties, and that a satisfactory team-working culture is maintained;
- demonstrating that the operation procedures are developed taking into account the staff competencies and are maintained as current and are used in practice;
- demonstrating that human factors and errors such as staff fatigue issues especially in shift type work have been taken into account in the control room and human-machine interface design; and
- that succession planning is taken into account in the training and development of staff.

C.4.9 Contractor Management

The Safety Case should provide information on the process for selection and management of contractors to ensure that any contractors engaged are competent and adequately resourced to undertake the activities assigned to them.

The process will include:

- assessing the risks involved in the type of work to be undertaken;

- selection of appropriate contractors to work at the facility and the undertaking of pre-contract checks on competency and capability against the established standards;
- assessing the overall safety management systems of the contractor;
- developing key safety performance targets for the contractor to manage their operations;
- conducting audits and inspections of the contractors' work;
- adapting methodology for induction and education to the contractors;
- deciding the level of necessary communication and co-operation;
- deciding the level of management and monitoring for the work; and
- holding meetings to review the safety performance of the relevant contractor.

The job holder in the distribution business who is responsible for the relationship management, and the safety performance of the relevant contractor, should be identified.

C.4.10 Failure and Incident Management

The Safety Case should document the procedures to be followed when there is a significant failure of a distribution asset and describe what actions are taken to:

- ascertain the reasons for the failure;
 - determine the likelihood of future failures; and
 - ensure that the likelihood of future failures is eliminated or reduced to an acceptable level.
- (a) The Safety Case should provide evidence of appropriate arrangements for investigating gas safety related accidents and incidents, which should show that sufficient skill will be applied to ascertain not only the immediate cause(s) but also the 'root cause' of such accidents and incidents. The arrangements for carrying out accident and incident investigation should also describe how recommendations to prevent recurrence are made and how follow-up actions are managed.
- (b) Description should also include the methodology for improving the safety culture within the organisation such taking into account:
- human factors;
 - reporting near misses; and
 - reporting of non-compliances.
- (c) If an incident is of an extremely serious nature e.g. involving injuries or loss of life, the Authority reserves the right to take part in internal investigations, conduct its own independent investigation or commission independent experts as required.
- (d) All requirements relating to the Gas Licence Condition: Major Gas Incidents will still apply.

C.4.11 Monitoring and Reporting

The Safety Case should provide details of the safety monitoring and reporting framework that the distribution business uses to demonstrate that gas safety is being managed effectively, that safety trends are analysed and progress towards safety performance objectives and targets are being achieved. The monitoring and safety reporting framework should provide details of:

- the process for establishing safety performance targets and objectives;
- how monitoring of safety performance is undertaken and what specific aspects of safety are measured and how;
- the structure and contents of safety reports that the Licensee will be required to submit to the Authority in the form of a quarterly, six-monthly or yearly reports. The safety key performance indicators should be included along with an explanation as to how they are used in measuring gas safety performance. This will assist with establishing reporting frequencies;
- what safety trends analysis is undertaken and what comparators are used to assess overall safety performance;
- the reporting regime in the event of gas emergency incidents. This should include a definition of the various categories of incident that may arise and the process and person interfaces involved in incident reporting and subsequent investigation; and
- how improvement actions are identified and implemented to ensure that there is a culture of continual improvement.

C.4.12 Business Continuity Management

The Safety Case should provide a detailed description of the Business Continuity Plan (BCP), or its equivalent, to demonstrate that there are sufficient business back-up or standby facilities available to manage the distribution business effectively in the event of an unexpected crisis.

- (a) The BCP should address the arrangements for:
- alternate system control facilities;
 - back-up records systems;
 - redundancy of safety critical control systems;
 - standby operational facilities; and
 - roles and responsibilities of individuals during a crisis, etc.
- (b) There should also be a description in the BCP of how the back-up systems are regularly tested for their efficacy.

C.4.13 Regular Review and Audit Plan

The Safety Case should describe the arrangements for undertaking safety audits and inspections and the resources which will be applied to it. The audit and inspections regime should be based on the assessment of risk as it applies to the asset or activity under consideration.

- (a) There should be a description of the approach to undertaking audit and inspection, which should include:
 - development of a yearly audit plan based on the assessment of risk on activities;
 - the timing of routine audits and inspections – daily, weekly, monthly, quarterly, annually;
 - the approach to non-routine audits and inspections;
 - the structure of audits and inspections; and
 - competency requirements for persons undertaking audits and inspections.
- (b) There should be a description of how the results and outcomes of audits and inspections are fed back into the performance monitoring and review process.
- (c) All requirements relating to the Gas Licence Condition: Independent Technical and Safety Audits will still apply.

C.4.14 Change Management

The Safety Case should include information on the framework and procedures as to how changes to the organisation and/or operation of the Licensee are assessed, implemented and controlled in an effective manner, both during the change process and after its completion.

- (a) Information should be provided on:
 - the methodology used to assess risks to Health, Safety and Environment as a result of change;
 - what steps are taken to manage and minimise the risks as part of the change procedure;
 - how is the change documented and incorporated in the asset database;
 - how is the change to operating and management policies managed; and
 - how is major organisational change managed and absorbed.
- (b) Such changes may be considered non-material or material (note: in this context “material” means significant). The Safety Case should include procedures for analysing proposed changes through the Formal Risk Assessment process to determine whether a change is deemed to be non-material or material. In the case of non-material changes, the overall risk to the safety of operations is unchanged. In the case of material changes, the Authority should be notified in advance of the change and a process and timeline agreed for assessing and implementing the required change.

A material change is likely to be one that changes the basis on which the original Safety Case was accepted. This would involve changes to the basis on which risk control decisions are made or which necessitate a review of the adequacy of major hazard control measures. It includes both physical modifications and operational management changes of sufficient significance.

To enable a greater understanding to be developed by the Licensees in advance of the process on the types of changes that may be regarded as material, Licensees will be encouraged to liaise with the Authority to determine a material change in their Safety Case.

What is classed as material may often differ depending on the size, nature and type of activity.

Examples of material changes include:

- ‘significant’ changes to the configuration of the network or the way in which the network is supplied with gas;
- major modifications or repairs to the network and equipment that may result in major negative impact on safety;
- extension of asset life beyond its original design life;
- major organisational changes that impact key safety related roles and responsibilities;
- changes to operating policies and procedures; and
- outsourcing of key activities.

C.4.15 Document Management

The Safety Case should provide information to ensure that a process is in place for the management of documents, data and records.

- (a) The Licensee should ensure that the methodology should include control, development, implementation, operation and review of documentation applicable to operations. This includes:
 - providing information about the type and extent to which the data is collected;
 - the mechanism used to collect, record, interpret, analyse data;
 - accessibility and availability of the asset and operational data to personnel;
 - management of changes to documentation, data and records; and
 - removal of obsolete documentation from the asset database.
- (b) The process should be detailed to ensure that the documents are appropriate to the users and the approval mechanism is aligned to the appropriate level within the business.

C.4.16 Gas Safety Promotion and Public Awareness

The Safety Case should describe in detail the Licensee's commitments to promoting gas safety and public awareness of the potential dangers of gas and, in particular, working in the vicinity of gas distribution pipelines.

- (a) There should be clear demonstration of how the Licensee:
 - provides published material with information and adequate safety messages to warn about the potentially hazardous properties of gas, how to handle a gas leak and the gas emergency number to dial;
 - issues advice on safe working in the vicinity of underground gas pipelines and plant;
 - conducts contractor briefing/inductions; and
 - develops standard procedures for safe working and excavating in the vicinity of distribution low pressure pipelines.
- (b) All requirements relating to the Gas Licence Condition: Provision of Expert Advice will still apply.

C.5 EMERGENCY PLANNING AND RESPONSE

The Safety Case should describe the arrangements that are in place for the management of:
(i) localised emergencies; and (ii) network emergencies.

- (a) Localised emergencies are usually 'smaller-scale' incidents whereby gas supplies to a relatively small number of customers are interrupted and the incident can be managed with a relatively low level of resources – e.g. minor pipeline damage.
- (b) Network emergencies are 'larger-scale' emergencies whereby gas supplies to significant numbers of customers are affected and coordination of the resources of transmission and distribution businesses are required to manage the response to the emergency – e.g. major pipeline damage or plant failure.
- (c) The Safety Case should describe how the planning for and response to these emergency events is undertaken within the distribution business. The Safety Case should include details of:
 - the name, appointment and contact details of the person who has overall managerial responsibility for the Licensee, normally the Chief Executive Officer or the Managing Director;
 - the name, appointment and contact details of day-to-day "controlling mind" of the asset .i.e. the person who makes day-to-day decisions on how to run the asset. This could be the Operations Manager or Production Manager of the asset;

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- a description of the likely events that could lead to a localised or network emergency – i.e. scenario planning;
 - structure of the emergency response team, including the person/appointment responsible in the distribution business for managing the response to the emergency – i.e. the Emergency Response Manager (ERM);
 - the resources that are available to the ERM in terms of:
 - operational staff;
 - office-based facilities and an incident room;
 - management information systems;
 - communications systems; and
 - corporate support.
 - the interaction with other organisations – e.g. transmission businesses, other distribution businesses, supply companies, external agencies etc;
 - the frequency and scope of emergency exercises to be undertaken to test the emergency preparedness and the effectiveness of the response; and
 - consultation and exchange of information with emergency services, government agencies and other third parties involved in the emergency response.
- (d) All requirements relating to the Gas Licence Condition: Preparation for Emergencies and Security Arrangements will still apply.