

GAS SUPPLY CODE

Energy Market Authority of Singapore

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Gas Supply Code

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Gas Supply Code

1 INTRODUCTION

1.1 The Purpose of this Code

1.1.1 This Gas Supply Code is made pursuant to the Gas Act (Cap.116A). This Code sets out the obligation of gas licensees to comply with the standards and procedures for the safe operation of the gas supply system. This Code also describes the rights and obligations of gas licensees in respect of the conveyance of gas and the provision of a gas supply.

1.1.2 This Code also sets out the technical, safety and procedural requirements to be met by those who intend to be or are connected to the gas transporter's gas supply system and the requirements for connection or turn-on, discontinuance or disconnection of gas supply and alteration and addition of pipe work to any premises downstream of the gas meter or gas service isolation valve.

1.2 To Whom this Code Applies

This Code is applicable to:

- (a) any person who is granted a licence under section 7(3) of the Act;
- (b) any person whose gas installation/piping is connected or to be connected to a gas main of the gas transporter; and
- (c) any professional engineer and licensed gas service worker performing gas service work that are governed by the Gas Act and its subsidiary legislation.

1.3 Definitions

In this Code, unless the context otherwise requires:

“Act” means the Gas Act (Cap. 116A);

"Code" means this Gas Supply Code, as it may be supplemented, varied, modified or replaced from time to time;

“contingency conditions” means single failure contingency of equipment in the network;

“Critical Information Infrastructure (CII)” means a computer or computer system, as defined in the Cybersecurity Act 2018, that has been designated by the Commissioner of Cybersecurity;

“generating station” is as defined in the Electricity Act (Cap. 89A);

“industry practice” means any of the practices, methods and acts engaged in or approved by a significant portion of the international gas industry during the relevant time period, or any of the practices, methods or acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made,

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could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, security, safety and expedition. Industry practice is not intended to be limited to the optimum practice, method or act to the exclusion of all others, but rather extends to acceptable international practices, methods and acts exercised generally by the gas industry under similar conditions;

“maintenance” also includes any inspection, modification, repair, replacement, reinstatement, and/or rehabilitation;

“meter installation” is as defined in the Gas Metering Code;

“meter owner” is as defined in the Gas Metering Code;

“normal conditions” means no supply disruptions and no curtailment;

“Regulations” means the Gas (Supply) Regulations;

“retail consumer” means any consumer other than a direct access customer;

“Ten-Year Transmission Network Development Plan” refers to the document prepared by the gas transporter in clause 12.1.

1.4 Interpretation

1.4.1 Unless the context otherwise requires or the term is otherwise defined in this Code, all terms defined in the Act and the Regulations shall have the same meaning when used in this Code, and words and expressions used in this Code shall be construed as if the Interpretation Act (Cap. 1) applied to them.

1.4.2 Headings are for convenience only and shall not affect the interpretation of this Code.

1.4.3 A reference in this Code to any statute, subsidiary legislation, proclamation, ordinance, by-law, resolution, rule, order, supplements, gazette notification or directive includes all statutes, subsidiary legislation, proclamations, ordinances, by-laws, resolutions, rules, orders, supplements, gazette notifications or directives varying, consolidating, re-enacting, extending or replacing it.

1.4.4 A reference in this Code to a document or provision of a document includes a modification or supplement to, or replacement or novation of, that document or that provision of that document, as well as any exhibit, schedule, appendix or other annexure thereto.

1.4.5 A reference in this Code to a body, whether statutory or not, which ceases to exist or whose functions are transferred to another body includes a reference to the body which replaces it or which substantially succeeds to its functions, powers or duties.

1.4.6 A reference in this Code to the word “including” or grammatical variation thereof means “including but not limited to”.

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1.4.7 A reference to a contract between a gas licensee and a consumer shall be construed as being a reference only to a contract pursuant to which the gas licensee retails to the consumer.

1.5 Hierarchy of Codes

1.5.1 Nothing in this Code shall be construed as affecting the obligation of a gas licensee to comply with the provisions of relevant legislation or of its gas licence and, in the event of an inconsistency between the provisions of relevant legislation or of such gas licence and the provisions of this Code, the provisions of relevant legislation or of such gas licence shall govern to the extent of the inconsistency.

1.5.2 The hierarchy of codes of practice is as follows:

- Gas Supply Code
- Gas Metering Code
- Gas Retailer Code of Conduct

1.5.3 Except as may be otherwise provided in a gas licensee's licence, in the event of any conflict between provisions contained in more than one code of practice, the provision in the higher code of practice referred to in clause 1.5.2 shall prevail.

1.6 Modification to this Code

1.6.1 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 follows:

- (a) Before making any modification to this Code, the Authority shall give notice to all gas licensees and other persons likely to be affected by the proposed modification:
 - (i) stating that the Authority proposes to make modification in the manner specified in the notice;
 - (ii) 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 gas licensee or third party; and
 - (iii) specifying the period from the date of the giving of the notice (not being less than twenty-eight 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 twenty-eight calendar days.
- (b) If no written representation is received by the Authority within the period specified in the notice referred to in clause 1.6.1(a) or if all written representations made in response to such notice are subsequently withdrawn,

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the Authority may modify this Code as specified in such notice without giving any further notice.

- (c) Where the Authority receives any written representation under clause 1.6.1(a), the Authority shall, except to the extent that such representation is withdrawn, consider such representation and may:
 - (i) reject the representations;
 - (ii) amend the proposed modification in accordance with the representation; or
 - (iii) withdraw the proposed modification,and the Authority shall, where clause 1.6.1(c)(i) or 1.6.1(c)(ii) applies but subject to clause 1.6.1(d), modify this Code accordingly.
- (d) 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.
- (e) Any modifications made under clause 1.6 shall be published by the Authority in such manner as will secure adequate publicity.
- (f) A modification to this Code shall not come into force until such time as the Authority has complied with clause 1.6.1(d), where applicable, and ten 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 1.6.1(e).

1.6.2 Nothing contained in clause 1.6.1 shall prohibit any gas licensee or any other party from notifying the Authority of suggested changes to this Code.

1.7 Compliance with all Relevant Statutes, Regulations and Codes

1.7.1 The demarcation of responsibility for the gas service work for single / multiple retail consumer(s) and for Direct Access Customer (DAC) are shown in Appendices 1 and 2.

1.7.2 All works undertaken by any person to whom this Code is applicable must comply with all relevant statutes, regulations and this Code.

1.7.3 All gas installations or gas fittings which extend downstream of the gas service isolation valves to the gas appliances shall comply with Singapore Standard SS 608 for gas installation pipework for the conveyance of town gas and natural gas at operating pressures of up to 50 kPa gauge or other applicable codes and standards.

2 APPLICATION, CONNECTION AND TURN-ON OF GAS SUPPLY

2.1 Application for Gas Supply

2.1.1 An application from a retail consumer for a supply of gas or an increase to an existing supply thereof shall be made to a gas retailer in accordance with regulation 3 of the Regulations and the procedures stipulated in the relevant gas retailer's Handbook on Gas Supply.

2.1.2 Submission of plans for gas service works

A licensed gas service worker may submit plans for works on all retail consumers' internal pipes and meters.

Where any of the abovementioned works is meant for operating pressures above 30 mbars, plans for the gas service works shall be submitted by a professional engineer.

2.1.3 Gas retailer shall approve plans submitted by an applicant with respect to clause 2.1.1.

2.2 Connection of Gas Supply

To connect the gas installation or gas fitting of any premises to a gas pipeline network, an application shall be made by the responsible person to the gas transporter together with a plan marking the connection point and setting out the specification of the gas installation or gas fitting of the premises together with such additional documentation or information relevant to the application as the gas transporter may require. No connection work for the supply of gas shall be carried out without the prior approval of the application by the gas transporter.

2.3 Gas Supply to Retail Consumers

The gas transporter shall ensure that:

- (a)(i) gas supplied to low pressure town gas retail consumers shall be maintained at a pressure between 10 mbars and 20 mbars (inclusive of both pressures) measured at the outlet of the gas service isolation valve;
- (a)(ii) gas supplied to low pressure natural gas retail consumers shall be maintained at a pressure between 17 mbars and 23 mbars (inclusive of both pressures) measured at the outlet of the gas service isolation valve; and
- (b) gas supplied to medium or higher pressure retail consumer at other parts of the gas supply system shall be at a pressure agreed between the gas transporter and the gas retailer / retail consumer.

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2.4 Gas Supply to Direct Access Customers

- 2.4.1 Direct Access Customer shall engage a professional engineer to design and endorse the plan of the relevant gas fitting prior to submitting an application to the gas transporter for admittance of gas.
- 2.4.2 The gas transporter shall make gas available for offtake from the gas supply system at an offtake point at the applicable offtake pressure agreed between the gas transporter and the shipper/ Direct Access Customer.

2.5 Admittance of Gas

- 2.5.1 Every application for admittance of gas shall be made in such form as may be required by the gas transporter and in accordance with regulation 5(2) of the Regulations.
- 2.5.2 Prior to the application, the applicant's designated representative shall carry out the appropriate tests as specified in Singapore Standard SS 608 for gas supplied at pressure up to 50 kPa gauge or other applicable codes or standards for gas supplied at pressure above 50 kPa gauge on the gas installation or gas fitting from (but excluding) the gas service isolation valve to (but excluding) the meter installation. In addition, the designated representative shall ensure that all end points of the gas installation or gas fitting are securely sealed off with a cap, plug or blank flange to prevent any leakage of gas.
- 2.5.3 The designated representative shall certify to the gas transporter that the gas installation is installed in accordance with Singapore Standard SS 608 for gas supplied at pressure up to 50 kPa gauge or other applicable codes or standards for gas supplied at pressure above 50 kPa gauge and that appropriate tests on the gas installation or gas fitting have been carried out.
- 2.5.4 Prior to the connection and admittance of gas to the gas installation or gas fitting, the applicant's designated representative shall conduct appropriate proof test and certify to the gas transporter that the gas installation or gas fitting is leak free.
- 2.5.5 Immediately after the final connection is made, the applicant's designated representative shall carry out and certify to the gas transporter that purging and commissioning of the gas installation or gas fitting from the gas service isolation valve have been carried out successfully.
- 2.5.6 Forthwith after admitting gas into the gas installation or gas fitting up to (but excluding) the meter installation, the gas transporter shall issue a statement of admittance of gas as prescribed in regulation 5(3)(c) of the Regulations.
- 2.5.7 The applicant shall ensure that no gas is taken from the gas supply system until he has received a statement of admittance of gas issued by the gas transporter.
- 2.5.8 If gas is not admitted to the gas installation up to (but excluding) the meter installation and the said portion of the gas installation or gas fitting is left unattended on completion of the tests referred to in clause 2.5, any connection made to the gas

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installation shall be disconnected. The applicant's designated representative shall re-perform the appropriate test and re-certify to the gas transporter and follow the procedures as outlined in clauses 2.5.3, 2.5.4 and 2.5.5.

2.5.9 The gas service isolation valve shall not be turned on except by the gas transporter pursuant to an application made under clause 2.2.

2.5.10 Where the applicant is a Direct Access Customer, the applicant shall ensure that all the requirements in clause 2.4 are performed by or under the supervision of a professional engineer prior to admittance of gas at the relevant gas service isolation valve by the gas transporter.

2.6 Procedure for Turn On of Gas Supply

2.6.1 An application to turn on a gas supply at the meter control valve shall be made by the retail consumer or his designated representative to the gas retailer in accordance with the relevant gas retailer's Handbook on Gas Supply.

2.6.2 The gas retailer shall arrange for the installation of an appropriate meter at the retail consumer's premises.

2.6.3 The gas retailer shall ensure that appropriate tests, before and after the installation of the meter, are performed on the gas installation from and including the meter to the gas appliance before the gas supply is turned on at the relevant meter control valve. The tests shall be carried out by a licensed gas service worker or a professional engineer, where applicable, in accordance with the Singapore Standard SS 608 for gas supplied at pressure up to 50 kPa gauge or other applicable codes or standards for gas supplied at pressure above 50 kPa gauge.

2.6.4 The gas retailer shall inform retail consumers of safety measures in case of gas escape and ensure that a sticker with the telephone number of the gas transporter's 24-Hours Call Centre is affixed to the meter or an accessible location near to the meter in such a manner that the telephone number is readable by the retail consumer.

2.7 Facilitation for Change of Gas Retailer

2.7.1 A gas retailer shall not be permitted to own any gas installation notwithstanding that such gas installation may have been paid partially or fully by the gas retailer.

2.7.2 A retail consumer may, subject to the terms and conditions of the supply contract with the relevant gas retailer, arrange to change the gas retailer for the supply of gas to his premises. The new gas retailer shall, within nine calendar days, inform the gas transporter in writing of the change and information required by the gas transporter to enable the gas transporter to update such records as the gas transporter may require.

2.8 Record Keeping for Application of Gas Supply

2.8.1 The gas retailer shall maintain a register to record all applications of gas supply made in accordance with regulation 3(1) and 14(3)(a) of the Regulations.

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2.8.2 The gas retailer shall upload specified data online to the Authority's information system at such intervals as may be required by the Authority.

2.9 Connection Charges

2.9.1 Upon receipt of an application complete with all requisite information, the gas transporter shall determine the required connection charge in a non-discriminatory manner, and shall inform the applicant of the connection charge accordingly.

2.9.2 The gas transporter shall provide the applicant with an itemised breakdown for the connection charge if so requested by applicant.

3 DISCONNECTION OR DISCONTINUATION OF GAS SUPPLY

3.1 Application for Disconnection of Gas Supply

An application to disconnect a gas installation or gas fitting from a gas pipeline network shall be made by the responsible person to the gas transporter in the following instances:

- (a) when the gas supply to the premises has been discontinued; or
- (b) when the supply of gas is no longer required; or
- (c) when the premises are undergoing renovation or demolition and gas supply has to be disconnected for safety reasons.

3.2 Termination of Gas Supply Requested by Retail Consumer

3.2.1 The gas retailer shall, with the co-operation of the gas transporter, establish the procedures for the discontinuation of gas supply at the meter installation.

3.2.2 The gas retailer shall arrange for the removal of gas meter from the gas installation within nine calendar days and inform the gas transporter of the discontinuation of gas supply at the meter installation.

3.2.3 The gas transporter shall notify the responsible person to apply for the disconnection of gas supply if any gas installation or gas fitting is no longer being used to supply gas to any consumer.

3.3 Maintenance of Records of Gas Installation and Gas Fitting

The gas transporter shall maintain records of premises and all gas installation or gas fitting whether connected to or disconnected from a gas supply system, including gas fitting of Direct Access Customers, so that it can establish in a proactive manner the leak survey programme in accordance with clause 8.5 of this Code and the inspection programme as required in clause 9 of this Code.

4 ALTERATION OF GAS INSTALLATION OR GAS FITTING

4.1 Alteration of Gas Installation between Gas Service Isolation Valve and Meter

- 4.1.1 When a supply of gas needs to be shut off for the replacement of or addition or alteration to the gas installation from the gas service isolation valve to (and including) the meter, the designated representative shall make the necessary arrangement with the gas transporter to shut off the gas service isolation valve.
- 4.1.2 In the case of a gas installation operating at pressures of above 30 mbars, the replacement of or addition or alteration to such gas installation shall be designed by a professional engineer and such work shall be performed by or under the supervision of a professional engineer.
- 4.1.3 In the case of gas fitting used for the supply of gas to a Direct Access Customer, the replacement of or addition or alteration to such gas fitting shall be designed by a professional engineer and such work shall be performed by or under the supervision of a professional engineer.
- 4.1.4 The re-admittance of gas, where applicable, shall comply with the relevant provisions of clause 2.5 on the admittance of gas.

4.2 Alteration of Gas Installation after Meter

The gas retailer shall establish in the relevant gas retailer's Handbook on Gas Supply, the procedures for retail consumer to apply for the replacement of, addition or alteration to a gas installation located between the meter installation and the gas appliances.

5 RESPONSE ARRANGEMENTS FOR GAS INCIDENTS

5.1 Gas Escapes and Gas Related Incidents

- 5.1.1 The gas transporter shall provide appropriate technical and human resources to enable attendance at all reported gas escapes or gas related incidents, with the purpose of making the situation safe as follows:
- (a) to attend to all uncontrolled gas escapes in accordance with the key performance indices specified by the Authority; and
 - (b) to attend to all gas escapes which have been isolated by shutting the meter control valve in accordance with the key performance indices specified by the Authority.

The gas transporter shall inform the relevant party/parties as soon as possible upon the receipt of such reported gas escapes or gas related incidents.

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- 5.1.2 A “controlled gas escape” is defined as a leak from an appliance or the gas installation that has been isolated by shutting off the meter control valve.
- 5.1.3 An "uncontrolled gas escape" is defined as a gas escape in a gas installation or the gas supply system that cannot be controlled or contained by shutting off the meter control valve.
- 5.1.4 In the event of an uncontrolled gas escape, the gas transporter shall arrange to:
- (a) identify all properties or other confined areas that are or will be affected by the escaping gas;
 - (b) ventilate all affected properties, as required, and evacuate all persons immediately until gas concentrations reach a level assessed by the gas transporter to be safe;
 - (c) continuously monitor the concentrations of gas within all affected properties until the source of the gas escape has been located and made safe;
 - (d) investigate whether gas is escaping from pipework within any of the affected properties and confirm by temporarily isolating the gas supply to individual properties in a systematic manner; and as soon as gas concentrations stabilise and begin to diminish, conduct gas soundness testing to identify the source of the gas escape from any internal pipework;
 - (e) where isolating gas supply to the affected properties does not result in a reduction in gas concentrations, investigate the surrounding area, excavate as necessary and establish the source of all external gas escapes;
 - (f) make the site safe and carry out permanent repairs, as necessary;
 - (g) purge, as required, and re-establish all gas supply that has been temporarily isolated; and
 - (h) wherever possible, establish the cause of the failure that resulted in the gas escape.
- 5.1.5 The gas transporter shall establish and maintain appropriate arrangements to ensure that members of the public can report to the gas transporter actual and suspected escape of gas or gas related incidents at any time and by reasonable means, including by telephone. The gas transporter shall ensure that there is appropriate publicity of the risks associated with gas escapes, and of the arrangements for reporting gas escapes.

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- 5.1.6 The relevant gas licensee (as specified in Standing Operating Procedures issued by the Authority which are applicable to that gas licensee in respect of the investigation and reporting of major incidents related to gas) shall carry out investigations and submit reports relating to all major incidents related to gas in accordance with the Standing Operating Procedures, and shall comply with all requirements specified in the Standing Operating Procedures in relation to the notification, investigation, reporting and follow-up action taken or to be taken in relation to such incidents.
- 5.1.7 The gas transporter shall maintain or make arrangement to maintain a 24-Hours Call Centre for the public to report actual or suspected escapes of gas or gas related incidents.
- 5.1.8 The gas transporter shall maintain records of all gas escapes and gas related incidents. The records shall include, but not be limited to, the type and cause of gas escape, date and time, location and the remedial actions taken.

5.2 Safety and Emergency Services

- 5.2.1 The gas transporter shall prepare a gas safety plan, in consultation with the Authority and any other relevant authority as the Authority deems fit, setting out the following, for the Authority's approval:
- (a) procedures to meet the gas transporter's duties under the Act and Regulations for the gas safety (including protection from danger to health) of the general public, retail consumers, shippers and the gas transporter's employees, officers and agents. The gas transporter shall provide, to the Authority, a standing operating plan describing the procedures to be adopted by the gas transporter for dealing with such incidents arising from gas-related activities, including the import of gas; and
 - (b) advice on the potential dangers arising from gas escapes and safety measures to be taken by retail consumers and shippers to minimise such dangers; and
 - (c) details of its proposed public safety awareness campaign relating to the use of gas for retail consumers within its authorised area.

The Authority may approve the plans with such changes as the Authority deems necessary.

- 5.2.2 Without prejudice to its obligations under the Act and the Regulations, the gas transporter shall prepare, in consultation with the Authority, a major gas incident plan setting out how, in the conduct of its gas transportation business, it will monitor and repair the gas supply system in co-ordination with the appropriate emergency agencies (governmental or otherwise) and in the event of a major incident or potential major incident, including, without limitation major loss of gas supplies or public disruption that may develop into a gas explosion.

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- 5.2.3 The gas transporter shall provide, to the Authority, a standard operating plan describing the procedures to be adopted by the gas transporter for dealing with escapes of gas.
- 5.2.4 The gas transporter shall take steps to respond to a gas escape, in any premises to which the gas transporter conveys gas, or any other event which the Authority considers to be an emergency or to be a risk to public safety, within one (1) hour of its being reported. The gas transporter shall make the reported gas escape safe and:
- (a) ensure that the persons it engage or arrange to attend to the gas escapes are adequately trained to recognise the signs of gas leakage and that such persons are instructed to report any signs of such leakage to the owner or occupier of the premises immediately;
 - (b) take appropriate action to stop the gas escape; and
 - (c) inform the owner or occupier, or fix a notice on the premises, if, in the reasonable opinion of the gas transporter, any repair work is required.
- 5.2.5 The gas transporter shall ensure that it has, at all times, appropriate resources and is able to engage or arrange for persons with the appropriate skills to carry out such investigations into safety related technical matters on the gas supply system as either the gas transporter or the Authority considers necessary.
- 5.2.6 The gas transporter shall submit a statement within the timeframe of the subsequent calendar year, in a form approved by the Authority, setting out the gas transporter's performance in each calendar year, including the type and number of gas incidents and potential and actual interruptions in the conveyance of gas by it.

6 INTERRUPTION AND RESTORATION OF GAS SUPPLY

6.1 Planned Works

For planned works of the gas transporter which will involve interruption to the gas supply, written notification shall be given by the gas transporter at least fourteen days in advance (except for those consumers who through their relevant shippers or otherwise have separate agreements with the gas transporter in which case the provisions for prior written notification and restoration of gas supply in such agreements will take precedence) to each affected consumer.

6.2 System Faults

- 6.2.1 Where any consumer's gas supply is interrupted, the gas supply shall be restored as soon as practicable by the gas transporter unless:
- (a) it is not safe to restore the gas supply; or
 - (b) the consumer has requested for the gas supply to be restored at a later time; or

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- (c) the gas supply has been interrupted due to fault present after the gas service isolation valve and has not been rectified by the responsible person.

6.2.2 Where for safety reasons the gas supply is interrupted or where a delay in restoration of gas supply is expected, the gas transporter will use its reasonable endeavours to inform as soon as is reasonably possible, all affected consumers of the gas supply interruption and the expected time at which the gas supply will be restored. The gas transporter may make the necessary arrangements with the relevant gas retailer for the safe restoration of gas supply to its retail consumers.

6.3 Faults in Consumer Premises

6.3.1 The gas retailer shall refuse to supply gas to any premises, if in its opinion, the gas installation or gas appliance to which such supply is made is unsafe for use or does not comply with the Act, the Regulations, the Singapore Standard SS 608 for gas supplied at pressure up to 50 kPa gauge or other relevant codes and standards for gas supplied at pressure above 50 kPa gauge and the relevant retailer's Handbook on Gas Supply.

6.3.2 The gas retailer shall discontinue the supply of gas when it becomes aware that any gas installation or gas appliance to which a supply of gas is made by it is unsafe.

6.3.3 The gas retailer shall promptly inform the relevant retail consumer and the gas transporter the reasons for any discontinuance of supply of gas made by it under clause 6.3.2.

6.3.4 The gas retailer shall ensure that the procedures for the restoration of the gas supply is in compliance with the Act, the Regulations, the Singapore Standard SS 608 for gas supplied at pressure up to 50 kPa gauge or other relevant codes and standards for gas supplied at pressure above 50 kPa gauge, and the relevant retailer's Handbook on Gas Supply and clause 2.6.3 of this Code.

6.3.5 The gas retailer shall within nine calendar days inform the gas transporter of any restoration of any supply of gas made by it.

7 CHARACTERISTICS OF GAS SUPPLY TO CONSUMERS

7.1 Gas Specification

Gas supply to consumers at gas pressure not exceeding 30 mbars shall comply with the following specification limits as applicable:

(a) Natural Gas

Wobbe Index (WI) : 45.2 – 52.0 MJ/m³

Gross heating value : 35.3 – 50.3 MJ/m³

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Hydrocarbon dewpoint	:	12.8 °C @ 50 bar
Free liquids	:	zero (0)
Oxygen (max)	:	0.1 % by volume
Hydrogen sulphide (max)	:	8 ppm by volume
Total sulphur (max)	:	30 ppm by volume

Note: The complete Singapore Natural Gas Specification is shown in Appendix 3.

(b) Town Gas

1	Specific Gravity	:	0.50 - 0.59
2	Gross Calorific Value	:	18.63 MJ/m ³ , Saturated @ 288.75 K & 101 kPa
3	Wobbe Index	:	23.15 – 26.35 MJ/m ³
4	Weaver Flame Speed	:	32 – 42
5	Stoichiometric Combustion Air	:	4.4 vol / vol of gas
6	Limits of Flammability	:	3.0 – 55 % of gas in air
7	Ignition Temperature	:	> 400 °C
8	Theoretical Flame Temperature	:	~ 2000 °C

Typical Town Gas Composition

This list is intended to be a guide where specific and technical information is required. During normal operations, the individual components in the piped-gas are expected to vary between low and high ranges as given below:

Components	Low Range	High Range
Hydrogen	41.0	65.0
Methane	4.0	33.0
Ethane	0.0	2.6
Propane	0.0	1.3
Butane	0.0	1.7
Pentane	0.0	5.0
Carbon Monoxide	2.0	6.0
Carbon Dioxide	9.0	20.0
Nitrogen	2.0	10.0
Oxygen	0.5	2.5

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7.2 Gas Odourisation

- 7.2.1 The operator of any relevant facility referred to in section 38 of the Act shall ensure that gas supply to all consumers be odourised using an appropriate odourant such as Tetrahydrothiophene (THT) to enable detection by a normal sense of smell.
- 7.2.2 The rate of injection of the appropriate odourant injected into the gas supply shall be continuously monitored and recorded. A record of the frequency and quantities of odourant injected into the gas shall be maintained according to the requirement of the gas transporter.

8 PUBLIC SAFETY

8.1 General Requirements

- 8.1.1 The gas transporter must ensure that the gas pipeline network is designed, constructed, commissioned, maintained and operated safely and effectively, in compliance with its duties, rights and obligations under the Act, the Regulations, its gas transporter's licence and the Gas Network Code. The gas transporter must:
- (a) ensure as far as reasonably practicable that adequate protective measures have been taken or are in place;
 - (b) ensure as far as reasonably practicable that personnel have the skills, training and experience to carry out the work safely; and
 - (c) ensure as far as reasonably practicable that the public are aware of the works and are advised of precautions they can take.
- 8.1.2 The gas transporter shall ensure that suitable procedures and practices are in place and adequate resources are used to operate and maintain the gas supply system safely and reliably.

8.2 Construction of Pipeline

During the construction of gas pipeline, the work area shall be cordoned off and only authorised personnel shall be allowed access to the site.

8.3 Testing and Commissioning of Pipeline

- 8.3.1 The gas transporter shall ensure that all gas pipelines in its gas supply system are tested, commissioned and de-commissioned safely.
- 8.3.2 For pressure testing of gas pipelines or transmission line valve above 1.4 bar, water shall be used as the testing medium unless:
- (a) the gas pipeline or transmission line valve is located in the premises at the material time under the control of a gas transporter or an onshore receiving facility operator; or

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- (b) the gas transporter considers that the prevailing circumstances require air to be used for pressure testing above 1.4 bar in which case the requirements of clause 8.3.3 shall be applicable.

8.3.3 If pneumatic testing is to be carried out at pressures above 1.4 bar, the gas transporter shall ensure that the following actions are carried out under the directions of a professional engineer:

- (a) a detailed engineering study confirms the required test procedure and identifies all potential risks to workers, residents and the general public;
- (b) all pressure testing is undertaken in accordance with the requirements of the test procedure and appropriate measures are implemented throughout the test period to control the identified risks and ensure that all testing is completed safely; and
- (c) competent staff are sufficiently deployed at strategic locations to patrol the route of the pipeline during testing, keep members of the public away from the area and ensure that critical phases of the testing (e.g. whilst the test pressure is being raised or is being vented) are carried out when vehicular and human traffic are low.

8.3.4 On completion of all testing and commissioning, a detailed record shall be prepared confirming that the engineering study, test procedure and safety measures were all carried out in accordance with the above requirements. The record shall be signed by the professional engineer and retained by the gas transporter.

8.4 Pipeline Patrol

The gas transporter shall set up a programme and procedures to safeguard its gas transmission pipeline, any part of its polyethylene pipeline operating with gas pressures above 1 bar, and all other apparatus and equipment relating thereto against third party interference and damage. The programme shall include publicising the various measures and precautions to be taken by third parties who intend to carry out any work in the vicinity of the gas transmission pipeline prior to and in the course of such work, which shall include requiring such third parties to provide plans of all relevant apparatus and equipment required, to check such plans prior to the commencement of work, to inform the gas transporter of all works to be carried out within the vicinity of any gas transmission pipeline, polyethylene pipeline operating with gas pressures above 1 bar, apparatus or equipment, to ensure that all necessary measures and precautions notified by the gas transporter have been carried out, and to permit the gas transporter's representative to be on site if the gas transporter so requires. The programme shall also include regular pipeline patrol.

8.5 Leak Survey

8.5.1 Leak survey of any gas main network and any part of the gas service pipe from a gas main up to a gas service isolation valve, and include any short length of pipe immediately after the gas service isolation valve that is buried in the ground, shall be

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carried out using the appropriate gas detection equipment which may be mounted on a vehicle or by foot patrol, as the case may be.

- 8.5.2 The gas transporter shall submit its programme for the leak survey annually to the Authority.
- 8.5.3 The gas transporter shall maintain records of all leak surveys of the gas pipeline network and services and submit a report on such surveys to the Authority at regular intervals.
- 8.5.4 In an area where soil subsidence is suspected by the gas transporter, a wider area in the vicinity as determined appropriate by the gas transporter, shall be surveyed and where the integrity of the gas installation or gas fitting may be affected by soil subsidence, the gas transporter shall notify the owner of the premises to engage a professional engineer to inspect and certify that the gas installation or gas fitting after the gas service isolation valve is safe for continuing use. If the owner of the premises fails to comply with the instruction, the gas transporter shall take the necessary action to disconnect the gas supply and notify the relevant gas retailer or shipper. All costs related to the survey of such wider area shall be borne by the gas transporter.

9 INSPECTION PROGRAMME FOR GAS INSTALLATION OR GAS FITTING

- 9.1 The gas transporter in discharging its obligation under section 29(4) of the Act, shall ensure that every gas installation used to supply gas to a retail consumer or retail consumers is inspected at such intervals as shown in subsequent clauses in this clause 9 for the purpose of ensuring that gas can continue to be supplied through such gas installation and used safely.

9.2 Inspection Programme For Residential Premises

The gas transporter shall be responsible for establishing and implementing the following systematic inspection programmes for all residential premises:

- (a) the gas transporter shall carry out inspection of gas installation from the meters to the gas appliances in every residential premises in accordance with a systematic fifteen yearly inspection programme; and
- (b) the gas transporter may require the responsible person of every residential building with multiple consumers to engage a licensed gas service worker or a professional engineer to carry out inspection or soundness test where necessary, of the gas installation or gas fitting linking the gas service isolation valve up to the meters of individual residential units in the building in accordance with a systematic five yearly inspection programme.

9.3 Inspection Programme For Non-Residential Premises

The gas transporter shall be responsible for establishing and implementing the following systematic inspection programmes for all non-residential premises:

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- (a)(i) for gas installation or gas fitting linking the gas service isolation valve to the meters of individual non-residential units within a building , annual inspection shall be carried out by a licensed gas service worker or a professional engineer, as the case may be, appointed by the responsible person;
 - (a)(ii) for gas installation or gas fitting from the meter to the gas appliances, annual inspection shall be carried out by a licensed gas service worker or a professional engineer appointed by the retail consumer;
 - (b) if any part of a gas installation or gas fitting referred to in clauses 9.3(a)(i) and (ii) is not accessible for inspection, soundness test shall be carried out by a professional engineer appointed by the responsible person once every three years. The soundness test for gas installation or gas fitting shall be carried out at the operating pressure. The inspection of the gas installation or gas fitting by a licensed gas service worker in clauses 9.3(a)(i) and (ii) will not be required for a period of 12 months after the soundness test by a professional engineer; and
 - (c) for a gas installation or gas fitting of non-residential premises operating at any pressure above 30 mbars, the gas transporter may, in discharging its obligation under section 29(4) of the Act, require the responsible person to appoint a professional engineer to certify annually the fitness for such part of the gas installation or gas fitting for which the afore-mentioned person is responsible.
- 9.4 For gas installation or gas fitting referred to in clause 9.3, the gas transporter may, in order to ensure that the said gas installation or gas fitting is maintained at all times in a safe and proper operating condition, functions at all times in a reliable manner and is reasonably protected against damage, notify and require the responsible person to engage a licensed gas service worker or a professional engineer, where applicable, to carry out the inspection on the gas installation or gas fitting and submit a certificate of fitness to the gas transporter.
- 9.5 If any person after being notified by the gas transporter under clause 9.4 fails to comply with the inspection notice, the gas transporter may, subject to the power provided to it under relevant provisions of the Act, arrange with the relevant gas retailer or shipper to take necessary actions to discontinue or disconnect, where applicable, the supply of gas to the relevant gas installation or gas fitting.
- 9.6 The gas transporter shall not vary the frequency of inspection stipulated above unless it deems necessary to do so to meet changes in circumstances that may affect the integrity and safety of any gas installation, gas fitting or critical operations of the consumer.
- 9.7 The gas retailer and shipper, where applicable, shall provide the gas transporter with all relevant information pertaining to its consumers to enable the gas transporter to implement and maintain the programme of inspection as stipulated in clauses 9.2 and 9.3.

10 HANDBOOK ON GAS SUPPLY

10.1 Each gas retailer shall establish and publish a Handbook on Gas Supply to provide a comprehensive guide to developers, consultants, professional engineers and licensed gas service workers in the application of gas supply. The Handbook on Gas Supply shall incorporate both the gas retailer's and the gas transporter's requirements for the application for supply, connection and turn-on of gas to retail consumers.

The Handbook shall contain, but not limited to the following:

10.1.1 Procedures, forms, certificates, etc. for:

- application for supply of gas;
- approval of gas installation plan and drawings for supply of gas;
- approval of amendment plans for gas supply;
- application for final pressure test (including the submission of the as-built drawings);
- issuing of certificate of final pressure test;
- approval for final pressure test;
- request for connection to the gas main (include the as-built drawing and the certificate of final pressure test);
- approval for the connection to the gas main;
- application for admittance of gas (include the consent by professional engineer/main contractor/responsible person);
- notification of the date for admittance of gas;
- issuing of statement of admittance of gas;
- application for turn-on of gas (include the consent by professional engineer/main contractor/ responsible person);
- issuing of statement of turn-on of gas;
- statement certifying the appliance is safe for use; and
- notification of the date for turn-on of gas.

10.1.2 Flowchart on the procedure for applying/obtaining gas supply to premises;

10.1.3 Procedure for replacement, addition and alteration of gas fittings and appliances; and

10.1.4 Other requirements of the gas transporter and gas retailer.

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- 10.2 The gas transporter shall make available to all gas retailers its requirements and procedures for connection of gas supply and admittance of gas for each gas retailer to incorporate them in the gas retailer's Handbook on Gas Supply.
- 10.3 In the case where the supply is not for a retail consumer, the gas transporter shall publish and make available its requirements and procedures for application of gas supply, connection of gas supply, admittance of gas and turn-on of the gas supply.

11 GAS SUPPLY SYSTEM - PLANNING AND DEVELOPMENT

The gas transporter shall be responsible for the planning, development, maintenance and operation of the gas supply system.

12 TRANSMISSION SYSTEM PLANNING AND DEVELOPMENT

- 12.1 The gas transporter shall be responsible for the annual formulation of a Ten-Year Transmission Network Development Plan for the development and augmentation and expansion of the gas transmission network in accordance with the guidelines and criteria set forth in clause 14 of the Code. The plan shall take into account the gas demand forecasts made by the Authority, proposals for additional injection or offtake as advised by the Authority and all firm and proposed capacity certificates that have been issued by the gas transporter.
- 12.2 The gas transporter, in formulating its Ten-Year Transmission Network Development Plan or any adhoc transmission network development proposals which may include but not limited to assets renewals, network enhancements or modifications, shall ensure that the network design and any addition of network elements shall not affect the security and reliability of the existing gas supply system. The gas transporter shall prepare and submit, each year, a Ten-Year Transmission Network Development Plan to the Authority for approval. As and when necessary, or as required by the Authority, the gas transporter shall submit the adhoc transmission network development proposals to the Authority for endorsement and approval respectively. The gas transporter is required to complete approved adhoc transmission network projects or projects in the Ten-Year Transmission Network Development Plan within the stipulated completion dates, unless otherwise specified by the Authority.
- 12.3 To facilitate gas transporter's preparation of its Ten-Year Transmission Network Development Plan, the Authority shall provide gas transporter each year with the ten-year rolling gas demand projection with their respective expected locations.
- 12.4 The Authority shall review and revise, if necessary, the guidelines as detailed in clause 14.
- 12.5 The proposals for which the gas transporter is responsible shall include:
- (a) a detailed plan for the 18 barg and above networks for the next ten years for transmission network expansion, enhancement, upgrading, replacement and re-configuration;

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- (b) mode of transmission network operation such as network configuration, operating philosophy (e.g. flow or pressure control) and pressure setting, valve status during normal operation as well as emergency condition, pressure discharge settings, etc;
- (c) provision of ancillary equipment and systems to ensure system stability and security and that contingency requirements, as set forth in clause 14.1, can be met;
- (d) cost estimate and phasing of each gas transmission network development project, and total capital expenditure. The gas transporter shall demonstrate that the gas transmission network development is cost effective and not excessive; and
- (e) justification for any addition or changes of gas transmission network development proposals from the previous year's submission. The gas transporter shall also demonstrate that these changes are cost effective and not excessive.
- (f) the gas transporter shall conduct a presentation and briefing session to the Authority outlining its preliminary Ten-Year Transmission Network Development Plan at a time mutually agreed between the gas transporter and the Authority; and submit a report on the Ten-Year Transmission Network Development Plan to the Authority at a time mutually agreed between the gas transporter and the Authority. The report shall include:
 - (i) steady state study in meeting the forecasted supply and demand;
 - (ii) transient study on pressure decay profiles in the event of interruption to any source of supply;
 - (iii) alternative scenarios (as specified by the Authority) on gas supply disruptions;
 - (iv) assumptions applied for the various studies and the network simulation results (in both hard and soft copy);
 - (v) schematic diagrams including piping and instrumentation drawings of onshore receiving facilities, offtake stations, and/or metering facilities; and a Singapore map showing the existing network and the proposals including the locations and names of all the injection points and offtake points of the transmission network; and
 - (vi) maximum gas velocity within the gas transmission network for the next ten years.

12.6 The gas transporter shall not proceed to implement any development proposal until it has received approval from the Authority to proceed with the proposed development.

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- 12.7 The Authority shall review the gas transporter's rolling Ten-Year Transmission Network Development Plan, taking into consideration the projected gas demand, to ensure that system security and stability are maintained, network reliability meets the security standards prescribed by the Authority and that the Ten-Year Transmission Network Development Plan is not excessive based on the security standards. The Authority shall provide detailed comments and require the gas transporter to revise the Ten-Year Transmission Network Development Plan accordingly.

The gas transporter shall revise and resubmit the plan to the Authority within one month from receipt of the Authority's comments or otherwise stated by the Authority. The Authority shall approve the gas transporter's re-submitted Ten-Year Transmission Network Development Plan if the Authority is satisfied with the plan.

13 BASIS FOR TRANSMISSION AND DISTRIBUTION SYSTEM PLANNING AND DEVELOPMENT

- 13.1 The gas transporter may engage in the development of proposals, at its own instigation, for the reinforcement or extension of the existing gas pipeline network for reasons which include, but are not limited to:

- (a) an increase in demand requirements of an existing consumer or supply requirements of an upstream facility / onshore receiving facility / LNG terminal facility / offtake station that is already connected to the gas pipeline network; and
- (b) the introduction of a new connection point or modification of an existing connection point between a consumer's metering/receiving facility, offtake stations or upstream facility / onshore receiving facility / LNG terminal facility and the gas pipeline network.

- 13.2 In the gas pipeline network development proposals, the gas transporter shall, inter alia:

- (a) make a full assessment of the costs and benefits of the various alternatives to enhance / develop the gas pipeline network and recommend the most cost effective development proposal; and
- (b) report on the impact on gas transportation tariff of any such development to the various classes of consumers, if any.

14 GENERAL OBJECTIVES FOR TRANSMISSION SYSTEM PLANNING AND DESIGN

The gas transporter shall plan and design the gas pipeline network such that:

- (a) the gas transmission network can meet the requirements set forth in this clause and the forecasted demand provided by the Authority, while operating within the security standards set by the Authority. Planning for single failure

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contingency of equipment within the gas transmission network shall be the default requirement. The gas transmission network shall operate without causing system instability or interruption of supply in the event of an outage (whether scheduled or unscheduled) of any single equipment within the gas transmission system such as valve / pump / vaporiser / regulating stream / compressors / heater / coolers etc; and

- (b) the gas mains network can cater for single contingent outage of equipment.

15 APPLICATION FOR A NEW OR MODIFIED UPSTREAM FACILITY / ONSHORE RECEIVING FACILITY / LNG TERMINAL CONNECTION – GENERAL CONDITIONS

- 15.1 An application to connect an upstream facility / onshore receiving facility / LNG terminal facility to the gas transmission network or modify the injection capacity of an existing upstream facility / onshore receiving facility / LNG terminal connected to the gas transmission network shall be submitted by the responsible person (“Applicant”) to the gas transporter. After having submitted the application, the Applicant shall promptly notify the gas transporter in writing of any subsequent material additions or changes to the information submitted.
- 15.2 Upon receipt of the application from the Applicant, the gas transporter:
 - (a) shall forward such application to the Authority;
 - (b) may require additional information to be submitted by the Applicant;
 - (c) shall perform the necessary analysis and studies of the application, based on the projected quantity and locations of demand submitted by the Applicant and/or provided by the Authority, to determine the pipe size and routing. The proposed connection shall not have any adverse effect on the secure, stable and reliable operation of the gas transmission network and any other installation, already connected or approved for connection to the gas transmission network;
 - (d) shall advise the Applicant on whether the sites identified by the Applicant are suitable for new connections. If a connection point has been identified for each of the respective sites at which a connection may be made, the gas transporter shall advise the Applicant of details, e.g. type of joint, map co-ordinates etc with regards to the connection; and
 - (e) shall ensure that any requirements with respect to the network expressed by the Authority have been satisfied.
- 15.3 The gas transporter shall forward the proposed connection indicating the pipe size, pipeline laying, and locations of connection to the Authority. The Authority, upon receiving the proposed connection from the gas transporter:

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- (a) may require additional information to be submitted by the Applicant and/or the gas transporter;
 - (b) shall conduct analysis and studies to determine the impact of the proposed connection or modification to existing upstream facility / onshore receiving facility / LNG terminal on the security, stability and reliability of the gas supply system;
 - (c) shall, within 30 calendar days of receiving the proposed connection scheme from the gas transporter, advise the gas transporter whether it endorses or rejects the proposed connection. If the Authority rejects the proposed connection, it shall inform the Applicant and the gas transporter in writing of its reason(s) for such rejection; and
 - (d) where deemed necessary, shall advise the Applicant on the requirements of the proposed connection or modification to the existing upstream facility / onshore receiving facility / LNG terminal to ensure the security, stability and reliability of the gas supply system. The Applicant shall confirm in writing to the Authority, with a copy to the gas transporter, its acceptance of the requirements specified by the Authority and ensure that the requirements are met.
- 15.4 The gas transporter shall respond to the Applicant within 21 calendar days regarding the proposed connection after it is duly endorsed by the Authority and the project costs approved by the Authority.
- 15.5 The gas transporter shall notify the Applicant of the terms and conditions of connection or modification to the existing connection, and of the charges, if any, payable to the gas transporter to carry out the relevant works for the Applicant's acceptance. The gas transporter shall provide to the Applicant a copy of the System Entry Agreement within the next 42 calendar days upon the Applicant accepting the proposed connection.
- 15.6 The gas transporter shall not connect any upstream facility / onshore receiving facility / LNG terminal to the gas transmission network if the Applicant fails to comply, or the gas transporter determines on reasonable grounds that the Applicant is not capable of complying, with the procedures and requirements for connection to and use of the gas transmission network set forth in this Code and the System Entry Agreement.
- 15.7 The processes and procedures for connection of an upstream facility / onshore receiving facility / LNG terminal shall also apply in the case of a reconnection.

16 CONNECTION OF GAS SUPPLY TO DIRECT ACCESS CUSTOMERS – GENERAL CONDITIONS

- 16.1 An application to connect an installation to the gas transmission network or modify an existing installation connected to the gas transmission network shall be submitted by the responsible person ("Applicant") through a shipper, to the gas transporter. After having submitted the application, the Applicant shall promptly notify the gas

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transporter in writing of any material additions or changes to the information submitted.

- 16.2 Upon receipt of the application from the Applicant, the gas transporter:
- (a) may require additional information to be submitted by the applicant;
 - (b) shall perform the necessary analysis and studies of the application to determine size and location of the connection. The proposed connection shall not have any adverse effect on the secure, stable and reliable operation of the gas transmission network and any other installation, already connected or approved for connection to the gas transmission network;
 - (c) shall advise the Applicant of the indicative connection charges, and other details (e.g. type of joint, location, pressure regime of the network to be connected to etc.) with regards to the connection; and
 - (d) shall ensure that any requirements with respect to the network expressed by the Authority have been satisfied.
- 16.3 The gas transporter shall forward the proposed connection indicating the pipe size, pipeline laying, and locations of connection to the Authority. The Authority, upon receiving the proposed connection from the gas transporter:
- (a) may require additional information to be submitted by the Applicant or the gas transporter;
 - (b) shall conduct analysis and studies to determine the impact of the proposed connection of the installation or modification of the existing installation on the security, stability and reliability of the gas supply system;
 - (c) shall within 30 calendar days of receiving the proposed connection from the gas transporter, advise the gas transporter whether it endorses or rejects the proposed connection. If the Authority rejects the proposed connection, it shall inform the gas transporter in writing of its reason(s) for such rejection; and
 - (d) where deemed necessary, shall advise the Applicant of the requirements for the installation or modification of the existing installation to ensure the security, stability and reliability of the gas supply system and the Applicant shall confirm in writing to the Authority, with a copy to the gas transporter, its acceptance of the requirements specified by the Authority, and ensure that the requirements are met.
- 16.4 The gas transporter shall respond to the Applicant within 21 calendar days with regards to the proposed connection after it is duly endorsed by the Authority and the project costs approved by the Authority.
- 16.5 The gas transporter shall notify the Applicant of the terms and conditions of connection or modification to the existing connection and of the charges, if any,

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payable to the gas transporter to carry out the relevant works for the Applicant's acceptance.

- 16.6 The gas transporter shall not connect any installation to the gas pipeline network if the Applicant fails to comply, or the gas transporter determines on reasonable grounds that the Applicant is not capable of complying, with the procedures and requirements for connection to and use of the gas pipeline network set forth in this Code.
- 16.7 The processes and procedures for connection of an installation shall also apply in the case of a reconnection.

17 STANDARDS AND STANDING OPERATING PROCEDURES

- 17.1 All gas plant and equipment shall:
- (a) be in compliance with all applicable technical requirements of this Code and shall be designed and constructed in accordance with industry practice;
 - (b) be capable of operating under normal and contingency conditions of the gas network as set forth in clause 14; and
 - (c) where applicable, comply with the standards acceptable to the gas transporter.
- 17.2 For meter installation supplying natural gas to a generating station, the meter owner shall be the gas transporter or the relevant gas shipper.
- 17.3 For meter owner referred to in clause 17.2, the meter owner shall ensure that its meter installation be designed and operated in such manner that no single failure / outage shall cause natural gas supply disruption to the generating station.

18 PRESSURE

- 18.1 Upstream facility / onshore receiving facility / LNG terminal facility shall be designed for injection of natural gas into the gas transmission network as follows:
- (a) flow control with high pressure and low pressure overrides as specified by the gas transporter;
 - (b) Any other operating conditions as specified by the gas transporter and endorsed by the Authority.
- 18.2 If an installation is to be connected to the gas pipeline network, the gas transporter shall notify the Applicant of the proposed location of the connection and the anticipated maximum delivery pressure at the connection point. The Applicant is to ensure that the installation is designed to operate safely at the anticipated maximum delivery pressure.

19 RESPONSIBILITIES OF THE GAS TRANSPORTER, ONSHORE RECEIVING FACILITY OPERATOR AND LNG TERMINAL OPERATOR

- 19.1 Each of the gas transporters, the onshore receiving facility operator and LNG terminal operator shall operate and maintain its onshore receiving facility or its LNG terminal, as the case may be, in a reasonable and prudent manner to ensure that normal operating condition is maintained at all times, the risk of failure to convey gas to the consumers is minimized at all times, and carry out prompt response during emergencies. To achieve such a condition, the gas transporter, the onshore receiving facility operator and LNG terminal operator shall do, at least but are not limited to, the following:
- (a) determine the maintenance programme required in respect of the gas supply system or the onshore receiving facility or the LNG terminal, as the case may be, and plan the maintenance in accordance with/or as stringent as the Original Equipment Manufacturer's requirements and/or the industry best practices so as to minimise or avoid gas supply disruption;
 - (b) carry out analysis to identify factors that can affect the gas supply system or the onshore receiving facility or the LNG terminal, as the case may be, and take necessary precautions to mitigate the risks prior to any operation, maintenance and modification activities;
 - (c) state and update all operation and maintenance procedures and ensure the persons responsible for the procedures are fully aware and conversant in carrying out their job;
 - (d) comply with the operation and/or maintenance procedures referred in clause 19.1(c) to ensure the risk of failure to convey gas to the consumers is minimized at all times and prompt response to sudden disruption in gas supply and/or gas emergencies.
 - (e) carry sufficient inventory of critical spares and consumables in a local store room within Singapore to facilitate timely replacement or to replenish depleting consumables at any of its facilities or assets so that the facilities or assets can operate as designed for, in the shortest possible time.
 - (f) engage and make available, at all times, trained and qualified person(s) to operate and maintain the gas supply system or the onshore receiving facility or the LNG terminal, as the case may be;
 - (g) take precautionary measures to ensure that all activities carried out do not pose a danger to the gas supply system or the onshore receiving facility or the LNG terminal, as the case may be;
 - (h) operate the gas supply system or the onshore receiving facility or the LNG terminal, as the case may be, in a manner which enables supply of gas to meet downstream demand for gas; and

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- (i) ensure that any malfunction of equipment must be properly investigated and its root cause identified. Action must be taken to rectify the malfunction promptly.
 - (j) Put in place adequate cyber security measures to ensure that designated Critical Information Infrastructures (CIIs) are properly maintained, operated and secured, so as not to compromise, or cause any adverse impact, to the security, reliability and stability of the gas supply system including interruption of gas supply due to inadvertent system or equipment failure, human error or through malicious actions of other parties. The cyber security measures shall include those described in Appendix 4.
- 19.2 Gas shippers shall provide to the gas transporter, as soon as reasonable practicable with the information the gas transporter may reasonably require pursuant to clause 12.1(a).
- 19.3 The onshore receiving facility operator and the LNG terminal operator shall carry out the following promptly at all times to enable the shippers using the onshore receiving facility or the LNG terminal, as the case may be, to inject gas into the gas supply system:
 - (a) provide data/information (whether electronic, written or in any other form) to the shippers on the gas quality and availability of the incoming gas supply to the onshore receiving facility or the LNG terminal, as the case may be;
 - (b) provide advanced information and notices to shippers on the potential problems that can arise from the activities of the onshore receiving facility operator or the LNG terminal operator licensee in the onshore receiving facility or the LNG terminal, as the case may be; and/or
 - (c) co-operate fully with shippers and relevant agencies to mitigate the consequences of any failure of the onshore receiving facility or the LNG terminal, as the case may be, such as an increase/decrease of gas supply or gas pressures, etc.
- 19.4 The onshore receiving facility operator or the LNG terminal operator shall investigate any failure of the onshore receiving facility or the LNG terminal, as the case may be, in injecting gas into the gas supply system and submit a written report to the Authority within a reasonable period of time as may be directed by the Authority.
- 19.5 The Licensee (namely the Onshore Receiving Facility Operator Licensee, the LNG Terminal Operator Licensee, the Town Gas Producer Licensee and the Gas Transporter Licensee) shall:
 - (a) report any near miss to the Authority within 4 weeks from the occurrence of the near miss; and
 - (b) collate reports of near misses encountered by their contractors while working on the licensees' pipeline/equipment/plant/facility, and submit these reports to the Authority within 4 weeks from the occurrence of the near miss.

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The Authority may, where it considers necessary, require the Licensee to share the learning points of the near miss with other key stakeholders in the gas industry.

For the purposes of this clause, “near miss” means an unplanned incident that did not result in but had the potential to cause either a failure or mal-operation of equipment, plants, facilities or gas pipelines, or partial/total disruption in gas supply. A near miss does not include averted equipment failures observed or discovered or suspected through maintenance, condition monitoring, commissioning or re-commissioning works.

The reporting of near miss is not intended to determine/apportion blame or liability, but is for the industry to share and learn from the incidents and make necessary improvements so as to enhance the reliability of their equipment and plants/facilities.

19.6 The Licensee (namely the Onshore Receiving Facility Operator Licensee, the LNG Terminal Operator Licensee, the Town Gas Producer Licensee and the Gas Transporter Licensee) shall:

- (a) establish and maintain adequate safety procedures to ensure the safety of the public or personnel and/or prevention of death/injury to any person or damage to any property for any work or testing is carried out on any gas pipelines or equipment belonging to or under the management or control of the gas transporter, town gas producer, onshore receiving facility operator or the LNG terminal operator.
- (b) comply with all applicable or relevant safety procedures, requirements and practices to ensure the safety of the public or personnel and/or prevention of death/injury to any person or damage to any property when any work or testing is carried out on any gas pipelines or equipment belonging to or under the management or control of the gas transporter, town gas producer, onshore receiving facility operator or the LNG terminal operator.

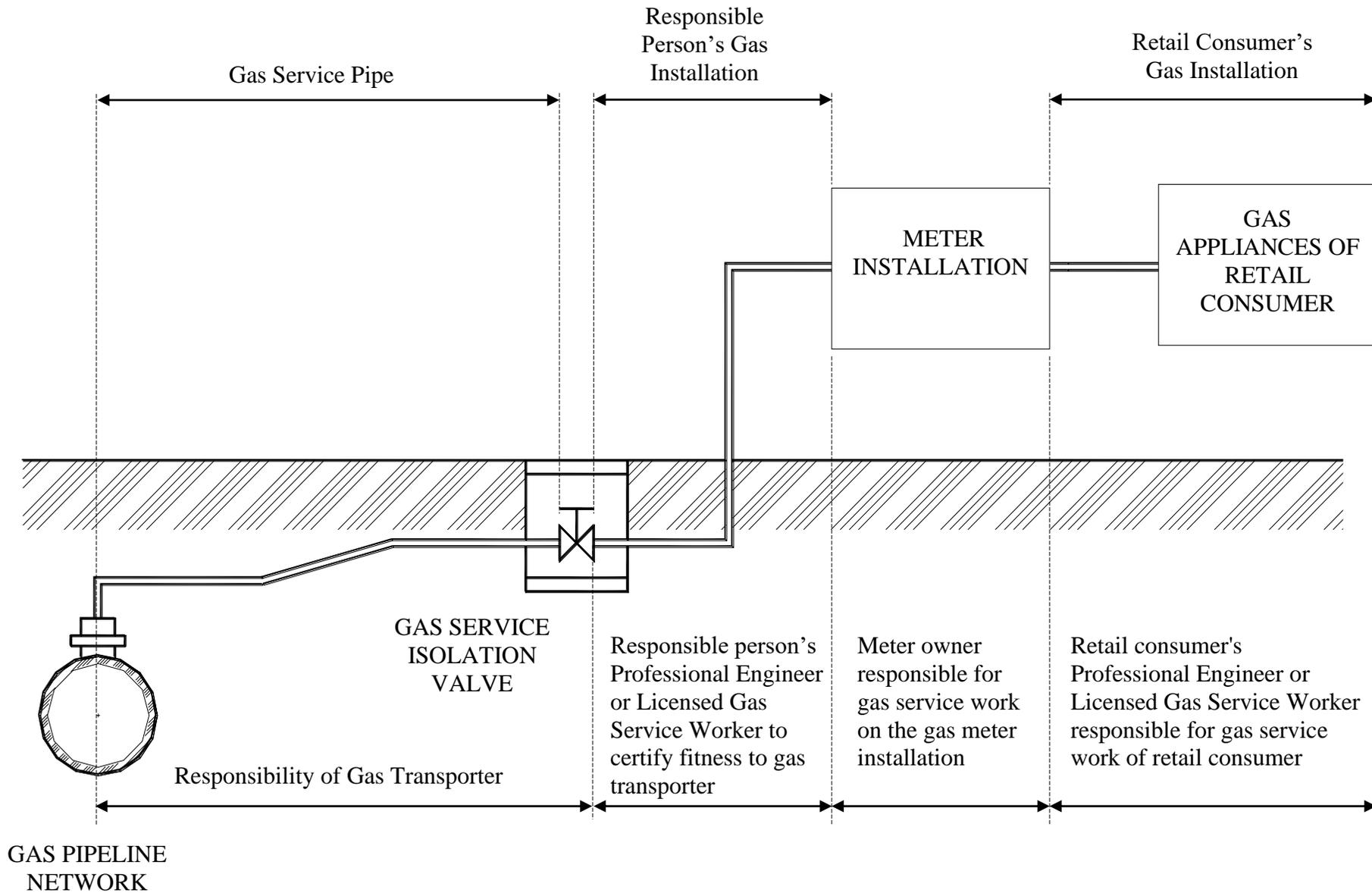
20 REGISTER OF PIPELINES AND OTHER RECORDS

20.1 The gas transporter shall keep an up-to-date record of:

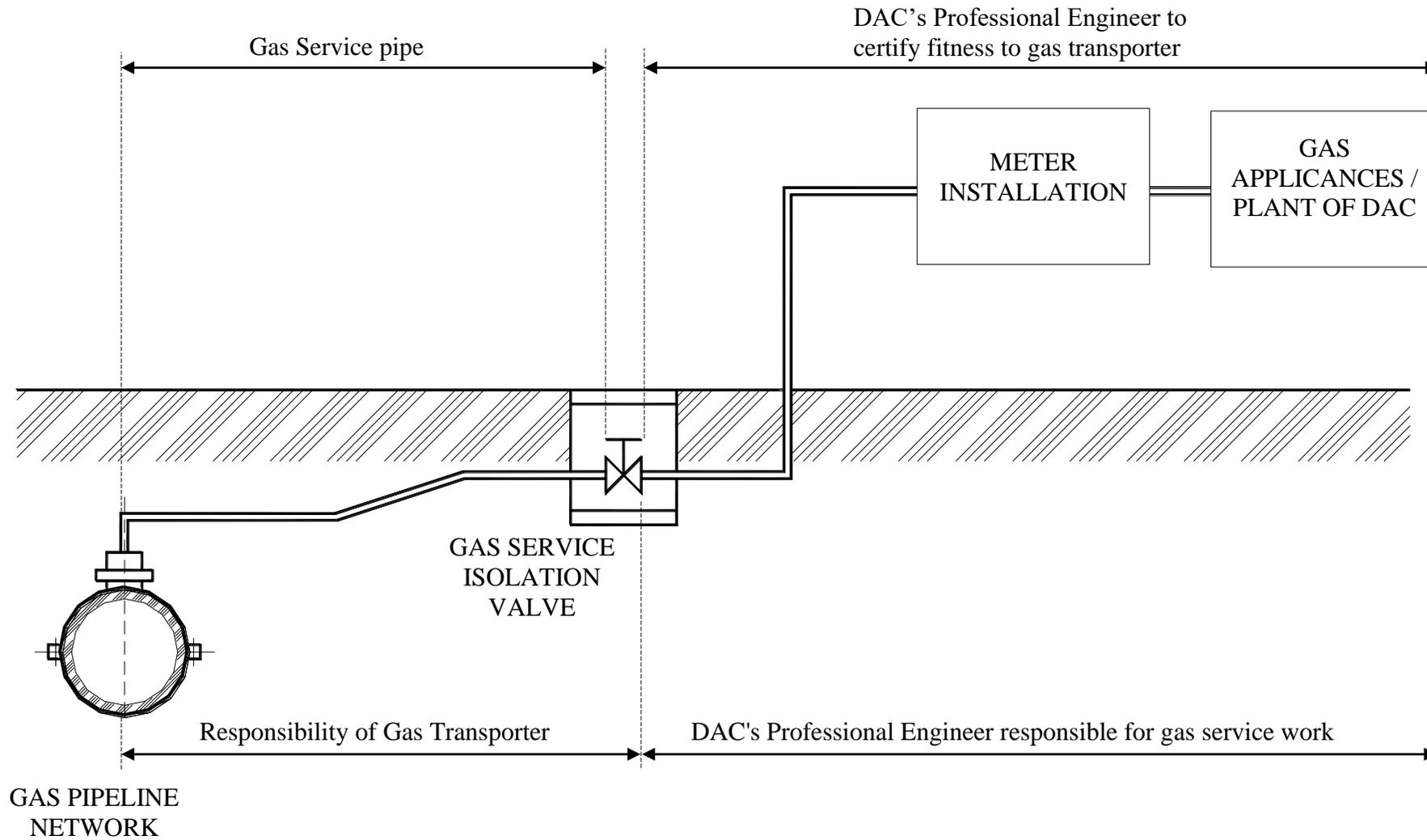
- (a) all assets associated with the gas supply system as owned, operated or the responsibility of the gas transporter;
- (b) town gas pipelines and natural gas pipelines (including those that have been converted from conveying town gas to natural gas);
- (c) premises connected to the gas supply system, including, without limitation, by means of an gas installation or an internal pipe;
- (d) the reference number assigned by the gas transporter to each meter installed at metered premises which are so connected to the gas supply system;

Gas Supply Code

- (e) the ownership of meters through which gas conveyed by the gas transporter was supplied to premises and metered;
 - (f) each shipper with whom the gas transporter has a contract for the conveyance of gas;
 - (g) each gas service isolation valve on the gas supply system; and
 - (h) gas pipeline networks installed in and under public places and highways, in such form as is accessible by other utility service providers or such other persons who reasonably require such information.
- 20.2 The gas transporter shall provide such record storage, access schemes and including digital mapping and such other processes that may be used to locate gas pipelines effectively as required by the Authority for the purpose of public safety, infrastructure planning works or other purposes as required by government agencies and agreed by the Authority. The gas transporter shall also ensure that its digital mapping or records of gas pipelines are accurate and comply with the relevant requirements in the prevailing version of Singapore Land Authority's Utility Survey Standard.



APPENDIX 1: Demarcation of Responsibility of Gas Service Work of Single / Multiple Retail Consumer(s)



APPENDIX 2: Demarcation of Responsibility of Gas Service Work of Direct Access Customer(s) (DAC)

APPENDIX 3: SINGAPORE NATURAL GAS SPECIFICATION

Wobbe Index (WI)	:	45.2 – 52.0 MJ/m ³
Gross heating value	:	35.3 – 50.3 MJ/m ³
Hydrocarbon dewpoint	:	12.8 °C @ 50 bar
Water dewpoint	:	9.4 °C @ 50 bar
Free liquids	:	zero (0)
Methane (min)	:	80 % by volume of total reactants
Oxygen (max)	:	0.1 % by volume
Carbon dioxide (max)	:	5 % by volume
Nitrogen (max)	:	5 % by volume
Total inerts (max)	:	10 % by volume
Hydrogen sulphide (max)	:	8 ppm by volume
Total sulphur (max)	:	30 ppm by volume
Particulate – size (max)	:	10 micron
Particulate – quantity (max)	:	3 ppm by weight
Potassium and Sodium (max):		0.5 ppm by weight
Lead (max)	:	1 ppm by weight
Magnesium (max)	:	2 ppm by weight

APPENDIX 4: Cyber Security Measures

External Connections and External Access

- 1) Remove all non-essential connections between a CII (Critical Information Infrastructure) and any external system, and implement network segregation for essential connections.
- 2) For essential connections requiring only a 1-way data flow out of the CII, to put in place devices or systems that will ensure that only a unidirectional flow out of the CII is permitted.
- 3) For essential connections requiring a 2-way data flow into/out of the CII to put in place a 2-way non TCP/IP serial communication link.
- 4) Implement encryption for all site-to-site communications.
- 5) Implement strict syntactic and semantic checks (of allowed data set) such that data entering the CII does not contain any commands that can alter CII operations. In addition, strong authentication mechanisms e.g. transmission security and message integrity should be implemented.

System Lockdown

- 6) Minimise the number of users with domain, system or local administrative privileges.
- 7) Disable all unused input/output ports, all unused internal drives or media devices, and all non-essential Operating System (OS) services.
- 8) Implement stringent controls on use of all removable media and laptops in CII environment. All removable media devices and laptops used in the CII shall be owned and maintained by the CII Owners, and must be authorised only for dedicated use between specific servers, workstations and end-point devices, Programmable Logic Controllers (PLCs), Remote Terminal Units (RTUs), network switches and routers.

Network and End-point Protection

- 9) Monitor perimeter, network and security of the CII to detect any system anomaly. Cyber security logs including, but not limited to, system security logs, system health logs, devices/services activity logs and audit logs shall be kept for at least 18 months. These logs shall be piped to the Authority's Sectoral Detection and Early Warning System (SDEWS) at intervals specified by the Authority.
- 10) Install necessary firewalls, Intruder Detection System / Intruder Protection System (IDS/IPS) and network monitoring software.
- 11) Application of whitelisting to prevent malicious software and other unapproved programs from executing.
- 12) Install anti-virus on all servers, workstations and end-point devices of CII Systems and ensure the virus definitions are up to date.
- 13) Ensure that all CIIs shall be regularly patched to resolve software applications and operating system vulnerabilities and that all patches are up to date. Interim mitigating controls shall be in place to address the vulnerabilities if the patches cannot be implemented promptly.

Governance and Operation

14) CII Owners shall attain and maintain certification to ISO-27001 (or equivalent) for all CII's.

14-a) CII Owners shall provide updated copy of CII's network diagram and asset inventory lists annually or as and when there are changes to the network equipment in machine readable PDF format showing the following information but not limited to;

- Hostname;
- IP address of the equipment/devices.

Others

15) Any other measures or directives issued by EMA.