Institution of Gas Engineers & Managers

Bulk transport of LNG by road

IGEM/IG/4
Communication 1854

ASSIDUE EXQUIRENDO SERVIRE

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SECTION

SECTION 1 : INTRODUCTION

1.1 This Industry Guidance is part of a series of Institution of Gas Engineers and Managers (IGEM) publications giving guidance on the operations and distribution of Liquified Natural Gas (LNG) by road.

1.2 This Guidance has been drafted by an Institution of Gas Engineers and Managers (IGEM) Panel, appointed by IGEM's LNGC Committee, and has been approved by IGEM's Technical Co-ordinating Committee on behalf of the Council of IGEM.

1.3 Terms such as "maximum operating pressure" (MOP), "maximum incidental pressure" (MIP) and "operating pressure" (OP) are used to reflect gas pressure terminology used in European standards. These terms will arise in all relevant IGEM Standards and, possibly, in other standards. Other terms have been introduced to assist in recognition of design information to be transferred between interested parties.

1.4 This Guidance makes use of the term "must", "shall" and "should" when prescribing particular procedures.

- the term "must" identifies a requirement by law in Great Britain (GB) at the time of publication
- the term "shall" prescribes a procedure which, it is intended, will be complied with in full and without deviation
- the term "should" prescribes a procedure which, it is intended, will be complied with unless, after prior consideration, deviation is considered to be acceptable.

1.5 Such terms may have different meanings when used in legislation, or Health and Safety Executive (HSE) Approved Codes of Practice (ACoPs) or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

1.6 New and improved practices may be adopted prior to this Guidance being updated. Amendments to this Guidance will be issued when necessary and their publication will be announced in the Journal of IGEM and elsewhere as appropriate.

1.7 Requests for interpretation of this Guidance in relation to matters within their scope, but not precisely covered by the current text, are to be either:

- addressed to Technical Services, IGEM, IGEM House, 26 & 28 High Street, Kegworth, Derbyshire, DE74 2DA; or
- emailed to technical@igem.org.uk.

These will be submitted to the relevant Committee for consideration and advice, but in the context that the final responsibility is that of the engineer concerned. If any advice is given by or on behalf of IGEM, this does not imply acceptance of liability for the consequences and does not relieve the responsible engineer of any of their obligations.

1.8 This Guidance was published in June 2023.

SECTION 2 : SCOPE

2.1 This Guidance document covers the design, construction, inspection, maintenance and operation of LNG transportable tankers and ancillary loading and unloading equipment.

2.2 Pressures quoted are gauge pressures unless otherwise stated.

2.3 Italicised text is informative and does not represent formal requirements.

2.4 Appendices are informative and do not represent formal requirements unless specifically referenced in the main sections via the prescriptive terms "must", "shall" or "should".

SECTION 3 : LEGAL AND ALLIED CONSIDERATIONS

This Guidance document is set out against a background of legislation in force in GB at the time of publication (See Appendix 2). The devolution of power to the Scottish, Welsh and Northern Ireland Assemblies means that there are variations to the legislation described below for each of them and consideration of their particular requirements is to be made. Similar considerations are likely to apply in other countries where reference to appropriate national legislation is necessary.

All relevant Legislation is required to be complied with and relevant Approved Codes of Practice (ACoPs), official Guidance Notes and referenced codes, Standards, etc. are to be taken into account.

Care shall be taken to ensure that the latest editions of the relevant documents are used.

Appendix 2 lists Legislation, Guidance Notes, Standards etc. which are identified within this Guidance. Where Standards are quoted, equivalent national or international Standards etc. equally may be appropriate. Unless otherwise stated, the latest version of the referenced document should be used.

3.1 PRIMARY LEGISLATION

3.1.1 Health and Safety at Work Act (HSWA)

HSWA applies to all persons involved with work activities, including employers, the self-employed, employees, designers, manufacturers, suppliers etc. as well as the owners of premises. It places general duties on such people to ensure, so far as is reasonably practicable, the health, safety and welfare of anyone who may be affected by the work activity. Competency is achieved by an appropriate combination of education, training and practical experience.

3.2 SECONDARY LEGISLATION

3.2.1 International Carriage of Dangerous Goods By Road (ADR)

These Regulations are implemented in the GB through The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 ("CDG 2009"), SI 2009 No 1348. These reflect the European Agreements concerned with the International Carriage of Dangerous Goods by Road (ADR). ADR is intended to provide a common trading and safety standard for international transport of dangerous goods (including compressed, liquefied and dissolved under pressure gases and vapours).

3.2.2 Carriage of Dangerous Goods (CDG)

As the UK has withdrawn from the European Union, the European Transportable Pressure Equipment Directive is no longer in force; however, the essential requirements of TPED have been replicated in UK legislation by the Carriage Of Dangerous Goods and Transportable Pressure Equipment Regulations.

This legislation allows for extant TPED compliant Transportable Pressure Equipment to carry on in service within the UK/EU and requires that NEW TPE that is introduced to the market is subject to Conformity Assessment by a UK approved body, for TPE to be used within the UK, as well as being subject to conformity assessment by an EU Notified Body for TPE intended to be used within the EU.

3.2.3 Dangerous Substances And Explosive Atmospheres Regulations (DSEAR)

DSEAR are concerned with protection against risks from fire, explosion and similar events arising from dangerous substances used or present in the workplace. DSEAR require that risks from dangerous substances are assessed, eliminated or reduced. They contain specific requirements to be applied where an explosive atmosphere may be present and require the provision of arrangements to deal with accidents, emergencies etc. and provision of information, training and use of dangerous substances. DSEAR

also require the identification of pipelines and containers containing hazardous substances.

Note: The following contain details of the Regulations and their application:

- *L138*
- *L137*
- *L136*
- *L135*
- *L134*
- *INDG370.*

3.2.4 International Maritime Dangerous Goods (IMDG)

The IMDG Code was developed as an international code for the maritime transport of dangerous goods in packaged form, in order to enhance and harmonize the safe carriage of dangerous goods and to prevent pollution to the environment. The Code sets out in detail the requirements applicable to each individual substance, material or article, covering matters such as packing, container traffic and stowage, with particular reference to the segregation of incompatible substances.

3.2.5 Pressure Systems Safety Regulations (PSSR)

The aim of PSSR is to prevent serious injury from the hazards of stored energy as a result of failure of a pressure system or one of its component parts. With the exception of steam, PSSR do not consider the hazardous properties of the contents released following system failure. PSSR do not apply to the installations within main buildings covered by this Standard but may apply to such gas infrastructure as network pipelines and PRIs external to the building.

Note: L122 is an ACoP on PSSR.

3.2.6 Transportable Pressure Equipment Directive (TPED)

TPED is a European Directive (2010/35/EU) that applies within the European Economic Area (EEA) to manufacturers, authorised representatives, importers, distributors, operators and owners of certain types of transportable pressure equipment used for the transport of dangerous goods by road, rail and inland waterway.

The Directive states which equipment requires examination by a Notified Body. There are also certain methods of conformity assessment depending on the type of equipment. This is based on the provisions in the ADR.

Existing EU Directives and Regulations will still apply whilst new arrangements for UK legislation will be put in place to replace the EU requirements such as "The Carriage of Dangerous Goods".

SECTION 4 : SAFE HANDLING AND TYPICAL PROPERTIES OF LNG

4.1 WHAT IS LNG?

LNG is Natural Gas (NG) that has been converted to a cryogenic liquid. It takes up about 1/600th the volume of NG in its gaseous state. When NG is cooled to below -160°C, it becomes a colourless and odourless liquid. As part of the cooling process (liquefaction), impurities such as water, carbon dioxide, nitrogen, oxygen and some sulphur compounds within the NG are removed with the remaining consisting mainly of methane.

LNG is odourless, colourless, non-toxic and non-corrosive. Hazards include flammability in the gaseous state in air at 5% LFL (Lower Flammable Limit) and 15% UFL (Upper Flammable Limit). Other hazards include cold (cryogenic temperatures potentially causing cold burns, hypothermia etc) and asphyxiation.

If LNG is released it will vaporise and form a visible vapour cloud as water vapour particles in the air condense, however the visible vapour cloud is not indicative of the extent of potentially explosive atmosphere. Leaking LNG could cause liquid ponding but will vaporise when it warms up. As it continues to warm, the vapour cloud will become invisible and lighter than air as it disperses.

4.2 WHAT IS LNG USED FOR?

LNG is re-gasified (for example, by heating) to return it to its natural gaseous state. It can then be used for both commercial and domestic applications where heating, cooking etc. is required.

LNG is also used as an alternative fuel for vehicle combustion engines as it has lower CO_2 emissions than traditional fuels and zero particulates. vehicles that run on natural gas can either store it as a gas at high pressure, known as Compressed Natural Gas (CNG) or as LNG. LNG is used in a number of applications including road, marine, rail propulsion and power generation schemes.

4.3 HOW IS LNG TRANSPORTED BY ROAD IN THE UK?

Bulk LNG is transported in the UK by road or rail in road tanker or International Standards Organization (ISO) containers. The road tankers and ISO containers are designed to maintain the product at a safe temperature and pressure during the transportation. Temperature of the product is maintained via a vacuum insulated double walled tank. The tank or tanker is fitted with Pressure Relief Valves (PRV) that will activate once the pressure reaches a pre-defined level.

SECTION 5 : DESIGN AND CONSTRUCTION

INTRODUCTION

LNG tanker minimum design and operational requirements are set out in ADR, which is not intended to replace those requirements. However, this Section does contain details of the design features and safety systems which have been identified as being best practice within the UK and aligned with storage terminal requirements.

5.1 TRANSFER COUPLINGS

5.1.1 Bulk offloading

5.1.1.1 Transfer couplings and connections shall be either a screwed connection with a soft seal or a dry disconnect type and should be compatible with receiving facility.

5.1.1.2 The transfer couplings shall be of the type identified below:

- LNG line:
  - male coupling half DN65 TR104 x 8 LH threaded (Mat. 1.4571)
  - male dry disconnect coupling with female NPT thread, EN1092 (DIN) and ANSI flanges.
- Boil-off line:
  - male coupling half DN40 TR69 x 8 LH threaded (mat.1.4571)
  - male dry disconnect coupling with female NPT thread, EN1092 (DIN) and ANSI flanges.

5.1.2 Bulk loading

5.1.2.1 Transfer couplings and connections shall be either a screwed connection with a soft seal or a dry disconnect type and should be compatible with receiving facility.

5.1.2.2 The transfer couplings shall be of the type identified below:

- LNG Delivery line
  - male coupling half DN40 TR69 x 8 LH threaded (mat.1.4571)
  - male dry disconnect coupling with female NPT thread, EN1092 (DIN) and ANSI flanges.
- Boil-off line (Vapour Return)
  - male coupling half DN40 TR70 x 8 LH threaded (mat.1.4571)
  - male dry disconnect coupling with female NPT thread, EN1092 (DIN) and ANSI flanges.
- Nitrogen Purge Line
  - HK Series 8, ML8HP36BS (ISO 7241-1 Series B, 1” quick release 316 stainless steel, Male).
- Station Air Line
  - male coupling AC71EF.

It is a requirement of the Road Tanker Loading Facility (RTLF) that an air connection is made between the loading facility and the receiving tanker or tank container. All actuating valves must close by one of the following means:

- emergency stop button activation
- loss of vehicle or loading facility air.

Failure to have a suitable air connection will result in the tanker/tank Container not being loaded.

5.2 ELECTROSTATIC EARTH AND EQUIPOTENTIAL PROVISION

5.2.1 The tank must have equipotential electrical continuity with any separate chassis/s, using suitable bonding methods that will not cause dissimilar metal corrosion.

5.2.2 Tankers must be fitted with at least one earth bonding fitting for the connection of a landside earth bonding clamp. This earth bonding fitting must be clearly marked with the symbol

5.2.3 All parts of a tank container shall be bonded together, using suitable bonding methods that will not cause dissimilar metal corrosion.

5.2.1 The tank container must have electrical continuity with the vehicle chassis.

5.2.5 Tank containers and ISO containers shall be fitted with at least one earth bonding fitting for the connection of a landside earth bonding clamp.

5.2.6 Tankers and tank containers which may discharge/decant at sites which do not have a landside earth bonding clamp shall be fitted with an earth continuity wire (of suitable length), which shall at its free end terminate in a suitable earth clamp.

5.2.7 The maximum resistance between the tank and any part of the chassis, pipework/fittings on the tanker/tank container shall not exceed 10Ω.

Note: There is to be full electrical continuity between the loading and unloading tanks and all associated equipment (such as fill guns or loading arms) and Earth during all loading or unloading operations, and the maximum resistance is not to exceed that outlined in clause 5.3.5.

5.3 SAFETY SYSTEMS

5.3.1 Drive away/rollaway prevention

5.3.1.1 The tanker or tank container system shall incorporate controls such that the vehicle is immobilised whilst the transfer hoses are connected.

5.3.1.2 All loading and unloading primary valves on the tanker or tank container shall instantly close in the case of unintended movement of the vehicle.

5.3.1.3 The system/controls shall be designed so that:

- Inadvertent actuation of the brakes cannot occur, other than when the vehicle is stationary and the parking brakes have been applied.
- Once the parking brakes have been applied and a cabinet has been opened and/or a hose connected, the parking brakes cannot be released until the hose has been disconnected and/or the cabinet door has been closed.
- That the brakes will not automatically release, if the parking brake control is in the release position and then a cabinet is closed or the hose disconnected, until after the parking brake control has first been moved back to the parking position.

- Fatal accidents have occurred when vehicle parking brakes have been put into the release position but the brakes have not released due to an open cabinet door. When the driver closed the cabinet door, the brakes released and the tanker rolled away.
- Any modification of or connection to the braking system will require approval by the enforcing authority for each vehicle.

5.3.2 DEAD-MAN SYSTEM

Unless the discharge/decant operation is controlled by a minimum of two persons or a monitored landside control system, which is interfaced with the tanker, it is

recommended that the tankers/tank containers control system incorporates a dead-man system that should be responded to at intervals not exceeding 2 minutes unless a separate risk assessment has been carried out and demonstrates it achieves ALARP. If the control system does not receive a response, the complete discharge system should stop and the tankers/tank containers actuated valves should close.

5.3.3 **STATION AND TANKER INTERFACE**

5.3.3.1 Station and tanker Emergency Shutdown (ESD) safety interface shall be installed. Consideration shall be given to determine the need for a bi-directional system.

5.3.3.2 For tankers/tank containers fitted with pumps (with a high noise level) consideration shall be given to fitting additional warning sounders and/or lights to indicate that a response is needed to the dead-man control system.

5.3.4 **EMERGENCY STOP SYSTEM**

Tankers and tank containers must be fitted with an emergency stop system, this should be incorporated into the air system that supplies all actuated valves. The valves are closed by the emergency system by one of the following means:

- emergency stop button
- loss of vehicle or facility
- manual cables.

5.3.5 **OVER PRESSURE PROTECTION**

All transportable LNG tanks shall be protected from catastrophic effect of overpressure.

5.3.6 **SAFETY RELIEF VALVES**

Where present, relief valves shall be set in accordance with appropriate vessel relief valve code.

5.3.7 **THERMAL RELIEF VALVES**

5.3.7.1 Where there is a risk of liquid being trapped the pipework and associated equipment shall be protected using thermal relief valve.

5.3.7.2 Where installed, the Thermal Relief Valve (TRV) shall be set to a maximum of the system maximum allowable working pressure (MAWP) that is protecting.

5.3.8 **MANUAL RELIEF VALVES**

Tankers shall be fitted with a manual relief valve, and it should be protected from unauthorised use.

5.3.9 **RELIEF VALVE VENTING**

All relief valve piping should be designed and located to discharge to normally controlled area. Flares and vent stacks shall be designed in accordance with recognized standards and shall limit flammable vapours entering the atmosphere.

5.4 **COMMISSIONING**

5.4.1 All tankers and tanks that have been brought into service for the first time in the UK shall follow a suitable commissioning process, such as:

- cooling of the tanks through the introduction of the liquid nitrogen (LIN)
- leak proofness test on all joints, connections and fittings
- pressure test
- vacuum test

- pump test (where pump fitted)
- trailer air test including air actuated valve, break actuated valve and break function test
- metered calibration where fitted or installed
- functionality of emergency stops
- all placards and labels are accurate and correctly placed.

Prior to the tankers being brought into service, all documentation, including ADR and P&I documentations shall be made available to the designated competent person (e.g., Dangerous Goods Safety Advisor DGSA) for review and approval.

SECTION 6 : OPERATION

6.1 LOADING

The LNG storage facilities have a responsibility to ensure that the tanker is suitably designed and authorised for the transportation of LNG. They also have a responsibility to ensure that the driver is qualified and authorised appropriately for the collection of the product and the carriage undertaken by road under the Carriage of Dangerous Goods Regulations 2009.

The LNG storage facilities will have their own Safe System of Work and policies for the operations whilst on the facility and these must be adhered to.

Upon arrival, the LNG storage facility shall carry out checks to ensure all relevant tanker, driver documentation and legislative requirements are being met.

The LNG storage facility has a legal responsibility as the Loader to check that:

- the tanker has a valid Technical Examination Certificate (ADR)
- the tanker has a valid Periodic or Intermediate Examination Certificate
- the driver has a valid Dangerous Goods vocational Licence (ADR), and this is valid for the carriage of Class 2 products (gasses) in tanks
- the driver's identity is verified by means of photographic I.D.

The above may be addressed using a Site Permit system that stores all the tanker and driver information electronically, this is then verified upon arrival by checking against the tanker & driver ID and database. This database will automatically show any expiration dates and prevent both access and the loading operations taking place if expired.

The site shall carry out a visual inspection of the tanker before permitting it onto the facility, this will include checking for leaks, LNG & Fluid, signs of damage and wheel temperatures.

Upon arrival at an LNG Loading facility, the relevant tanker and driver must follow the site-specific instructions for:

- booking in
- PPE
- loading Procedures.

In general, there are three conditions that a tanker should be conforming for the loading of LNG as per clauses 6.1.1, 6.1.2 and 6.1.3.

6.1.1 Loading, Normal Operations (Cold Fill)

The loading facilities shall have a preferred pressure window in which the tanker can be loaded. For example, the Isle of Grain (IOG) Road Tanker Loading Facility (RTLF expects the pressure to be at 3 barg. However, if it is between 3-7 barg the tanker can be accepted but will be required to lower the tanker pressure whilst connected to the system. Any pressure units above 7 barg cannot be accepted as a cold fill and will be treated as a warm fill.

LNG shall be pumped into the tanker at a flow rate of 80 m^3/hr and pressure of 3 barg, the tanker must be capable of receiving this pressure.

6.1.2 **Loading, Return to Service/First Fill**

The tanker shall be in a purged condition and contain LIN. The loading facility shall have a set procedure for this but requires the following documentation:

- Purge Certificate
- Return To Service Certificate that indicates the LIN dew point is below -46°C.

Note: Sufficient notice to be given to the facility to ensure all certification can be inspected and verified.

6.1.3 **Loading, Exceptional Operations (warm fill)**

The individual facility shall determine method of loading operations, for example the IOG RTLF differentiates a warm fill and a cold fill based upon the return temperature of the vapour from the tanker back to their facility:

- less than -10° C = Cold Fill
- more than -9° C = Warm Fill.

A warm fill will generally be required when the tanker is returned to service i.e., contains LNG but has not been in operation for a period of time, which could be several days or more.

Upon arrival at the terminal, the driver shall report to the appropriate person and shall follow the site-specific procedures.

The receiver's trailer shall arrive at the RTLF in a cold condition, which means a boil-off gas is at a temperature below –10° C, which could be methane or nitrogen.

Upon arrival at the RTLF, the receiver's trailer shall be under natural gas atmosphere and under no circumstances shall traces of oxygen, carbon dioxide, water vapour or any other contaminants, or impurities inside the receiving trailer and its associated piping, exceed the following gas specifications:

- maximum 1 ppm H_2O vapour
- maximum 100 ppm CO_2 and
- maximum 100 ppm O_2.

After completion of the loading operation, the RTLF operator shall provide the driver with the Quality and Quantity Documentation. Both the driver and the RTLF operator will sign the documents. It shall be the operator's responsibility to ensure that the loading rate of the trailer is compatible with the loading rate of the terminal.

6.2 **UNLOADING**

6.2.1 Upon arrival at the unloading site, Euro 6+ regeneration systems shall be isolated, if installed.

6.2.2 Vehicle windows shall be closed and night heaters shall be isolated.

6.2.3 A visual check should be made of;

- the area around the storage installation
- the actual LNG storage tank(s) and connections

for any unusual or potentially dangerous situations.

6.2.4 The tanker shall be parked on a level surface in a position so that the transfer hoses can be coupled up without them being strained.

6.2.5 The tanker should be orientated so that it can drive away from the unloading position without the need of any reversing manoeuvres.

6.2.6 The tanker brakes shall be applied and wheel chocks of a suitable size for the wheel and for the mass of the vehicle should be positioned to prevent vehicle movement.

6.2.7 Where used, activate the portable gas detector.

6.2.8 The LNG storage tank(s) shall be checked to ensure they can take the amount of product to be unloaded.

6.2.9 All of the tanker's electrical equipment that is not required for the unloading operation, shall be switched off.

6.2.10 The tankers brake interlock system shall be activated.

6.2.11 Fire extinguishers shall be suitably deployed.

6.2.12 The tanker shall be earth bonded to the LNG storage earthing point.

6.2.13 Where fitted, landside to tanker interface systems shall be connected.

Note: The interface can be either electronic interface or an air actuated interface

6.2.14 Transfer connection blanking caps shall be removed with care, ensuring that any trapped pressure is released before the cap is removed.

Note: If required, use only spark-proof tools.

6.2.15 Connect the transfer and, where required, the vapour balance hoses. Visually check the hose(s) for damage and ensure they are not kinked.

6.2.16 Purge all of the air from the hose(s) using vapour.

6.2.17 Pressurise and cool the hose(s) with vapour and visually/audibly check for leakage (this may be supplemented by using a portable gas detector).

6.2.18 Check the installation's pressure to ensure that it is not higher than acceptable to receive the delivery. If it is too high, reduce the pressure of the receiving tank in accordance with the relevant procedure.

6.2.19 As the transfer hose(s) and couplings cool, check for leakage and tighten as required.

6.2.20 Start the transfer operation of LNG. This will be either:

- through pressure decant transfer or
- through tanker pump transfer.

6.2.21 During the transfer operation, monitor the tanker for correct operation and ensure that the LNG storage is not overfilled. Where fitted continuous monitoring of transfer dead-man system shall be required.

6.2.22 At the end of the transfer operation, close off the liquid supply to the transfer hose and allow the liquid in the hose/adjacent pipework to boil off.

6.2.23 When all the liquid has boiled off, vent the remaining pressure from both the liquid transfer and vapour balance hoses, where used, to a suitably controlled area. Flares and vent stacks shall be designed in accordance with recognized standards and shall limit flammable vapours entering the atmosphere.

6.2.24 Ensure all tankers and site valves shall be positioned in accordance with tanker and site operating procedure.

6.2.25 Remove the hose(s) and return to their storage.

6.2.26 Replace all the coupling blanking caps.

6.2.27 Where fitted, disconnect the landside to tanker interface systems.

6.2.28 Disconnect the tanker to the LNG storage earthing point.

6.2.29 Replace/stow the fire extinguishers in their holders/boxes.

6.2.30 Ensure all of the tankers cabinet doors and hoses are correctly closed and deactivate the tankers brake interlock system.

6.2.31 Remove and stow the wheel chocks.

6.2.32 Undertake a visual survey of the installation and tanker to look for any signs of leakage (this may be supplemented by the use of a portable gas detector). If any leaks are found, then report in line with company/site safe procedures.

6.2.33 Turn off and stow the portable gas detector.

6.2.34 Drive the tanker from the unloading location.

6.3 TRANSPORTATION

The transportation of LNG in a tanker by road falls within the scope of ADR, which is implemented in the UK through the CDG. The following gives an overview of the requirements for Safety Obligations, Documentation, Vehicles and personnel equipment and training for the transportation of LNG in by road.

6.3.1 Safety Obligations

When there is an immediate risk that public safety may be jeopardized, the emergency services shall be notified, the information made available to them that they will require to act.

The main participants within the carriage shall have their own obligations that they shall undertake.

The Consignor shall:

- furnish the carrier with the transport document
- ensure all tankers are placarded, marked and labelled.

The Filler shall:

- ascertain the date of the next inspection has not expired
- ensure all tankers are placarded, marked and labelled
- ensure after filling the tanker that all closures are in the closed position and there is no leakage.

The Unloader shall:

- before and during unloading, check the operation to make sure there is nothing that would endanger the process
- ensure the closure of all valves.

6.3.1.1 Security Provisions

As LNG carried in tankers is classed as High Consequence Dangerous Goods, tanker operators and consignors shall have a Security Plan as prescribed in ADR clause 1.10.3.2.

The Security Plan shall cover:

- specific allocation of responsibilities for Security
- records of dangerous goods

- review and assessment of security risks and means to reduce risks
- effective and up to date procedures and reporting for dealing with security threats.

Note: More information can be found at https://www.gov.uk/government/publications/security-requirements-for-moving-dangerous-goods-by-road-and-rail

6.3.1.2 Road Transport Security Plan

It is the responsibility of the tanker operator to carry out a risk assessment that covers the parking of the tankers when not in use, whilst on the road, during unloading and loading operations and when left at third party locations for service, repairs and maintenance.

Exceptional events such as breakdowns, accidents and hijack guidance shall also be given.

tankers should be provided with a Dangerous Load Card (DLC). This must not be permanently displayed but should be located so it is easily accessed by the driver in the event of being asked to stop by the Police or Traffic Enforcement officers. The driver shall present the DLC in the window so that the authorities can confirm their identity to the vehicle operator and request they advise the driver to stop at a safe location.

6.3.1.3 Vehicle Supervision

Tankers carrying LNG shall always be supervised or, alternatively, be parked in a secure depot. If these arrangements cannot be met and the vehicle being properly secured, then the following can be considered:

- a vehicle park supervised by an attendant, the attendant being notified of the load and the whereabouts of the driver
- a public or private vehicle park where the tanker is not likely to suffer damage from another vehicle or
- a suitable open space separated from the public highway and from dwellings, where the public does not normally pass or assemble.

Where third party sites are used for the service and maintenance requirements, a Risk Assessment should be carried out as per the provisions of the security plan.

6.3.1.4 Safety Advisor

Each undertaking, the activities of which include the Consigning or the Carriage of Dangerous Goods by Road or related to the filling or unloading, shall appoint one or more DGSA, the main task of whom shall be:

- monitor compliance
- advise their undertaking
- prepare an annual report.

The Safety Advisor must hold a valid certificate, the validity of this being 5 years which can be extended by passing an examination.

6.3.2 **Documentation, Vehicle and Personal Protective Equipment**

6.3.2.1 The following documentation shall be carried on the tanker at all times and produced when requested by a Police Officer, or an Officer from the Driver and Vehicle Agency (DVSA):

- transport document
- instructions in writing (these must be readily available)
- certificate of approval for each transport unit (also known as the ADR certificate)
- driver training certificate (driver ADR licence)

- means of identification which include a photograph for each member of the vehicle crew.
- trailer registration certificate (required for transportation outside of UK)

If transporting LNG in a portable tank/tank container the Transport Document shall reference the holding time for the gas (in days or hours)

6.3.2.2 The following equipment must be carried on the tanker at all times:

- fire extinguishers (see Table 1)
- a wheel chock per transport unit of a size suited to the maximum mass of the vehicle and to the diameter of the wheel
- two self-standing warning signs.

Transport unit maximum permissible mass	Minimum number of extinguishers	Minimum total capacity of extinguishers	At least one extinguisher suitable for cab or engine fire	Additional extinguishers requirements, at least one
44 Tonnes	2	12 Kg	2 Kg minimum capacity	6 Kg minimum capacity

1. the capacities are for dry powder devices (or an equivalent capacity for any other suitable extinguisher agent) for inflammability classes a, b and c
2. extinguishers shall:
   A. be marked with the date (month/year) of the next inspection
   B. be fitted with a seal allowing verification it has not been used
   C. be installed on the transport unit, so they are easily accessible to the vehicle crew.

TABLE 1 - FIRE EXTINGUISHER REQUIREMENTS

6.3.2.3 The following must be carried on board the transport unit for each vehicle crew member:

- warning Vest (EN ISO 20471)
- portable lighting apparatus
- pair of protective gloves
- eye protection.

Note: It is recommended that the protective gloves and eye protection to be suitable for use with gases and cold contact gloves, EN511 Cold Contact LVL3 min; Eye Protection EN166, field of Use 5 (Gas & Vapour).

6.3.3 **Transport Documents**

The Transport Document must be retained by the carrier for a period no less than 3 months following the journey.

The Transport Document shall contain the following information:

- the product description, which shall be shown like this:
  "UN1972 METHANE, REFRIDGERATED LIQUID GAS, 2, (B/D)"
- the volume loaded
- name & address of consignor
- name and address of consignee (where multiple consignees are being delivered to the transport document should reference the delivery notes to verify the volume on board)
- in addition to the requirements under ADR for the transport documentation, the holding time of the product for the ISO tank shall be recorded. The holding time

must be calculated with a procedure recognised by the competent authority and stamped on the ISO tank data plate.

6.3.4 **Training**

Persons whose duties concern the carriage of dangerous goods shall be trained in the requirements appropriate to their responsibilities and duties. This includes those involved in filling, unloading, driving and crewing the vehicle. The training shall take the following form:

- general awareness (e.g., site, product etc.)
- function specific (e.g., loading, unloading, tanker operations etc.)
- safety
- security.

Drivers of the tanker vehicles must also be trained, pass and hold a certificate issued by the competent authority, which is 'Driver ADR Certificate'. This must include the Carriage of Dangerous Goods in tanks and Class 2, Gasses.

TRAINING	TERMINAL OPERATOR	DRIVER	OPERATOR MEMBER OF CREW
ADR- in tanks, class 2	not required	required	not required
General awareness	required	required	required
Function specific	required	required	required
Safety	required	required	required
Security	required	required	required

TABLE 2 - TRAINING REQUIREMENTS

6.3.5 **Vehicles and Tankers**

6.3.5.1 Vehicle and Tanker Markings

The following guidance is for journeys undertaken solely in Great Britain and conforms to CDG. The full specification of the markings below can be found in CDG (2009) and ADR:

- orange coloured plate shall be affixed to the front of the vehicle
- hazard warning panels shall be affixed to both sides and the rear of the tanker and must show:
  - The emergency action code 2YE
  - the UN number 1972
  - the hazard label to model no. 2.1, flammable gas
  - the phone number where specialist advise can be sought. the phone number must be one where the emergency services can obtain information at anytime.

6.3.5.2 Trailer Marking

Trailer registration number (required for transportation outside of UK) is to be displayed at the rear of the vehicle as far as reasonably practical from the registration plate of the towing vehicle. If it is not possible to attach the plate to the rear of the vehicle it must be displayed on both sides of the trailer (black characters in the vertical position on white background).

Any vehicle or trailer used to transport an LNG tanker or Portable tank Container must meet the requirements of the standards for the Construction for Vehicles intended for the Carriage of Dangerous Goods. They shall be constructed, and type approved to a minimum requirement of 'FL' as per ADR clause 9.1 and undergo an Annual Technical Inspection (ADR) (see also 7.1).

6.3.5.3 Any tanker or tank Container used to transport LNG shall meet the requirements of the standards for the Construction for the Carriage of Dangerous Goods to tank code RxBN (ADR tank) or T75 (portable tank) as per ADR clause 4.3 and 4.2.

6.3.6 **Exceptional Events**

6.3.6.1 Weather

If lightning is on or around the vicinity of the site where loading or unloading operations are to be carried out, all activities shall stop with regards to the venting and the transferring of LNG. Activities should not recommence until the all clear is given by the responsible person or the weather conditions permit.

6.3.6.2 Vehicle Breakdown or Road Traffic Accident

For any emergency situations and exceptional events involving transportation by road of bulk LNG, references should be made to IGEM/IG/3. This Guidance provides best practice to assist responders in managing an emergency event during the bulk transport of Liquefied Natural Gas (LNG).

SECTION 7 : INSPECTION AND MAINTENANCE

7.1 MANDATORY TESTING AND EXAMINATION

7.1.1 Testing, Inspection and Certification.

7.1.1.2 General

LNG tankers are subject to the full testing and inspection requirements of ADR:

- initial inspection
- periodic
- intermediate
- annual technical.

	Certificate of Approval	Initial	Intermediate	Periodic
Clause references	7.7	7.3	7.5	7.4
Fixed tanks	annual	at build	6 years (+/-3 months)	Initial 6 years and 12 years thereafter
Portable tanks (ISO)	not required	at build	2.5 years (+/-3 months)	5 years

TABLE 3 - LNG TANKER INSPECTION REQUIREMENTS

7.1.1.3 The testing and inspection of tankers including any "Exceptional Checks" must be in accordance with the requirements of the UK Competent Authority.

7.1.1.4 An exceptional check can be incorporated into an intermediate inspection requirement.

7.1.1.5 The tank, valves and fittings, and external pipework shall be made safe in accordance with a documented method statement for the proposed work.

7.1.1.6 Vacuum procedures shall not be used unless the tank data plate or other reliable documentation indicates that it has been designed for vacuum.

7.1.1.7 Working on a tanker is covered by various health and safety regulations, which require full risk assessments and method statements before work is permitted.

7.2 CERTIFICATION AND RECORDS

7.2.1 All inspections and tests, including failures, must be documented and the results retained by the owner or operator for the life of the tanker. These records must be retained for a minimum period of 15 months after a tanker has been taken out of service or scrapped.

7.2.2 If a tanker is sold or transferred, all records must be transferred, without delay, to the new owner or operator.

7.2.3 Upon request, all records must be provided to the competent authority.

7.3 INITIAL MANUFACTURING/TESTING

7.3.1 During initial tank construction, the Approved Inspection Body (AIB) must carry out stage inspections to ensure compliance with the tank design standard and type approval.

7.3.2 Results of all tests carried out must be made available to the AIB for verification that the tests have been completed and that the results are satisfactory.

7.3.3 On completion of assembly of the tank, pipework, valves and fittings, the AIB must witness the carrying out of a pneumatic leak test to ensure satisfactory tightness of all joints.

7.3.4 The AIB must record the individual identification numbers of all relief valves installed in the tanker.

7.3.5 On satisfactory completion of the above tests the AIB must issue the relevant certification.

7.4 PERIODIC INSPECTION

The tank, its service equipment and pressure containing system (including pipework and any permanently connected hoses) must undergo a periodic inspection at intervals which shall not exceed those indicated in Table 3 from the initial inspection and at intervals not exceeding those time period indicated in Table 3. The periodic inspection must be witnessed and documented by an AIB.

The major elements of the periodic inspection that are undertaken by the AIB are:

- examination of the documents
- a pressure test of the tank and pipework, which may be supplemented by NDT at the request of the AIB
- an inspection of the exterior of the tank, tank mountings, pipework and service equipment
- leak tightness test
- stamping the data plate
- issuing report/s and certification.

7.5 INTERMEDIATE INSPECTION

An intermediate inspection must be undertaken at the period indicated in Table 3 after the last periodic inspection.

The major elements of the intermediate inspection undertaken by the AIB, are:

- examination of the documents
- an inspection of the exterior of the tank, tank mountings, pipework and service equipment
- leak tightness test
- stamping the data plate
- issuing report/s and certification.

7.6 EXCEPTIONAL CHECK

7.6.1 An exceptional check must be undertaken in the case of:

- accidental damage which results in any visible deformation (including any gouges) of the tank, it's supporting saddles, pipework or valves, but not if the damage is limited to flexible hoses
- any accidental damage which results in the replacement of the vehicle chassis, or the tank being removed from the chassis to effect repairs
- any modifications to the tank
- any modifications to the service equipment (the complete LNG system excluding the tank) which are not a like for like replacement of components
- any repairs that involve the application of heat to the tank or to its service equipment (including the indirect application of heat).

Note: If service equipment is removed from the tanker for the application of heat, only that item of service equipment requires the Exceptional Check, not the tanker.

7.6.2 If all the requirements of a Periodic Inspection are undertaken at the time of the Exceptional Check, then it can be considered as a Periodic Inspection.

7.6.3 If all the requirements of an Intermediate Inspection are undertaken at the time of the Exceptional Check, then it can be considered as an Intermediate Inspection. This does not alter the timing of the periodic inspection.

7.6.4 If an exceptional check is considered to be a periodic or intermediate inspection, the exceptional check must still be documented (as well as the periodic or intermediate inspection).

7.7 CERTIFICATE OF APPROVAL

7.7.1 Vehicles and trailers that transport LNG must be constructed to meet the requirements of ADR. The specific vehicle code can be found in ADR Table A Column (14), the vehicle code for vehicles intended for the carriage of flammable gases in tank containers being FL.

7.7.2 A Certificate of Approval (ADR Certificate) must be issued to vehicles and trailers that meet with the requirements of FL as outlined within ADR clause 9.1, Scope, Definitions and Requirements for the Approval of Vehicles

7.7.3 Vehicles and trailers that meet the requirements of FL must be subject to an annual Technical Inspection in their registered country. The conformity of the vehicle must be certified by either the extension of the existing Certificate of Approval, or by the issuing of a new one.

7.7.4 The validity of the certificate must expire not later than one year after the date of the Technical Inspection preceding the issue of the certificate. The next approval term must be related to the last nominal expiry date if the technical inspection is carried out within one month before or after that date.

7.8 DEFECT MANAGEMENT

7.8.1 An operator of heavy goods vehicles must meet the governing legislation that is laid out by the Traffic Commissioners in their Statutory Guidance Document. This is in legislation and operators within the or outside of the UK should ensure vehicles are roadworthy and in compliance with local regulatory requirements.

7.8.2 There must be a system of reporting and recording defects that may affect the roadworthiness of the vehicle and prevent its safe operation during a working day or shift. This must also include how any defects recorded were rectified before the vehicle could be used.

7.8.3 If any safety defects are found, the vehicle must not be used on the road until it is repaired.

7.8.4 The driver is always legally responsible for the condition of the vehicle while in use. Therefore, conducting a daily walkaround check is a vital part of a driver's core role. Sufficient time must be given to allow the driver to conduct a complete walkaround check prior to using the vehicle.

7.8.5 Any defects found during the daily walkaround check, while the vehicle is in use or on its return to base, must be the subject of a written report by the driver or some other person responsible for recording defects.

It is good practice to have 'nil' defect reports as they are a useful means of checking that drivers are carrying out their duties and these forms can be used for audit purposes.

7.8.6 Drivers' defect reports used to record any faults and rectification work must be retained for at least 15 months.

7.8.7 There must be an internal system to ensure that unroadworthy vehicles are removed from service, with a nominated person responsible for taking vehicles off the road.

7.9 ADDITIONAL GUIDANCE ON TESTING AND INSPECTION

7.9.1 Leak Tightness Test

On satisfactory completion of the required inspection and reassembly of valves, fittings and pipework, the AIB must witness a pneumatic leak test to ensure pressure containment. This shall be conducted using an inert gas or gas vapour.

7.9.2 Pressure Relief Valves

All tank replacement pressure relief valves shall be set to the correct lift pressure and provided with current test certificates. It is recommended for new PRV's that the lift and reset settings are checked by an authorised test facility before they are fitted for the first time.

7.9.3 Vacuum integrity

On satisfactory completion of the required inspection and reassembly of valves, fittings and pipework, the AIB must witness a vacuum leak test to ensure vacuum retention.

7.9.4 Stamping

On satisfactory completion of the inspections the AIB must stamp the tank data plate accordingly and issue the prescribed certification.

APPENDIX 1 : GLOSSARY, ACRONYMS, ABBREVIATIONS AND UNITS

A.1.1 GLOSSARY

Industry accepted definitions are contained in IGEM/G/4 which is freely available by downloading a printable version from IGEM's website, www.igem.org.uk.

The definitions listed below are relevant to the use of this Guidance. Some definitions apply only to this Guidance and are not given in IGEM/G/4.

ISO container A tank constructed in accordance with a recognised ISO pressure vessel standard that is mounted in a frame, may be attached to the carrying vehicle by `Twist Locks' and is designed to be lifted from the carrying vehicle whilst full.

Re-gasified Change the liquefied natural gas back into a vapour.

Consignor The enterprise which consigns dangerous goods either on its own behalf or for a third party. If the transport operation is carried out under a contract for carriage, consignor means the consignor according to the contract for carriage.

Controlled area A controlled area is a limited access area in which the occupational exposure of personnel is under the supervision of an individual in charge. This implies that access, occupancy, and working conditions are controlled for protection purposes.

A.1.2 ACRONYMS AND ABBREVIATIONS

ACoP	Approved Code of Practice
AIB	Approved Inspection Body
Cat	category
CNG	Compressed Natural Gas
CO_2	carbon dioxide
DGSA	Dangerous Goods Safety Advisor
ESD	emergency shutdown
GB	Great Britain
HGV	heavy goods vehicle
HSE	Health and Safety Executive
IC	incident commander
IGEM	Institution of Gas Engineers and Managers
ISO	International Standards Organization
IOG	Isle of Grain
LBM	liquefied bio-methane
LFL	lower flammable limit – the lowest concentration of NG in air which will form a flammable or explosive mixture
LGV	large goods vehicle
LIN	Liquid Nitrogen
LNG	Liquefied Natural Gas which consists of predominately Methane, may also contain Bio-Methane
MAWP	maximum allowable working pressure
MIP	maximum incidental pressure
MOP	maximum operating pressure
NG	Natural Gas
OP	operating pressure
P&ID	pipe and instrumentation diagram
PRV	pressure relief valve
RTA	Road Traffic Authority
RTC	Road Traffic Collision (formally RTA) including off road excursions without a collision occurring

RTLF	road tanker loading facility
TPED	Transportable Pressure Equipment Directive
TRV	thermal relief valve
UFL	upper flammable limit – the highest concentration of NG in air which will form a flammable or explosive mixture
VRN	vehicle registration number.

A1.3 **UNITS**

bar	bar
Kg	kilogram
mbar	millibar
mm	millimetre
$m^3 h^{-1}$	cubic metre per hour
t	tonne
°C	degree Centigrade
Ω	Ohm
%	percent.

APPENDIX 2: REFERENCES

This Standard is set out against a background of legislation in force in GB at the time of publication. The devolution of power to the Scottish, Welsh and Northern Ireland assemblies means that there may be variations to the Legislation described below for each of them and consideration of their particular requirements is to be made. Similar considerations are likely to apply in other countries and reference to appropriate national legislation is necessary. The following list is not exhaustive.

All relevant legislation is required to be complied with and relevant Approved Codes of Practice (ACoPs), official Guidance Notes and referenced codes, standards, etc. shall be taken into account.

Where British Standards, etc. are quoted, equivalent national or international standards, etc. equally may be appropriate.

Care shall be taken to ensure that the latest editions of the relevant documents are used.

A2.1 PRIMARY LEGISLATION

- Health and Safety at Work etc. Act 1974.

A2.2 SECONDARY LEGISLATION

- International Carriage of Dangerous Goods By Road (ADR)
- Carriage of Dangerous Goods (CDG)
- Dangerous Substances and Explosive Atmospheres Regulations (DSEAR)
- International Maritime Dangerous Goods (IMDG)
- Pressure Systems Safety Regulations (PSSR)
- The Road Vehicles (Construction and Use) Regulations 1986
- Transportable Pressure Equipment Directive (TPED).

A2.3 IGEM STANDARDS

- IGEM/IG/3 Response to LNG Road Tanker Emergencies.

APPENDIX 3 : EXAMPLE CERTIFICATE, FORMS AND INSPECTION SHEETS

A3.1 An example of ADR certificate is shown below:

Certificate of Approval for Vehicles carrying certain Dangerous Goods

Department for Transport — Competent authority for the United Kingdom

Driver & Vehicle Standards Agency

Driver & Vehicle Agency

This certificate testifies that the vehicle specified below fulfils the conditions prescribed by the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)

1 Certificate number	2 Vehicle manufacturer	3 Vehicle Identification Number	4 Registration number (if any)

5 Name and business address of carrier, owner or operator

6 Description of vehicle
SEMI TRAILER TANK

7 Vehicle designation(s) according to 9.1.1.2 of ADR (delete what is not appropriate)
(XXXXX) (XXXXX) (FL) (XXXXX) (AT) (XXXXX)

8 Endurance braking system
(X) Not applicable ( ) The effectiveness according to 9.2.3.1.2 of ADR is sufficient for a total mass of the transport unit of t

9 Description of the fixed tank(s)/battery-vehicle (if any)

9.1 Manufacturer of the tank	**9.1 M1 ENGINEERING**
9.2 Approval number of the tank/battery vehicle	**9.2 RSA FT2 04088**
9.3 Tank manufacturer's serial number/ Identification of elements of battery vehicle	**9.3 CR/528/12**
9.4 Year of manufacture	**9.4 2012**
9.5 Tank code according to 4.3.3.1 or 4.3.4.1 of ADR	**9.5 R12.506BN**
9.6 Special provisions according to 6.8.4 of ADR (if applicable)	**9.6 TA4,TT9**

10 Dangerous goods authorised for carriage
The vehicle fulfils the conditions required for the carriage of dangerous goods assigned to the vehicle designation(s) in no.7

10.1 In the case of an EX/II or EX/III vehicle
( ) goods of Class 1 including compatability group J
( ) goods of Class 1 excluding compatability group J

10.2 In the case of a tank-vehicle/battery vehicle
( ) only the substances permitted under the tank code and any special provisions specified in no.9 may be carried
or
(X) only the following substances (Class, UN number and if necessary packing group and proper shipping name) may be carried

METHANE, REFRIGERATED LIQUID OR NATURAL GAS, REFRIGERATED LIQUID WITH HIGH METHANE CONTENT. CLASS 2 UN NO. 1073

Only substances which are not liable to react dangerously with the materials of the shell, gaskets, equipment and protective linings (if applicable) may be carried.

ADR 1(C)
May 2017

11 Remarks

12 Valid until

JANUARY 31st 2022 (Twenty-two)

Place

Date

JANUARY 27th 2021 (Twenty-one)

Signature

Department for Transport

...r and Vehicle
...dards
... ncy

Tested at .....

13 Extension of validity until

Place

Date

Signature

14 Extension of validity until

Place

Date

Signature

15 Extension of validity until

Place

Date

Signature

NOTE This certificate shall be returned to the issuing service when the vehicle is taken out of service; if the vehicle is transferred to another carrier, operator or owner, as specified in no. 5; on expiry of the validity of the certificate; and if there is a material change in one or more of the essential characteristics of the vehicle.

A3.2 An example of template of certificate of type approval is shown below:

Certificate of Type Approval

Certificate number: GB/T/15/029809/rev 1

Date of Issue : 09/05/2016

Department for Transport

Maritime & Coastguard Agency

This certificate is issued by a Department for Transport Appointed Inspection Body (AIB). Any queries regarding this certificate should be directed to the AIB.

Tank type:	ADR fixed tank (6.8)	Manufacturer:	
RID/ADR tank code:	R10.4BN	Country:	United Kingdom
Drawing no.:			CR/587/15
Shell thickness (mm):	5.95	Max. working pressure (bar):	7
End thicknesses (mm):	6.1 and 6.1	Test/Calculation pressure (bar):	7
Partition thickness (mm):		Min. design pressure (bar):	10.4
Length (m):	13.449	Max. permitted density (kg/m³):	1,400
Width/Diameter (m):	2.595	Maximum design capacity (litres):	56000
Height/Other (m):	2.595		
Max. gross mass (kg):	38000	Max. design temperature (°C):	50
Tare mass (kg):	16000	Min. design temperature (°C):	-196
IMO tank type:	Type8		

For all tanks carrying liquids (including vacuum insulated)

Compartment	1
Capacity (litres)	56000

Securing method: N/A

Inspector: AIB ref.

Additional comments:

UN numbers: UN1972, TU18, TA4, TT9, TP5
UN1977, TA4, TT9, TU19

Standard Used: BS EN13530-2

Expiry Date: 10/09/2025

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A3.3 An example of template of initial inspection is shown below:

Certificate of Initial Inspection

Certificate number:

Date of Issue : 19/05/2016

Department for Transport

Maritime & Coastguard Agency

This certificate is issued by a Department for Transport Appointed Inspection Body (AIB). Any queries regarding this certificate should be directed to the AIB.

Tank type:	ADR fixed tank (6.8)	Manufacturer:	
Type approval number:	GB/T/15/029809	Country:	United Kingdom
RID/ADR tank code:	R10.4BN	Year of manufacture:	2016
Tank serial number:		Owner's/operator's tank identifier:	
Owner:		Operator:	

	Required	Measured		
Shell thickness (mm)	5.95	6	Max. working pressure (bar):	7
End thicknesses (mm)	6.1 and 6.1	6.9 and 6.9	Test/Calculation pressure	10.4
Partition thickness (mm)	0	0	Min. design pressure (bar):	0
			Actual capacity:	55546 litres

Tare mass (kg): 16440	Max. gross mass (kg): 38000	IMO tank type: Type8

For all tanks carrying liquids (including vacuum insulated)

Compartment	1
Capacity (litres)	55546

Items inspected		Documents inspected	
Tank interior:	Yes	Type approval:	Yes
Tank exterior:	Yes	Maintenance:	No
Service equipment:	Yes	Previous inspection:	No
External insulation:	Yes		

Hydraulic pressure test result (bar): 10.4

Leakproofness test result (bar):

Tank: 7 Equipment: 7

Vacuum testing: No

Design characteristics checked: Yes

Inspection of frame or other structural equipment:

Not Applicable

Date of inspection: 27/01/2016 Next regular inspection: 27/01/2022 Type of next inspection: Periodic

Location of inspection:

Inspector: AIB ref: FT2 05706

Inspection notes: Examination carried out by

UN numbers: UN1972, TU18, TA4, TT9
UN1977, TU19, TA4, TT9

Standard Used: BS EN13530-2:2002

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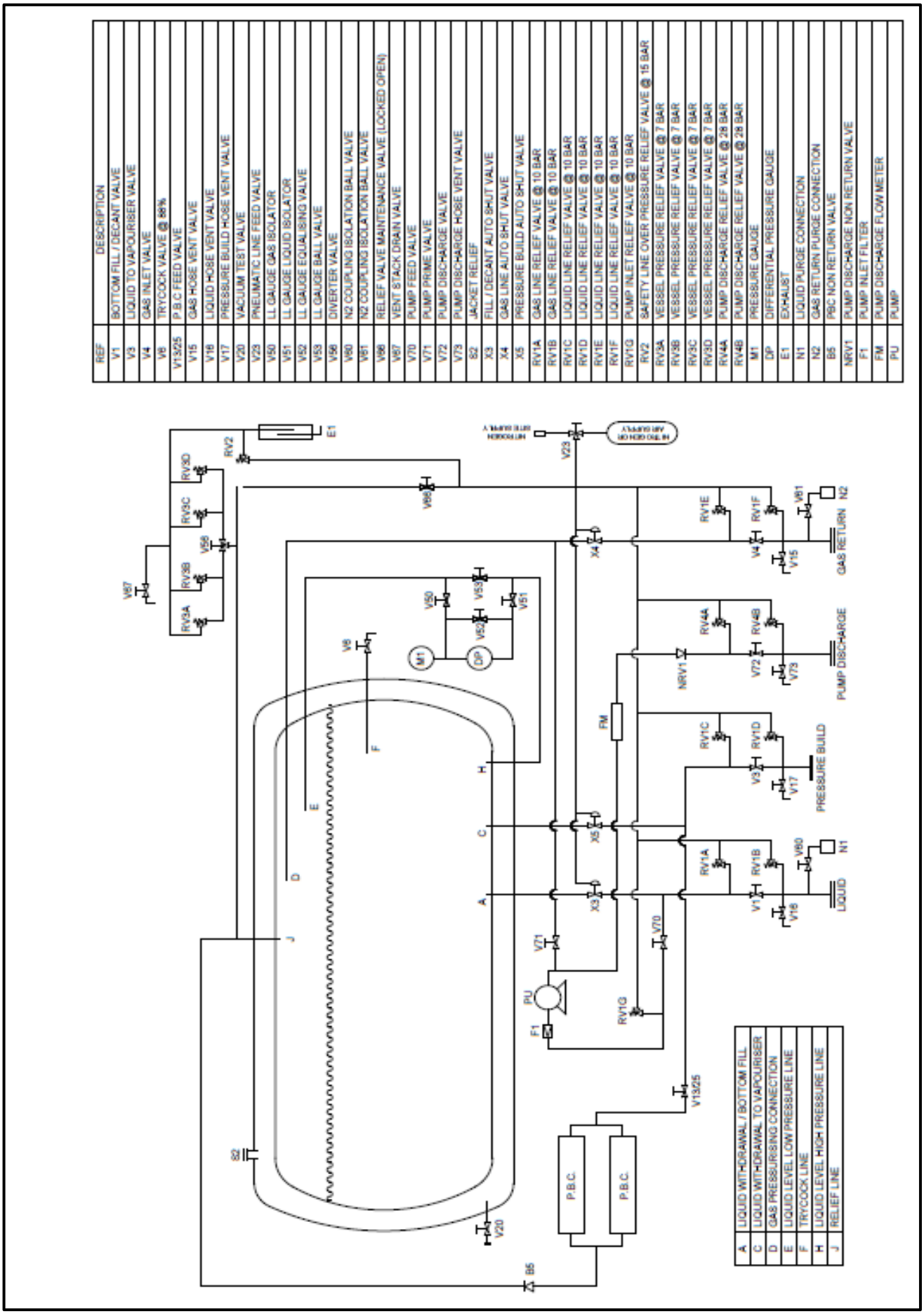
A3.4 An example of template of P&ID is shown below:



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Communication 1854
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