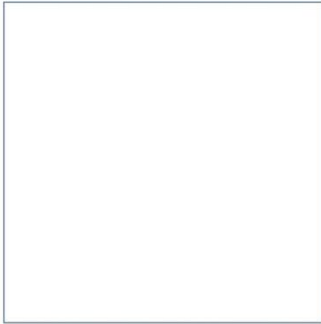
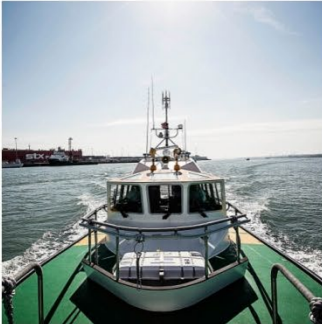
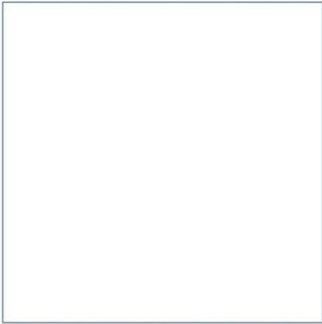
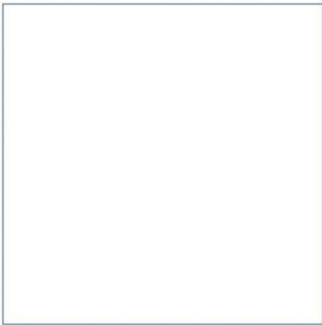


Peel Ports Group

# Group Bunkering Guidelines

August 2024



Innovative Thinking - Sustainable Solutions



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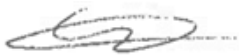


# Group Bunkering Guidelines

August 2024



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# Foreword

This guidance has been produced by ABPmer for the Peel Ports Group (PPG). The intension of this document is to provide information and guidance to PPG for the preparation of policy and procedure for the management and control of bunkering operations within their jurisdiction. The Guidelines also provide an overview of potential bunkering operations and is not limited to those undertaken within PPG's areas of jurisdiction.

Spillages and leakages during bunkering operations are a primary source of oil pollution. Experience has shown that many of the bunker overflows and spillages that do occur can be attributed to human error. This document is for assisting with the construction of policy and procedure, and the contents should be used to develop specific guidelines that cover the relevant operations for each port within the Group.

All bunkering operations should be carefully planned and executed in accordance with applicable regulations, and with good liaison between vessels and the Statutory Harbour Authority. Personnel involved in the bunkering operation on board should have no other tasks and should remain at their workstations during topping-off. Generally, bunkering during cargo operations is not considered to be best practice owing to the need to avoid conflicts of interest for operational personnel. Spillages often occur when crew members are distracted by another task.

The appendices to this Guidance Document provides industry standard practices and approaches and are provided for guidance and reference.

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- B LNG Bunker Ship to Ship Checklist
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- D Ship to Road Tanker Checklist

# 1 Introduction

This guidance document is produced by ABPmer for use by the Peel Ports Group (PPG). It reflects operations undertaken by the Group and identifies best practice from across the ports and shipping industry.

The term bunker is generally applied to the petroleum products stored in tanks, and bunkering is known as the method in which a fuel or product is transferred from one source to a vessel. This document considers bunkering for a ship-to-ship and shore-to-ship perspective; for both commercial and recreational vessels; using both petroleum and alternative based fuels.

The bunkering of any vessel is an essential part of most working ports. Vessel crews need to be adequately trained with suitable experience to carry out their roles and ensure the safety of operations. Additionally, port operators need to ensure that the operation is undertaken in a safe and efficient manner. Spillages and leakages during bunkering operations are a primary source of oil pollution. Experience has shown that many of the bunker overflows and spillages that do occur can be attributed to human error.

## 1.1 Purpose

This document is written to assist with the construction of policy and procedure, and the contents should be used to develop specific guidelines that cover the relevant operations for each port operated by the Group. Ship owners, bunker supply companies, bunker barges and road tankers that are authorised to supply or receive bunkers at PPG sites must ensure their employees align with the guidelines and requirements within this document (so far as they are relevant to their operations). Additionally, the guidance in this documentation considers adjacent activities which may be affected by bunkering operations.

## 1.2 Legislation

The following section identifies relevant legislation relating to bunkering operations and associated activities. It must be noted that the PPG has a duty of care to those who might be affected by its operations, and is responsible for ensuring that operational plans are in place to react to an emergency involving an oil spill within its Statutory Harbour Authority areas. The following legislation and associated guidance should be considered when preparing policy and procedure for bunkering operations.

### 1.2.1 Primary legislation

#### **The Merchant Shipping (Ship-to-Ship Transfers) Regulations 2020 (SI 94/2020)**

This national legislation applies to anyone intending to undertake fuel transfer operations and is applicable to bunkering operations undertaken at all PPG ports. Several sections are important to note for bunkering operations within a port authority. These sections are summarised below.

Section 4 of this regulation states the requirements for cargo transfers in the UK or controlled waters. It is required that cargo transfers include the following:

- Part 1) A cargo transfer must not be carried out in United Kingdom waters unless the ships carrying out the cargo transfer are:
- (a) within harbour authority waters, or
  - (b) within the permit area, and a permit has been obtained from the Secretary of State in accordance with the procedure set out in Merchant Shipping Notice 1829.

- Part 4) The requirements are that:
- (a) a ship-to-ship transfer operations plan has been approved by the ship's flag state;
  - (b) a copy of that ship-to-ship transfer operations plan is on board the ship; and
  - (c) the cargo transfer is carried out in compliance with that ship-to-ship transfer operations plan.

Section 5 refers to cargo transfers within harbour authority waters:

- Part 1) Subject to Regulation 6 (exceptions) and Regulation 11 (exemptions), a cargo transfer must not be carried out in harbour authority waters unless it is:
- (a) carried out in accordance with an authorisation of the harbour authority that regulates or manages the waters in which the cargo transfer is carried out.
  - (b) a lightening operation; or
  - (c) a consolidation operation.

Section 6. Defines the applicable exemptions to the Section 4 (cargo transfers within United Kingdom waters or controlled waters); and Section 5 (cargo transfers within harbour authority waters):

- (a) between a ship and an offshore installation;
- (b) to or from a warship or naval auxiliary ship;
- (c) to or from any other ship owned or operated by a State and used solely, for the time being, on government non-commercial service; or
- (d) carried out by or on behalf of a General Lighthouse Authority.

Section 7 covers the authorisation of cargo transfers within harbour authority waters:

- (1) A harbour authority may only authorise a cargo transfer which is within the scope permitted by the harbour authority's oil transfer licence.
- (2) The authorisation of a cargo transfer by a harbour authority is valid only if given:
  - (a) on receipt of a written application for authorisation;
  - (b) in advance of a cargo transfer; and
  - (c) in writing.

Section 8 states the requirements a harbour authority must meet prior to obtaining an oil transfer licence:

- Part 1) Before a harbour authority may obtain an oil transfer licence, the harbour authority must:
- (a) determine, in accordance with the procedure in Schedule 1 (initial determination of likely effects on European sites), whether the cargo transfers to be authorised pursuant to the licence would be likely to have a significant effect on any European site; and
  - (b) apply for the licence to the Secretary of State in accordance with the procedure in Schedule 2 (procedure for grant of an oil transfer licence).

**Note:** Guidance for the application of these regulations is covered within MSN 1829 Ship to Ship Transfer Regulations 2020. Details of this MSN are covered in Section 1.2.3 of this document.



## Merchant Shipping Act 1995

Section 135 of the Merchant Shipping Act 1995 places restrictions on transfer of oil at night. It identifies that:

- Part 1) No oil shall be transferred between sunset and sunrise to or from a ship in any harbour in the United Kingdom unless the requisite notice has been given in accordance with this section or the transfer is for the purposes of a Fire and Rescue Authority or other person who employs or engages fire-fighters, the Scottish Fire and Rescue Service, the Northern Ireland Fire and Rescue Service Board or other person who employs or engages fire-fighters.
- Part 2) A general notice may be given to the harbour master of a harbour that transfers of oil between sunset and sunrise will be frequently carried out at a place in the harbour within such period, not ending later than twelve months after the date on which the notice is given, as is specified in the notice; and if such a notice is given it shall be the requisite notice for the purposes of this section as regards transfers of oil at that place within the period specified in the notice.
- Part 3) Subject to subsection (2) above, the requisite notice for the purposes of this section shall be a notice given to the harbour master not less than three hours nor more than 96 hours before the transfer of oil begins.
- Part 4) In the case of a harbour which has no harbour master, references in this section to the harbour master shall be construed as references to the harbour authority.
- Part 5) If any oil is transferred to or from a ship in contravention of this section, the master of the ship, and, if the oil is transferred from or to a place on land, the occupier of that place, shall be liable on summary conviction to a fine not exceeding level 3 on the standard scale.

**Note:** Consideration of should be given to include details of any restrictions and exemptions Impacting the transfer of oil within the harbour limits. Care and detailed instruction should be made available, including any reference to local byelaws or directions controlling or restricting transfer operations.

## Health and Safety at Work (etc) Act 1974

The Health and Safety at Work (etc) Act 1974 (HASAWA) is an Act that (as of 2011) defines the fundamental structure and authority for the encouragement, regulation and enforcement of workplace health, safety and welfare within the United Kingdom. The Act defines general duties on employers, employees, contractors, suppliers of goods and substances for use at work, persons in control of work premises, and those who manage and maintain them, and persons in general.

**Note:** Relevant application of HASAWA 1974 should be considered when creating procedures for all bunkering operations, this would include following the correct associated guidance and codes of practice such as the HSE's Safety in docks. Approved Code of Practice. This Approved Code of Practice (ACOP) and guidance covers safety in dock operations and is aimed at those who have a duty to comply with provisions of the Health and Safety at Work (etc) Act 1974.

## 1.2.2 Secondary legislation

### The Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 1998 (SI 1056/1998)

This regulation places duties and responsibilities on ports and harbours when handling oil or vessels over a certain size which have a potential to be a contributing factor to the scale of an oil pollution event. The regulations set out the requirements on ports and harbours depending on whether they meet the thresholds listed below:

- a) any harbour for which there is a statutory harbour authority having an annual turnover, as defined in the Schedule hereto, of more than £1 million;
- b) any other harbour, and any oil handling facility, offering berths alongside, on buoys or at anchor, to ships of over 400 GT or oil tankers of over 150 GT;
- c) any other harbour, and any oil handling facility, in respect of which the Secretary of State has served the harbour authority or operator (as the case may be) with a notice stating that he is of the opinion that maritime activities are undertaken at that harbour or facility which involve a significant risk of discharge of over 10 tonnes of oil; and
- d) any other harbour or oil handling facility in respect of which the Secretary of State has served the harbour authority or operator (as the case may be) a notice stating that he is of the opinion that it is located in an area of significant environmental sensitivity, or in an area where a discharge of oil or other substances could cause significant economic damage.

**Note:** Consideration should be given to including the above regulations into bunkering procedures and also the approved emergency response and environmental plans.

### The Dangerous Goods in Harbour Areas Regulations 2016 (SI 721/2016)

This regulation identifies the requirements for the marking of vessels and the flags and lights that must be used by vessels for the handling of dangerous good in a harbour. This is detailed in Part 3, Sections 8 and 9.

Flags and lights to be displayed by vessels. Section 8:

- (1) Where a vessel is carrying any of the dangerous goods specified in Schedule 1, the master of that vessel shall ensure that it displays
  - (a) In the case of a vessel with a mast:
    - (i) during the day, a flag complying with the requirements of Parts 1 and 2 of Schedule 2, and
    - (ii) at times of restricted visibility or during the night, an all-round red light giving a clear, uniform and unbroken light visible in good nighttime conditions for a distance of at least 2 nautical miles.
  - (b) in the case of a vessel without a mast:
    - (i) during the day, a flag complying with the requirements of Parts 1 and 3 of Schedule 2, and
    - (ii) when moored or anchored during the night and during the day in restricted visibility, an all-round red light.
- (2) Any flag or light required by paragraph (1) to be displayed shall be positioned so as to be as conspicuous as is reasonably practicable, and in the case of a light, so that it is above any other light being displayed by the vessel.

- (3) Any dumb craft must have either its towing craft or, when moored, its accompanying craft display the appropriate flag or light as detailed in the paragraphs above.
- (4) This regulation does not apply to a ferry operated entirely within Category A-D waters within the meaning of the Merchant Shipping (Categorisation of Waters) Regulations 1992.

Vessels to keep a safe distance from moored or anchored vessels displaying the flag or light required by regulation 8.

Vessels to keep a safe distance from moored or anchored vessels displaying the flag or light required by regulation 8. Section 9.

- (1) A master shall not bring a vessel alongside a moored or anchored vessel which is displaying a flag or signal required by regulation 8 without:
  - (a) the permission of the berth operator and the master of the vessel if it is at berth;
  - (b) the permission of the harbour master and the master of the vessel if it is elsewhere, and must otherwise keep a safe distance from that vessel.
- (2) The permission in paragraph (1) may relate to a named vessel, to a class of vessels or to vessels generally.

**Note:** Bunkering guidance and procedures should contain reference to all controls which may impact or conflict with bunkering or movement of dangerous goods within the harbour limits. Policy and procedure for handling dangerous goods should also consider the impact of bunkering operations. Details of vessel marking, lights and day signals should be included within bunkering procedures and dangerous goods handling procedures if applicable.

### The Merchant Shipping (Oil Pollution) (Bunkers Convention) Regulations 2006 (SI 1244/2006)

The Merchant Shipping (Oil Pollution) (Bunkers Convention) Regulations 2006 amends Chapter 3, Part 6 of the Merchant Shipping Act 1995. This regulation introduces terms of liability for bunker oil pollution damages to the parties which could be involved. It requires the parties involved to have appropriate insurance for their operations and is directed towards bunker operators and owners.

Consideration should be given to include a process for checking and approving insurance details of receiving and delivery vessels. The procedures should incorporate a method of approval based on the production of evidence of protection insurance.

### The Petroleum (Consolidation) Regulations 2014 (SI 1637/2014)

The Petroleum (Consolidation) Regulations 2014 combine, update and replace all previous legislation on petrol storage. The existing health and safety responsibilities remain the same; anything that is still relevant is included in the 2014 Regulations. Section 12 covers general prohibitions on dispensing and supply of petrol to motorboats.

**Note:** Consideration should be made as to whether this would apply to the fuel transfer operations undertaken within the port area. Fuelling of leisure craft in marinas or boatyards may need to be included within the bunkering procedures for the port. This should be assessed and included as required, taking into consideration the requirements of Section 12 of the regulations.

## The Dangerous Substances and Explosive Atmosphere Regulations 2002 (SI 2776/2002)

The primary legislation applying to the control of substances that can cause fires and explosions in the workplace is the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) (SI 2002 No.2776).

DSEAR requires employers to assess the risks of fires and explosions that may be caused by dangerous substances in the workplace. From June 2015 DSEAR also covers the risk caused by gases under pressure and substances that are corrosive to metals. This is to allow for changes in the EU Chemical Agents Directive the physical hazards aspects of which are enacted in Great Britain through DSEAR. These risks must then be eliminated or reduced as far as is reasonably practicable. The aim is to protect employees and other people who may be put at risk, such as visitors to the workplace and members of the public. The Regulations complement the requirement to manage risks under the Management of Health and Safety at Work Regulations 1999 (SI 1999 No 3242).

**Note:** Consideration should be given to ship board operations and related safe systems of work which control the atmospheric environment during fuel transfer operations. Similar, consideration should be given to shore based controls for landside bunkering operations. This should form part of the approval process and control measures as part of the safe systems of work.

### 1.2.3 Guidance

#### Guide to Good Practice for Port Marine Operations (GtGP) 2018

The GtGP is intended to supplement the Port Marine Safety Code (Code). The Code and GtGP are applicable both to statutory harbour authorities and to other marine facilities which may not necessarily have statutory powers and duties. The GtGP, in Section 6.7.3, states that:

*"The harbour authority should have in place processes or procedures which control activities under the safety management system for controlled work such as:*

- Hot work,
- Cold work,
- Diving,
- Entering enclosed spaces,
- **Bunkering or refuelling of vessels / craft**
- Vessels requiring engine immobilisation."

**Note:** The inclusion of bunkering procedures should form part of the Marine Safety Management System (MSMS) in order to meet the requirements of the PMSC. Consideration should be given to how bunkering operations impact on other marine and landside operations within the port. Details of control measures and risk assessment should form part of the MSMS.

#### International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (2002)

The purpose of the International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels (IGF) is to provide an international standard for ships, other than vessels covered by the International Gas Carrier (IGC) Code, operating with gas or low-flashpoint liquids as fuel.

The IGF code establishes the additional training required for personal involved with low flashpoint fuels and should be referred to during operations involving them. The Code states that:

*“Seafarers responsible for designated safety duties associated with the care, use or emergency response to the fuel onboard ships subject to the IGF Code shall hold a certificate in basic training for service on ships subject to the IGF Code”.*

**Note:** This code should be reviewed and considered when drafting procedures for bunkering. The code is aimed at shipboard operations, however, evidence of adherence with the code should be considered if the bunkering procedure require vessel validation or approval inspections as part of the acceptance criteria.

### MSN 1829 Ship to Ship Transfer Regulations 2020

MSN 1829 provides guidance to shipowners, masters, bunker suppliers, and operators engaged in ship-to-ship operations. The notice draws on information from Annex I of the International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 and should be read in conjunction with the Merchant Shipping (Ship-To-Ship Transfers) Regulations 2020/94.

The key points which apply to operations within a Statutory Harbour Area include the following:

- UK flagged ships that are involved in cargo transfers to or from a ship of 150 GT or more are internationally required to carry a plan prescribing how to conduct Ship to Ship (STS) operations in line with International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I.
- For transfers within the permit area this notice establishes detailed technical requirements to apply to STS operations including a need to provide 72 hours' notice.

**Note:** The guidance in MSN 1829 applies to the UK and must be considered for inclusion into bunkering policy and procedure. The guidance explains the requirements of the Ship to Ship Transfer Regulations 2020 and provides guidance for Statutory Harbour Authorities for the management of transfer operations.

### International Safety Guide for Oil Tankers and Terminals (ISGOTT 6) 6th Edition

OCIMF and ICS together with the International Association of Ports and Harbours (IAPH) worked together for over two years to revise and update the International Safety Guide for Oil Tankers and Terminals (ISGOTT).

This Sixth Edition (published 2020) encompasses the latest thinking on a range of topical issues including gas detection, the toxicity and the toxic effects of petroleum products (including benzene and hydrogen sulphide), the generation of static electricity and stray currents, fire protection and the growing use of mobile electronic technology.

New significantly reappraised topics include:

- Enclosed space entry.
- Human factors.
- Safety Management Systems (SMSs), including complementary tools and processes such as permits to work, risk assessment, Lock-out/Tag-out (LO/TO), Stop Work Authority (SWA) and their linkage to the underlying principles of the International Safety Management (ISM) Code.

- Marine terminal administration and the critical importance of the tanker/terminal interface.
- Alternative and emerging technologies.
- **Bunkering operations, including the use of alternative fuels such as Liquefied Natural Gas (LNG) and Methanol.**
- Cargo inspectors.
- Alignment with OCIMF's recently revised Mooring Equipment Guidelines.

### Dangerous Substances and Explosive Atmospheres Regulations 2002. Approved Code of Practice and guidance

The Approved Code of Practice (ACOP) and guidance provide practical advice on how to comply with the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR). These Regulations require the elimination or reduction of risk of fire and explosion from substances connected with work activities.

The ACOP is primarily for an informed and experienced audience such as health and safety professionals. The leaflet [Controlling fire and explosion risks in the workplace INDG370](#) provides a short guide to DSEAR for small and medium-sized businesses.

**Note:** Consideration should be given to shipboard operations and related safe systems of work which control the atmospheric environment during fuel transfer operations. Similar, consideration should be given to shore-based controls for landside bunkering operations. This should form part of the approval process and control measures as part of the safe systems of work.

The ACOP applies to workplaces that manufacture, store, process or use dangerous substances as defined in this publication.

### Safety in docks. Approved Code of Practice

Safety in Docks: Approved Code of Practice and guidance (ACOP) covers safety in dock operations and is aimed at those who have a duty to comply with provisions of the Health and Safety at Work (etc) Act 1974. This includes people who control dock premises, suppliers of plant and equipment, dock employers, managers, safety officers, safety representatives and workers.

**Note:** Developed by the Health and Safety Executive, Port Skills and Safety and Unite the Union and others to help employers, employees and the self-employed to comply with the law. The ACOP only addresses some specific dock-related issues and complying with the ACOP alone will not be sufficient to fulfil your duties under health and safety law. You will also need to refer to ACOPs and Regulations relating to relevant operations.

## 2 Bunkering Operation

This section provides an overview of the bunkering operation and types of operation. The information provided does not give procedural guidance, it provides more of a background of the operation. Consideration should be given to the types of bunkering operation undertaken within the port or harbour area.

When the ship receives any kind of oil for use in its machinery it is called a bunker fuel or bunker oil. Bunker is used to describe fuel which is stored on a ship and used to power the engines. If a vessel is carrying marine fuel or lube oil to discharge it to another port, it is not called "bunker". If the vessel or truck is carrying it to transfer to another ship for use in its machinery, it is termed as "bunker" and the operation performed to transfer the oil is known as "bunkering". Bunker fuel or bunker oil are carried in separate storage tanks on vessels.

The bunkering procedure is an operation which has been the reason for several accidents in the past. Bunkering on a ship can be of fuel oil, sludge, diesel oil, cargo etc. Bunkering of fuel or diesel oil requires utmost care and alertness to prevent a fire, accident or oil spill.

### 2.1 Types of bunkering

Bunkering is an operation which involves the transfer of fuel to or from a vessel for use as a fuel source. This process can be completed in a number of different ways but falls into two separate categories. Different fuels have different methods and procedures and thus carry different risks for port operations.

#### 2.1.1 Ship to ship

Ship to ship bunkering operations is when a bunker vessel berths alongside another receiving vessel that is either moored at a berth, or is at anchor, and transfers the bunkers to the other. Bunker vessels typically range from barges (which carry around 800 m<sup>3</sup> of bunkers) to ships (that carry 5,000 m<sup>3</sup>). Dependent on the design and operation a bunker vessel may carry different grades of bunker fuels and lube oils in its tanks.

The bunker vessel will typically supply its own fenders for deployment between the vessels, allowing it to come safely alongside. It will then pass ropes to be made fast to the receiving vessel's mooring equipment. Once secure, the bunker vessel passes a hose or hoses to be connected to the receiving vessel's bunker tank manifolds. It is then usual practise to complete a checklist which establishes sampling, quantities, method of communication and emergency procedures etc for both vessels. Once completed the transfer of the bunker will commence.

Generally, ship to ship transfers involve sizeable quantities of bunkers. For example, the largest container ships may have a fuel oil bunker capacity that is in excess 15,000 m<sup>3</sup> and a diesel oil bunker capacity in excess of 2,000 m<sup>3</sup>.

#### 2.1.2 Shore to ship

Shore to ship bunkering operations is when the vessel receives bunkers from either a roadside tanker, or a shoreside fuel line. As with ship-to-ship transfers shoreside staff and vessel crew will establish sampling, quantities, method of communication, emergency procedures, etc for both parties. A hose is used to transfer fuel between the ship and the shoreside connection or road tanker. Road tankers have

a capacity of around 40 m<sup>3</sup>, so are generally used for bunkering smaller vessels. The quantities available to be delivered by a shoreside connection will depend on the size of the shoreside storage tanks.

### 2.1.3 De-Bunkering/Lightening (Ship to ship and Ship to Shore)

De-bunkering is a rare occurrence in most ports. A de-bunkering operation is when a vessel has its bunkers removed in order to decrease its draught or if access to a tank is required. The operation is mostly undertaken by vessels that are entering dry dock. This de-bunkering operation may be undertaken using a ship-to-ship, or ship-to-shore process and uses a hose to transfer the fuel/oil between the discharging vessel and the receiving barge/road tanker or shoreside receiving facility.

## 2.2 Fuel types

The majority of bunkers currently supplied to all vessels are petroleum based. Vessels powered by more sustainable greener fuels are currently under development and are expected to enter into the market over the next decade. This section covers some of the different types of bunkers which fit into these categories and their current usage in industry, as well as looking at some of the possible future and alternative fuels.

### 2.2.1 Petroleum-based bunkers

There are a variety of different bunkers supplied to commercial, passenger and recreational vessels, the majority of which are petroleum-based products and include but are not limited to the following types.

#### Marine Fuel Oil (MFO)

MFO also known as (Heavy Fuel Oil - HFO) and sometimes referred to BFO (Bunker Fuel Oil) by UK refineries. There is a slight difference between all these variations with HFO used to mean 380 centistokes, and MFO used to mean 180 centistokes. MFO is now used as a broad term in describing heavy fuel oil for ships. MFO has a tar like consistency and has to be heated in order to reduce the viscosity to allow it to be pumped. It is primarily used in low to medium speed engines as a fuel source for vessel propulsion. MFO has a relatively low cost compared to comparatively cleaner fuel sources such as distillates. MFO is contaminated with several different compounds including aromatics, sulphur and nitrogen; making emissions upon combustion more polluting compared to other fuel oils.

#### Marine Diesel Oil (MDO)

MDO is a distillate fuel that is primarily used in high and medium speed engines and generators.

#### Marine Gas Oil (MGO)

MGO is very similar to MDO, but lighter and with lower number of residuals. It contains the lowest amount of sulphur.

#### Intermediate Fuel Oil (IFO)

IFO is a blend of HFO and MGO. Its viscosity is such that it usually doesn't require heating, unless used in colder climates.



## Liquefied Natural Gas (LNG)

LNG is a gas (predominantly methane, with some mixture of ethane) that has been cooled down to liquid form. This is for ease and safety of non-pressurized storage or transport. Due to legislation restricting the use of bunkers with a sulphur content greater than 0.5%; there has been an increase in the use of LNG as it is cheaper than low sulphur liquid fuels. Ships which carry LNG as a cargo often have engines that run on the LNG that boils off from the cargo tanks.

## Lubricating Oil (LO)

LO (also widely referred to as lube oil) is used in lubricating the moving parts of a vessel's engine and other machinery. The size of the engines used on ships results in an amount of LO being burnt during their operation. For example, a large containership may carry over 600 m<sup>3</sup> of LO in varying grades.

## 2.2.2 Alternative and future bunkers

In addition to the petroleum-based bunkers which are more standard fuel sources, there are various new fuels coming into use and could be used more widely in the future. Some of these fuel types are identified below.

### Drop-in fuels

Drop-in biofuels can be produced from oilseeds via trans-esterification, lignocellulosic biomass via thermochemical process, sugars and alcohol via biochemical conversion or by hybrids of the above methods. Drop-in fuels encompass high hydrogen to carbon ratio with no/low sulphur and oxygen content, low water solubility and high carbon bond saturation. In short drop-in fuel is a modified fuel with close functional resemblance to fossil fuel.

### Methanol (Drop in)

Methanol, also known as methyl alcohol, is one of the most widely produced chemicals on earth, with nearly 100 million tons currently being made per year worldwide. Nearly all methanol is produced from natural gas or coal, though there are greener methods of production now available. Methanol used as a fuel produces comparatively low pollutant emissions. Methanol handling and power conversion technologies are mature, and there is a strong level of infrastructure already existing in ports. However, the fuel emissions include a high amount of formaldehyde which at high levels would have a negative effect on the human nervous system and Methanol produces less power per tonne which means ships would require more frequent fuelling.

### Biofuels (Drop in)

Biofuels are produced from biomass and cover a range of fuels such as bioethanol and biodiesel. Biodiesel is used interchangeably with FAME (fatty acid methyl ester) which is the generic chemical term for a bio-based component from renewable sources like soya oil, used cooking oils and animal fats/tallow.

First-generation biofuels are produced from food crops grown on arable soil. The sugar, starch, or oil contained is converted into biodiesel or ethanol. This is currently 99% of today's biofuels. Second-generation biofuels are made on the basis of lignocelluloses, wood biomass, agricultural residues, waste vegetable oil and public waste.

Bioethanol can be sustainably produced from waste and lignocellulosic feedstocks, with much higher supply potential, capable of replacing all fossil fuels in the shipping sector. However, bioethanol is not

compatible with current marine diesels and cannot be used as a drop-in fuel. This had led to a development in engine technology with the introduction of multifuel engines. These engines can use oil, gas, and alcohols (e.g., methanol or ethanol) in a diesel cycle. Therefore, the use of ethanol may grow significantly.

## Hydrogen

The use of hydrogen is already being tested, with a number of small vessels having been built to operate on either diesel or hydrogen. The gas is already widely used in industrial processes across the globe, but nearly all hydrogen is produced using fossil fuels. Approximately 6% of global natural gas and 2% of coal currently goes to hydrogen production. While this kind of hydrogen could be used to power ships with zero emissions from the ship itself, it is not low carbon since fossil fuels are used to produce it. Hydrogen can be produced through electrolysis; however, this process is expensive. Currently just 0.1% of hydrogen is made using electrolysis.

Other issues of hydrogen include its high flammability and storage. To store it on board a ship as a liquid, it needs to be cooled to extremely low temperatures (around  $-253^{\circ}\text{C}$ ). It takes up around eight times more space than the amount of marine gas oil needed to give the same amount of energy.

## Ammonia

Ammonia is a compound of nitrogen and hydrogen with the formula  $\text{NH}_3$ . It has about half the energy density of traditional bunker fuels and takes on a liquid form at  $-33^{\circ}\text{C}$ , it does not have to be stored in high-pressure or cryogenic tanks. Ammonia is difficult to burn, specialised internal combustion engines are currently being developed. Green and blue hydrogen are potential feedstocks to produce zero carbon ammonia and are able to be bunkered both onshore and offshore before being combusted by onboard engines.

## Nuclear

There is long history of nuclear power being used in sea going vessels, primarily submarines and naval vessels. The few active commercial vessels using nuclear power as a form of propulsion are operated by Russia and include approximately six icebreakers and an ice breaking cargo ship. Experimental commercial vessels with nuclear propulsion were also constructed by the German, Japanese and American governments in the 1960s and 1970s. Current design concepts for commercial use include the use of alternative reactor technologies, such a molten salt cooling.

Although the switch to low emission fuel sources has created renewed interest in nuclear power questions remain around civil liability and safety. Any commercial vessel using nuclear power would require the use of highly specialised facilities to undergo refuelling.

## 3 Considerations for Bunkering Operations

Serious consideration should be given to requirements prior to the arrival of a vessel in order to ensure a safe and effective bunkering operation. These may include, but are not limited to:

- Pre arrival approvals;
- Bunker quantity;
- Bunker type;
- Bunker plan;
- Mooring arrangement;
- Tank status and location;
- Bunker equipment;
- Pollution equipment;
- Other Intended cargo operation/ship operations; and
- Port operations.
- Ship's trim and list

**Note:** It may be relevant to consider the notification, approval and oversight of the bunkering operation and how it impacts on the wider operation and safety of the port. The bunkering process should address these requirements and give clear instruction of the requirements of the harbour authority.

### 3.1 Responsibility

This section provides an insight into the responsibilities of each party as part of the bunkering transfer process. Consideration should be given to the areas of responsibility when policy and/or procedures are being written.

The International Safety Management (ISM) code requires that the vessel operators have a responsibility to 'establish procedures plans and instructions, including checklists as appropriate, for key shipboard operations concerning safety of the personnel, ship and protection of the environment'. Under this requirement the operators would have to supply the ship with appropriate checklists and procedures for bunkering operations. In addition to this the company is also required to identify potential emergency shipboard situations and establish procedures to respond to them.

It is common practice for the Bunker Supplier to have written safety, health, environment and quality programs (including a pollution emergency plan and/or Shipboard Oil Pollution Emergency Plan (SOPEP)) in place at all times and to make these available to the Harbour Master upon demand for inspection. Additionally, they shall undertake risk assessments of the bunkering services that it offers within the harbour authority waters and shall make these available to the Harbour Master upon demand for inspection.

The supplier is also expected to be insured for their operations which includes third party liability risks (including but not limited to third-party liability, wreck removal, pollution and personal injuries) and for levels of cover as would be taken out normally by a prudent supplier of comparable services, and the Bunker Supplier shall provide the Harbour Master upon demand with documentary evidence of such insurance cover.

During the operations the supplier, vessel owners and Masters should follow the principles of the bunkering operations guidance procedures as laid out in International Safety Guide for Oil Tankers and

Terminals (ISGOTT) (2020) and be responsible for complying with and adhering to the appropriate practices and procedures laid down for their operations and port guidance.

## 3.2 Training and competence

When drafting bunkering policy or procedure it is vital that consideration has been given to the competence and qualification of the staff undertaking the operation. The following provides information on the expected competence levels relating to the operation.

As bunkering operations are generally undertaken by seafarers, competence is achieved through mandatory Standards of Training, Certification and Watchkeeping (STCW) training, and onboard vessel familiarisation with procedures for bunkering and oil spill response. In addition to this the officers involved in loading and discharge operations onboard a bunker vessel will have a Dangerous Cargo Endorsement (DCE) that is relevant to the type of cargo being carried; oil, chemical or gas. If any shore side personnel are involved in the operations of loading fuel tanks from a shore facility, they should have training appropriate for that operation as required by the Management of Health and Safety at Work Regulations 1999.

Ports and Harbours are responsible for maintaining the safe and efficient use of the harbour by all those who wish to do so. Under the (Oil Pollution Preparedness, Response and Co-operation (OPRC) regulations (1998), Harbour Authorities, which meet the minimum threshold for handling of liquid bunkers, have a duty to prepare and implement plans which are subject to approval by the MCA for oil pollution response.

Port and harbour authorities falling within the regulations are required to hold sufficient resources to deal with Tier 1 (operational) spills. They are required to have further resources available within six hours on a contract or mutual support basis to deal with Tier 2 and above spills related to their operations.

In order to fulfil these requirements, the harbour authority will have to ensure that their staff are appropriately trained in order respond to a Tier 1 pollution; and their Tier 2 contractors are suitably trained and have suitable equipment for dealing with the potential pollutants in the Harbour. The harbour authorities' Oil Pollution Response Manual will indicate the specific level of training and equipment required at the port. Section 4 identifies different oil pollution response equipment that should be available. Below is a list of training which should be considered for port operators.

Shore side pollution response training and roles:

- Oil Spill Operator - First Responder (MCA Level 1 to MCA Level 2);
- Shoreline Site Supervisor (MCA Level 3);
- Oil Spill Clearance - On-Scene Commander (MCA Level 4); and
- Oil Spill Response Management (MCA Level 5).

## 3.3 Bunker Equipment

All bunker equipment should be maintained and certified for the operations they are used in. Bunker hoses can fail, so it is important that the certificates are in date, hoses are regularly pressure tested, with a record to prove their suitability. Hoses in use should be clean, free from kinks, and on inspection seem to be in good overall condition. No joints between hoses should be made overboard and all should be within one metre of the ship's side. When handling hoses, the use of single strops should be avoided. Correct gaskets are to be used, and all flanges properly secured with the correct sizes of bolts and nuts.

Many bunker barges use quick release connectors which provide a dry break, quick release system. These items should be serviced (both male and female ends) within the manufacturer's guidelines, clean and tested, and are certificated.

Consideration should be given to including a system within the procedures for pre-approval and inspection of bunker vessels operating within the authority's limits. This should include the management and quality of the equipment used in the bunkering operation. This can be achieved by pre-operational certification inspections as part of the approval process.

## 3.4 Management

Bunker transfer between bunker barge and vessel must be managed by the authorising authority making sure that the vessels have the correct authorisation and certification in order to undertake their operations within the Harbour's boundaries.

Bunker transfers between road tankers and vessels are the responsibility of individual ports and berth operator who should monitor the process. The harbour authority should undertake random checks as part of the duty of care as required by the Dangerous Goods in Harbour Areas Regulations, 2016.

Consideration should be given to how the operations are monitored and managed during the transfer. To aid in the oversight and management of the operation, procedures should contain detailed requirements for how monitoring and control is undertaken by both the ship and berth holders.

### 3.4.1 Approvals (reporting)

Prior to bunker suppliers working in the harbour area and undertaking bunker operations it is common practice for suppliers (including their operators, vessels and/or road tankers) to be registered with the authorising harbour authority before any individual act of bunkering is undertaken.

A Bunker Vessel and Barge Approval and Audit policy and procedure should be considered. This could include vetting, monitoring and acceptance criteria.

The procedure could include a process for bunker vessel vetting, with approval given when receipt of all required documentation. The harbour authority may then wish to issue a letter of acceptance allowing operations to be conducted, subject to the procedures laid out within the bunkering operational procedures.

A record of bunker barges approved for operation within the harbour authority limits could be considered. If implemented it should be maintained and audited annually. This process could include a system for improvement or renewal and provide feedback to bunker suppliers providing information of the outcome of the audit, noting any deficiencies found. Bunker suppliers could then have an agreed period to rectify any deficiencies found. This would provide evidence of a robust management by the authority of the bunkering operations and control of third-party operations.

The below is an example of Bunker Vessels approval requirements which could be considered:

1. Bunker Vessel Acceptance Criteria:
  - 1.1 An up-to-date copy of OCIMF Vessel Particulars Questionnaire (VPQ).
  - 1.2 Evidence of Pollution Insurance Cover.
  - 1.3 Operations Manual extracts for 'Bunkering Procedures' and 'Lightening Procedures', including copies of relevant Safety Check Lists used.

- 1.4 Shipboard Emergency Procedures.
- 1.5 Owners/Operators emergency contact details.
- 1.6 Fuel transfer training, recording and communications procedures.
- 1.7 Oil Spill Response Plan and reporting procedure.
- 1.8 Full list of oil spill response/clean up equipment (including booms) carried onboard.
- 1.9 Copy of personnel training records for Oil Spill Response.
- 1.10 Evidence of Safe manning (Drug and Alcohol policy).
- 1.11 The barge must carry a minimum of 100 metres of oil containment boom (two 50 metre lengths), which must be of a suitable type for use in offshore conditions.
- 1.12 Vessel booming drill must be undertaken upon first arrival of the barge and if more than 50% of undrilled crew join the vessel.

If item 1.1 is not available for any reason (such as non-seagoing barge), additional evidence should be requested in addition.

- 1.13 Details of compliance with construction and operational standards. (Inshore Waters Code is acceptable as a minimum compliance).
- 1.14 Loadline/Loadline Exemption details.
- 1.15 IOPP Certificate.
- 1.16 Safety Construction Certificate.
- 1.17 Record of Qualifications and Experience for key personnel.
- 1.18 Hose Test Certificate and details of Hose Inspection Regime (if not ISM vessel).
- 1.19 Details of fendering arrangements and sizes.
- 1.20 Details of mooring rope arrangements, sizes and certification.

Consideration should be given for additional information which may be required depending on the specific port requirements.

This information is likely to include:

- Name of bunker barge or (in the case of road tankers or shore facilities) details of Bunker Supplier.
- Name of Ship.
- Location of bunkering operations.
- Mode of transfer (bunker barge, road tanker or shore facility).
- Details of bunkers to be transferred and estimated quantity.
- Proposed commencement time of bunkering operations.
- Estimated completion time of bunkering operations.

### 3.4.2 Bunker plan

The provision of bunkering checklists being implemented by the vessel to reduce the risk of operational errors which can lead to spills and fires etc should be considered (an example bunker checklist from ISGOTT can be seen in Appendix A).

The plan may consist of the following but is not limited to:

- Determining that there is adequate space (ullage) for the volume of bunkers to be loaded.
- Establishing maximum loading volume for all tanks.
- Controls for the setting of bunker system valves.
- Determining loading rates for the start of loading, bulk loading and topping-off.
- Special precautions when loading into double bottom tanks.

- Arrangements of bunker tank ventilation.
- Overflow arrangements.
- Verification of gauging system operation and accuracy.
- Alarm settings on overfill alarm units.
- Bunker overfill protection (in general, the bunker overfill protection is an emergency stopping device only. It should not be used as a standard method of stopping bunkering).
- Communication between the supplier and receiver must be established before bunkering can be undertaken, including communication procedures for the bunkering operation and emergency stop.
- Manning requirements to execute the operation safely (including e.g. deck watch). Monitoring of the bunkering operation and checking it conforms to the agreed procedure.
- Changing over tanks during bunkering.
- Containment arrangements and clean-up equipment to be available.

Additional considerations could include:

- Stability of the vessel, including list and trim.
- Agreed pumping rate and pressure, including slowing down to top-off tanks.
- Emergency shut down procedures.
- Available personnel, for tank and manifold monitoring etc.
- Making fire-fighting and spill equipment readily available. Scupper plugs fitted.
- Agreement on the bunker grade, quantity, viscosity and temperature (particularly important for HFO which becomes solid unless heated).
- Methods of communication both between ship personnel and between the ship and bunker supplier.
- Sampling procedures.
- Procedures on completion of bunkering:
  - Emptying Lines.
  - Use of compressed air.
  - shutting of manifolds.

Consideration should be given to pre-transfer checks and communication with the port authority. Procedures may cover requirements to undertake pre-loading and communication checks prior to commencing the operation.

Consideration should be given to the loading rate and how it is to be checked.

The bunker plan should be made available to all personnel engaged in the bunkering operation, including a copy given to those supplying the bunker and the operational considerations to be discussed with both parties and agreed.

### 3.4.3 Restrictions

The inclusion of restriction of operations should be considered for inclusion into the bunkering procedures.

Bunkering operations are regarded as a dangerous activity, and they can be associated with dangers such as fires and pollution events. It is important to ensure that the activity is undertaken in safe and secure environments. In order to do this, it may be essential to restrict other activities which can normally be undertaken within the harbour or restrict certain locations used for bunkering operations.

There are a number of activities which are regularly restricted while bunkering operations are undertaken which include, cargo operations, shipboard maintenance, vessel moves, hot works, and smoking which is particularly pertinent when the receiving vessel is a cruise ship. The bunkering operation may also be restricted by location such as not being at anchor, adjacent certain berths, terminals, jetties, and facilities.

The sea-state and weather are also an important factor to consider during bunker operations. Both current and forecast weather conditions are to be considered when given approval to undertake operations. Clear limits for restriction or cancellation of bunkering operations must be included in policy and procedures. Bunkering operations should not commence if adverse weather conditions are expected before completion of the bunkering operation. Weather and sea conditions must be monitored during the bunkering operation.

In addition to these restrictions as per Merchant Shipping Act 1995 there must be no bunkering between sunset and sunrise or from a ship in any Statutory Harbour Area in the United Kingdom unless the Harbour Master has given notice that it can take place. The requirements of the Merchant Shipping Act are covered in more detail in Section 1.2.1. Consideration for inclusion of this requirement should be given.

### 3.4.4 Communications

Consider the effectiveness of communications.

Safe bunkering operations require the ship's crew and the shore or bunker barge teams to communicate effectively. It is important that a representative for the receiving vessel should be on standby at the receiving point (manifold). Likewise, a representative from the discharge vessel / road tanker / shore supplier should be on standby at their end of the transfer hose. Each person can be reached easily in an emergency.

In some cases, this may be made difficult by language differences. Background noise and environmental conditions may create further difficulties. Appropriately intrinsically safe two-way radios are a useful method of communication and are a requirement for mooring teams in many ports. Hand signals can also be a reliable means of communication that are recognised and understood by crews of ships of all nationalities. Use of these signals would likely be used by the bunker barge and or road tanker in slewing a transfer hose and/or mooring a bunker barge alongside.

### 3.4.5 Alternative fuels

When bunkering alternative fuels additional controls or alternative procedures may need to be recognised and performed in order to carry out the operation safely. In addition to new procedures local regulations may restrict the transfer of certain fuel types.

Consideration should be made for inclusion of alternative fuels into the bunkering procedures. Each new type should be assessed on a case-by-case basis, and detailed information relating to the product should be fully investigated and studied prior to approving transfer.



## 4 Oil Spill Prevention

During any bunkering operation both the receiving vessel and bunker vessel, shore side facility or road tanker should have appropriate pollution equipment to deal with minor spills from either entity. The port, should it meet the minimum requirements, is also required to provide a Tier 2 response.

In the event of an oil spill, the local port's Oil Spill Response Plan should be consulted. This will include in depth detail on the equipment available, procedures and processes to follow in an emergency. The following section covers standard equipment that may be available to help restrict and clean-up and oil spill.

### 4.1 Response plans

#### 4.1.1 Port oil spill response plans

Legal basis for marine pollution contingency planning.

As a party to the UN Convention on the Law of the Sea (UNCLOS), the UK has an obligation to protect and preserve the marine environment.

The UK Government also has obligations under the International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (the OPRC Convention). The Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 1998 (SI 1998 No 1056) implement the obligations of the Convention. They require harbour authorities to prepare plans to clear oil spills from their harbour and for those plans to be compatible with the National Contingency Plan (NCP) a strategic overview for responses to marine pollution from shipping and offshore installations.

Section 293 of the Merchant Shipping Act 1995, as amended by the Merchant Shipping and Maritime Security Act 1997, gives the Secretary of State for Transport the function of taking, or co-ordinating, measures to reduce and minimise the effects of marine pollution. The Environment Act 1995 places similar duties on the Environment Agency for England and Wales with respect to pollution from land-based sources.

### 4.2 Oil spill equipment

There is a variety of counter pollution equipment held by both ships and ports to assist with spill incidents. Additionally, the MCA holds a national stockpile of equipment for use in exceptionally large spills (Tier 3 response).

#### 4.2.1 Containment booms

A boom is a barrier to prevent the migration of oil on water. This assists in containing the spill and prevent it from contacting sensitive resources. In certain situations, a boom can help concentrate oil to allow for easier recovery. They can be constructed from a variety of materials dependent on use and cost including:

- Sorbent;
- PVC;
- Polyurethane;
- Neoprene; and
- Hypalon.

Designs include:

- Fence – for use in sheltered water only due to little reserve buoyancy.
- Tube – sits on top of the water. Commonly made of sorbent.
- Tube and skirt – uses a lower weighted skirt to prevent oil from going under the main tube.
- Shore sealing – uses a lower tube filled with water to anchor the boom in place on shorelines. Reduces the impact of an oil spill on beaches etc.

There are a number of considerations to make when deploying booms;

- Strength of material – inflatable booms can quickly become damaged if they are in contact with barnacle encrusted surfaces.
- They can be unwieldy when being deployed, particularly fence booms in areas with a current. It is recommended to work with short lengths.
- The personnel and possibly other vessels, such as workboats, that may be needed for deployment.

The configuration of deployment will depend on whether the booms are being used for protection, collection or deflection.

Limitations of booms include:

- Entrainment – oil breaks under booms when tow speeds or currents exceed 0.7 – 1.0 knots.
- Drainage – boom gets filled to capacity and oil is flowing out under skirt.
- Splash over – wind and wave chop cause oil to break over boom.
- Planing or flying – from towing too fast or with strong winds and currents from the opposite direction.
- Submergence – boom goes under the surface when current or tow speed exceeds 4-5 knots.

## 4.2.2 Recovery devices

There are a variety of devices available to assist in the recovery of spilt oil. Recovery devices may be held as part of the ports oil spill response equipment. They are not held as part of a ships SOPEP equipment. There are a variety of different recovery devices which use different methods, some of which include.

### Weir skimmers

Weir skimmers are floating devices used to recover layers of oil from water. They consist of a central ring with submerged bellows which go up and down with the movement of the water, and external floats which keep the ring level to the surface. Weir skimmers are used in combination with an oil recovery pump, which can be on board the skimmer itself, or located on land. A major advantage of weir skimmers without on-board pumps is that they are very light and easy to deploy. Weir skimmers work by sucking the layer of oil on the water into the central ring (or weir), from where it is pumped away through oil transfer hoses. Weir skimmers are used in cases where a simple and economical solution is required (with respect to their nominal recovery capacity) and where there is a thick layer of oil. By nature of design, weir skimmers are more efficient with low viscosity oils.

### Oleophilic skimmers

Oleophilic materials have a high affinity for clearing up oils and grease. They attract and absorb oil molecules more easily than water molecules. This type of skimmer uses oleophilic skimming media to

ensure that it collects the maximum amount of oil from the water. They are effective when dealing with oil spills of any thickness but are best for use against spills of un-emulsified light to medium oil.

Common types include:

- Disc;
- Rope mop; and
- Drum.

### Mechanical skimmers

This type uses a variety of mechanical equipment to physically remove floating spills from the water surface. It is best used in high viscosity oil, solid oil, and debris laden oil.

Types include:

- Toothed disc;
- Brush;
- Belt;
- Drum; and
- Grab bucket.

### Sorbents

Sorbent materials can provide a useful resource in a response to an oil spill, allowing oil to be recovered in situations that are unsuitable for other techniques.

While widely used in spill response, sorbents should be employed with caution to minimise inappropriate and excessive use that can present major logistical difficulties associated with secondary contamination, retrieval, storage and disposal. These all contribute significantly to the overall costs of clean-up operations. In particular, synthetic sorbent material should be used in moderation and should be used to its full capacity to minimise subsequent waste disposal problems. In general, sorbents are most effective during the final stages an oil spill clean-up and for recovering small pools of oil that cannot otherwise be easily recovered. Sorbents are not appropriate for use in the open water. They are generally less effective with more viscous oils (such as heavy fuel oil) and with oils that have become weathered and emulsified; although some sorbents have been specifically engineered for viscous oils.

Synthetic sorbents are generally the most effective in recovering oil. In some cases, a ratio by weight of oil to sorbent of 40:1 can be achieved compared to 10:1 for organic products and 2:1 for inorganic materials.

## 4.3 Nature of spilled oil/product

Consideration should be given to how different types of bunkers react when spilled into water. Distillates such as petrol and diesel tend to evaporate fairly quickly and dependent on the quantity and location of spill do not usually pose a significant environmental hazard. Other bunker grades such as HFO are far more persistent and viscous and may form a thick emulsification.

The characteristics of certain products when spilt are not well understood. Some of the ultra-low sulphur products, for example, have been found to have a particular propensity to form emulsions when spilt into the marine environment.

Consideration should be given to alternative fuel types and the possible complexities regarding the containment, collection, handling and disposal of these products if spilled. The wider port emergency plans and spill response plans should contain information of dealing with spills and emergencies involving alternative fuels.

## 5 Risk Assessments

It is the duty of a Berth Operator (under Health & Safety at Work regulations) to maintain a safe work area, clear of potential hazards. To this end, a risk assessment should be conducted in respect of operations at the berths. The assessment must consider the risk to not just the employees of the port, but also ship's crew, passengers, and visitors.

The Port Marine Safety Code (PMSC) also states that the 'risks associated with marine operations need to be assessed and a means of controlling them deployed' (DfT, 2016). The PMSC requires that the risks inherent in port operations must be reduced to "*as low as reasonably practicable*". Risk assessments must be reviewed regularly, following any incidents and where changes in operations are made.

There are two types of risk assessment to consider when conducting any port operation, these are termed 'formal' and 'dynamic'. The harbour authority should have established processes for each. The formal risk assessment is created and reviewed regularly; dynamic risk assessments are conducted on site prior to every bunkering operation to identify the potential hazards that are present at the time the operation is being undertaken. Issues identified in the dynamic risk assessments may be carried forward for inclusion in a formal risk assessment review if there are recurring hazards that have not been previously identified.

The risk assessment process is covered in Section 4 of volume 2 of the PPG MSMS.

### 5.1 Formal and reviewed risk assessments

The risk assessment process identifies hazards, their likelihood, control measures and the associated mitigations. Potential hazards and control measures for mooring operations have been identified and presented below. Additional items specific to the location and its conditions should be appended to this list.

#### 5.1.1 Potential hazards

Identifying hazards is an essential part of the risk assessment process. The following list shows the potential hazards of bunkering operations; this list is not inclusive and should be adapted for specific scenarios. The port's risk assessment process should highlight any local hazards; however, the following are expected to be seen with any bunkering operations.

- Cranes;
- Weights (hoses) suspended by cranes;
- Over or under pressurised bunker tanks;
- Falls from height;
- Slips, trips and falls;
- Splitting of hoses and pipes;
- Pollution events;
- Manual handling;
- Personnel injury from hazardous hot cargo;
- Entanglement, entrapment, or crush injuries;
- Working from boats;
- Use of capstans and winches for example riding turns;
- Working on, near or over water, falling into the water, hypothermia, drowning;
- Water borne diseases;
- Chemical spills;

- Fire and explosion;
- Ship collision;
- Mooring failures; and
- Hose/connection failure.

### 5.1.2 Controls

The controls identified below are not specific to any single port; a specific risk assessment review will highlight all appropriate controls for this operation.

- SOPEP equipment (Port and vessel);
- Oil spill plan;
- Bunkering plan;
- Authorisation and approvals;
- Permitting systems;
- Information, instruction and training;
- Safe use of capstans and bits;
- Co-ordination with other dock activities, including suitable control of quayside operations and vehicle movement in the vicinity;
- Lighting arrangements;
- Communications between ship and shore;
- Manual handling techniques including the use of mechanical aids; and
- Provision of appropriate PPE, such as lifejackets, safety helmets, high visibility clothing and gloves.

## 5.2 Dynamic risk assessments

Dynamic risk assessments would usually apply to the ships' crew but could include shore personnel in ship to shore bunkering. The dynamic risk assessments are discussed during toolbox talks conducted prior to the commencement of bunkering activities and are an addition to the formal risk assessment process. As bunkering operations take place in a potentially changeable environment (for example, rising and falling tides, or adverse weather) it is necessary to ensure that all new hazards are identified, and crew and employees involved are made aware.

## 6 Operational Guidance

This section covers the general guidance to individual parties involved with the bunkering operations.

### 6.1 Guidance to the Harbour Master

As previously mentioned, it is recommended to have a system whereby all bunker suppliers need to be approved by the Harbour Authority. This will allow the Harbour Master to ensure that all suppliers have suitable experience, equipment, method statements and liability insurance etc to safely deliver bunkers to vessels. Required information may include:

- Technical details of the bunkering barges or tankers;
- Vessel safety plan;
- Oil pollution emergency plan;
- Vessel particulars;
- Copy of the company's safety policies and bunkering procedures / precautions;
- Safety Management Certificate;
- Insurance details;
- Document of Compliance;
- Safety Management System – Bunkering Operations;
- Bunkering operations check lists;
- The competency of bunker vessel crews, evidenced by copies of their certification; and
- Minimum manning certificate.

It is important to deconflict any operations which might pose a risk to one another (e.g., hot work taking place during bunkering). As such it is highly recommended to have a work permit system in place which, when properly managed, should prevent such occurrences.

In instances where smaller vessels frequently receive bunkers from road tankers, it might be prudent to consider having a dedicated bunkering berth. A dedicated berth should reduce the chances of conflicting operations taking place concurrently. It also allows for oil spill equipment to be located in the vicinity of the berth, which may quicken deployment times.

Where anchored vessels receive bunkers by ship to ship transfer it may be prudent to have a nominated anchorage for such operations to take place. Considerations around this should include the levels of vessel traffic, and areas that would be least impacted should a spill occur.

It is recommended there is a reporting system in place, whereby prior to the commencement of bunkering operations, the Harbour Master (or nominated Deputy) is provided with the following information. This should be recorded and logged as necessary, and the Harbour Master must be informed when the bunkering operations have been completed. The reporting system should include:

- Name of vessel receiving bunkers;
- Name of bunker barge or (in the case of road tankers or shore facilities) details of the bunker supplier;
- Location of bunkering operations;
- Mode of transfer (bunker barge, road tanker or shore facility);
- Details of bunkers to be transferred, to include grades and quantities;
- Confirmation that relevant checklists have been completed;
- Proposed commencement time of bunkering operations;

- Estimated completion time of bunkering operations; and
- Notification to the Harbour Master when bunkering operations have been completed.

## 6.2 Guide to Ships Masters

Depending on the size of the vessel receiving bunkers, the Master may or may not be directly involved in the bunkering operation. However, a Master has overall responsibility for operations on a vessel and as such must ensure that bunkering is carried out in line with, company, port, industry and legislative requirements. As a minimum the Master should ensure the following:

- Reporting procedures are followed as specified in port specific guidelines.
- There is an appropriate risk assessment and method statement for the bunkering operations in place that is available for inspection.
- The Officer in Charge of the bunkering is in attendance at all times and has the appropriate level of manpower available to conduct the operation safely. They should also be suitably familiar with the vessel and the bunkering operation procedure.
- Appropriate levels of communication are established between persons on board the vessel, and between the vessel and the supplier. This should be checked throughout the operation by way of radio checks at agreed intervals.
- That the Ship is securely moored, with suitably tensioned moorings. The moorings are tended throughout the bunkering operations, with consideration given to the effects of interaction from passing vessels and fluctuations in water levels and possible changes in draught.
- That all openings from oil storage spaces are kept closed during the bunkering operations. Where there are pressure vacuum valves fitted, have been tested and are operational.
- Agree in writing with the Bunker Supplier on the handling procedures of the bunker. This should include the maximum loading or unloading rates taking into account the arrangement, capacity and maximum allowable pressures of the receiving equipment. Consideration should also be given to the possible pressure increase due to an emergency shut-down and the possible accumulation of electrostatic charge.
- Agree in writing with the bunker supplier the action to be taken and the signals to be used in the event of an emergency during Bunkering Operations. If an Emergency Stop/Shut-down system is in place, this should be tested prior to the start of the bunkering operation.

## 6.3 Guide to suppliers

The bunker supplier should conform to all legal and company requirements and follow the appropriate reporting procedures as specified in Section 3.3. The following are some items which should be considered:

- Ensure that there is suitable fendering is deployed by either the Bunker Barge or Ship.
- Ensure that the Bunker Barge is securely moored to the Ship, with suitably tensioned moorings, ready for the bunkering operations, and ensure that moorings are tended throughout the bunkering operations (consideration must be given to the effects of interaction from passing vessels).
- Establish emergency stop procedures and signals with the Officer in Charge.
- The Officer in Charge must complete and sign the Bunkering Safety Check List and keep the list available for inspection.
- Establish and maintain satisfactory communication with the Officer in Charge before and during Bunkering Operations.
- Ensure that the Bunker Barge's propulsion system is kept on immediate notice of readiness.



- Establish with the Officer in Charge the safe limits for wind and swell conditions for undertaking Bunkering Operations and for the Bunker Barge to remain safely alongside the Ship.
- Take appropriate preventative measures to ensure that all relevant equipment (e.g., pipelines, loading arms, flexible pipes, etc.) are not damaged and continually check for signs of leakage.
- Ensure that no ignition sources (e.g., smoking, naked flames or hot work, none intrinsically safe electrical items etc.) are within the area of the Bunkering Operations.

### 6.3.1 Road tanker to ship (road tankers)

Consideration should be given for providing safe access to the quayside for the driver of the road tanker. If necessary, consideration should be given to mandating the use of a competent banksman. This will assist the driver in safely positioning the vehicle.

## 6.4 Guidance to oil spill response

Consideration for including actions plans within the bunkering procedure for action in the event of an incident resulting in a spillage of Bunkers should be given. This may include in addition to any other requirements an initial reporting process covering the following:

- The location of the spill;
- Details of the vessels involved;
- The type and quantity of bunkers spilt; and
- Actions taken so far (and by whom) to contain and recover the spill.

This guidance should also form part of the large spill and emergency response plans.

# 7 LNG Operation Guidance

## 7.1 Introduction

The following is guidance for consideration of the inclusion of LNG Bunkering Operations in the bunkering procedures. Further expert guidance should be considered prior to inclusion into pre-authorisation vetting procedures.

LNG is becoming more popular as a marine fuel to providing power for ships. This is due to the characteristics of LNG meaning its adverse effect on the environment is far less than oil. This procedure describes the measures which should be considered to minimise the risk of an accident or incident during LNG bunkering operations. This guidance is directed to shore to ship bunkering via shore container off a road tanker.

## 7.2 Procedure

### 7.2.1 Notification

Before any LNG bunkering operation takes place, the port authority must be notified of the date, time and berth on which bunkering is intended to take place. When the Harbour Master (or other with appropriate level of responsibility for marine safety) has determined the operation is safe to carry out, and the contents of this procedure have been understood and followed then the LNG bunkering operation can proceed.

In order to establish if the LNG operation is safe to carry out at a specific berth, a risk assessment should be undertaken by a competent person(s) taking in to account all hazards and how best to control those hazards. This could include, but is not limited to:

- Adjacent cargo handling operations;
- Movement of dangerous goods;
- Sources of ignition;
- Any work being undertaken adjacent to the intended operation involving the issue of a permit or permission to work;
- Location of the berth and adjacent facilities; and
- The time the operation is to be undertaken.

A discussion with the LNG road tanker operator and the Ship's Master should take place to ensure that procedures are compatible, and all parties are happy to proceed after the risk assessments has been completed for the intended date, time and berth.

### 7.2.2 Communications

- Effective internal communication equipment is to be provided between the bunker control point and cargo control point or bridge of the LNG bunkering vessel, as applicable.
- Two means of voice communication between the LNG bunkering vessel and the receiving ship are to be provided (i.e., main and back up voice communications).
- Portable communication equipment is to be of a certified safe type (intrinsically safe).

### 7.2.3 Competence

It is necessary that a competent person manages the operations relating to LNG. There are no specific training requirements, however in the absence of experience there are courses which provide hazard awareness training for LNG operations (for instance by DNV<sup>1</sup>).

### 7.2.4 Emergency preparedness

The risk assessment must include appropriate control measures. The types of control measures should include but not be limited to:

- Firefighting systems being deployed and readily available;
- Agreed communications systems;
- Informing the local Fire & Rescue service that LNG bunkering operations take place;
- Appropriate escape routes from the site;
- Providing suitable warning signage;
- Controlling access control to the site; and
- Completing the LNG Bunker Checklist.

### 7.2.5 Safety and security zones

The Safety Zone can be defined as a three-dimensional space inside which the majority of leak events occur and where, in exceptional circumstances, there is a recognised potential for a leak of LNG to harm life or damage equipment/infrastructure. The zone is temporary by nature, present only during bunkering. It may extend beyond the gas-fuelled ship/LNG road tanker/bunker vessel, interconnecting pipework, and so on, and will be larger than the Hazardous Area as described in 7.2.6.

The safety & security zones can be considered to be the same zone for all practical purposes. The safety & security zones must be established around the bunkering point at the ship's side and the LNG road tanker.

This zone should be no less than 10 metres x 24 metres but may be larger. It should consist of a fenced off area on 3 sides with the fourth side being the ship. The fencing must be adequate to prevent access. Only authorised persons shall be allowed within the safety & security zone and access must be strictly controlled. There must also be appropriate signage on the safety & security zone. Within the safety zone there must be no sources of ignition and any electrical or mechanical equipment must be European Directives for Controlling Explosive Atmospheres (ATEX) approved, products must be suitable and certified for use in an explosive atmosphere.

If necessary, any under quay power supplies or lighting must be isolated (whilst still ensuring safe access) prior to the LNG bunkering commencing and remain isolated until it is completed.

### 7.2.6 Hazardous area

A hazardous area is defined by the Dangerous Substances & Explosive Atmosphere Regulations (DSEAR) (2002) as "any place in which an explosive atmosphere may occur in quantities such as to require special precautions to protect the safety of workers". The hazardous areas are classified into zones based on an assessment of the frequency of the occurrence and duration of an explosive gas atmosphere. The zones are as follows:

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<sup>1</sup> DNV: <https://www.dnv.com/training/lng-hazard-awareness-training-58023>

- Zone 0: An area in which an explosive gas atmosphere is present continuously or for long periods.
- Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
- Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur, it will only exist for a short time.

A DSEAR assessments should be undertaken by PPG to determine an LNG bunkering hazardous safety area at ports which wish to undertake LNG bunkering.

### 7.2.7 LNG bunker checklist

IAPH (International Association of Ports and Harbours) provides example LNG Bunker Checklist for Truck to Ship and ship to ship bunkering operations. This, or a variation of this, checklist should be completed in full for all LNG Bunkering operations and provides an audit trail for ensuring the operation is carried out safely. The checklist is replicated in Appendix A for ship to ship and Appendix B for truck to ship. Both checklists provide associated guidance along with the procedure.

### 7.2.8 Transfer operations

During transfer operations of LNG bunkers, cargo handling operations must be stopped unless it can be demonstrated by risk assessment that the cargo operations being undertaken simultaneously do not increase any of the risks involved from the bunkering operations. The Harbour/Dock Master must review that assessment and make a decision in conjunction with the local Health & Safety team and any other competent managers. On no account should any cargo operations involving dangerous goods be conducted simultaneously. The ship and LNG tanker must have suitable risk assessments and operating procedures in place to ensure that the transfer can be safely undertaken.

The Master is responsible for the shipboard operation and driver/technician is responsible for the LNG road tanker operation. The Harbour Master and if applicable, any terminal representative, are responsible for ensuring the berth is suitable for LNG bunkering operations to take place, the Harbour Master ultimately has overall authority for the operation and determining if it shall proceed or not.

## 8 Methanol Operation Guidance

### 8.1 Introduction

The following is guidance for consideration of the inclusion of Methanol Bunkering Operations in the bunkering procedures. Further expert guidance should be considered prior to inclusion into pre-authorisation vetting procedures.

Methanol is a clear liquid product used in thousands of everyday, paints, cosmetics and fuels. Methanol is also an energy resource used in the marine, automotive, and electricity sectors, and an emerging renewable energy resource.

Methanol as a fuel is a light, versatile, colourless and flammable alcohol. It is a readily available chemical that can be produced from a variety of sources, including natural gas, biomass and carbon dioxide. It is considered as one of the alternative fuels for shipping as the sector continues its journey towards decarbonisation. This guidance describes the measures which should be considered to minimise the risk of an accident or incident during Methanol bunkering operations. This guidance covers the three main methods used for methanol bunkering to ship.

#### 8.1.1 Bunkering Methods

One of the key steps in safe methanol bunkering is verifying compatibility of the supplying ship or facility and the receiving ship. Methanol is liquid at atmospheric temperatures and pressures and hence bunkering is similar to conventional fuel oils, albeit the low-flashpoint and toxic properties require additional equipment and operational procedures.

The main methods of methanol bunkering to ships are:

- Road tanker-to-ship bunkering using a road tanker —
  - Road Tanker-to-ship bunkering is the most commonly used method of bunkering methanol to date. Methanol is widely used for land-based operations within Europe and is transported according to the International Carriage of Dangerous Goods by Road (ADR) regulation as a Class 3 flammable liquid (UN 1230).
- Ship-to-ship bunkering (delivery by bunker vessel/barge) —
  - Ship-to-ship bunkering, also referred to as “barge-to-ship” bunkering, is carried out while a ship is alongside at port or while at anchor. Fuel is provided from a bunker supply ship, tanker or barge to the receiving ship. Most large ships use this method of bunkering, although it may also be appropriate for smaller ships in some cases.
- Land storage tank (or terminal/facility) to ship bunkering, using a pipe or hose connection —
  - Bunkering from a land storage tank or terminal is a suitable solution for ships operating out of a home port, such as the pilot boat or tug, and ships operating on fixed routes that bunker from compatible ports.

For other ship types or varied ports of operations, the storage tank or terminal pipe sizes and delivery pressures should be considered and be compatible with the ship’s equipment. Providing fuel in portable tanks that are transferred to the vessel is another option that could be used particularly for smaller vessel applications, such as for fuel cells.

## 8.2 Procedure

### 8.2.1 Notification

Before any Methanol bunkering operation takes place, the port authority must be notified of the date, time and berth on which bunkering is intended to take place. When the Harbour or Dock Master or their appointed duty has determined the operation is safe to carry out, and the contents of laid out procedure have been understood and followed then the Methanol bunkering operation can proceed.

In order to establish if the Methanol operation is safe to carry out at a specific berth. A risk assessment should be undertaken by a competent person/s taking in to account all hazards and how best to control those hazards. This could include, but is not limited to:

- Adjacent cargo handling operations;
- Movement of dangerous goods;
- Sources of ignition;
- Any work being undertaken adjacent to the intended operation involving the issue of a permit or permission to work;
- Location of the berth and adjacent facilities; and
- The time the operation is to be undertaken.

A discussion with the Methanol road tanker operator and the Ship's Master should take place to ensure that procedures are compatible, and all parties are happy to proceed after the risk assessments has been completed for the intended date, time and berth.

### 8.2.2 Bunkering Permit

A fuel transfer/bunkering permit should be a considered requirement prior to bunkering operations. These permits enforce safe and environmentally conscious bunkering operations. Permissions are normally sought by the supplier at least 24 hours in advance of planned operations. The requirements depend on location and apply to all owners, people in charge and any other associated personnel.

A bunkering permit may include, but is not limited to the following requirements:

- Spill and recovery plan and contingency planning; suitable spill kits available.
- Compliance with all national or international regulatory requirements for fuel transfers.
- Personnel training and training sessions provided.
- Written operational plans and procedures including all activities distributed to all involved.
- Safe access between supplier and receiver.
- Emergency and evacuation procedures in place.
- Proper use and display of signages

### 8.2.3 Communications

- Effective internal communication equipment is to be provided between the bunker control point and cargo control point or bridge of the Methanol bunkering vessel, as applicable.
- Two means of voice communication between the Methanol bunkering vessel and the receiving ship are to be provided (i.e., main and back up voice communications).
- Portable communication equipment is to be of a certified safe type (intrinsically safe).

## 8.2.4 Competence

All personnel involved in the handling, supervising and managing of methanol should have at least minimum knowledge on the proper handling, storing and transportation of methanol that can help to avoid or reduce possible fatalities and incidents that can lead to major disaster.

It is necessary that a competent person manages the operations relating to Methanol. There are no specific training requirements, however in the absence of experience there are courses which provide hazard awareness training for Methanol operations.

## 8.2.5 Emergency preparedness

The risk assessment must include appropriate control measures.. The types of control measures should include but not be limited to:

- Firefighting systems being deployed and readily available;
- Agreed communications systems;
- Informing the local Fire & Rescue service on the types of bunkering operations taking place;
- Appropriate escape routes from the site;
- Providing suitable warning signage;
- Controlling access control to the site; and
- Completing the Methanol Bunker Checklist.

## 8.2.6 Environmental effects

Methanol dissolves readily in water and has significantly less impact if spilled or leaked into the environment than conventional hydrocarbon fuels. Only in very high concentrations does it create lethal conditions for marine life.

This means that a methanol spill would result in limited damage to the environment. Methanol in the ocean is abundant and common, being produced naturally by phytoplankton and readily consumed by bacteria microbes, making it a fundamental part of the marine food chain.

## 8.2.7 Safety and security zones

The security zone is an area around the ship that prevents other ships, equipment, vehicles, and other operations from a minimum distance from the bunkering operation. Only authorized and essential personnel are allowed to be within this zone to minimize any intentional damage or interference. The minimum distance of the zone is determined by the risk assessment analysis which takes all associated risks into consideration and any regulatory requirements. The security zone is typically not smaller than the established safety zone. When establishing the security zone, attention should be given to radio communication activities, traffic movement (ship or road) and simultaneous operations.

The Safety Zone can be defined as a three-dimensional space inside which the majority of leak events occur and where, in exceptional circumstances, there is a recognised potential for a leak of methanol or vapour to harm life or damage equipment/infrastructure. The zone is temporary by nature, present only during bunkering. It may extend beyond the road tanker or bunker vessel, interconnecting pipework, and so on, and will be larger than the Hazardous Area as described in 8.2.8.

The safety & security zones can be considered to be the same zone for all practical purposes. The safety & security zones must be established around the bunkering point at the ship's side and the road tanker/barge.

The safety zone is a designated ignition-free area where entry is limited to authorised essential personnel with proper training. The extent of the area is determined by regulation, review of local and national authorities, and analysis of the boundaries of areas where potentially flammable mixtures could enter in the event of an accidental release or spill. These boundaries are to be determined with a risk assessment and typically are set within a combined security zone. To prevent ignition sources, all sources should be eliminated prior to bunkering operations. The following considerations should be taken when creating the boundaries of a safety zone:

- Operational case scenarios for weather conditions during bunkering operations in the event of a spill.
- Height and vertical space in areas where people may be working.
- Surrounding environments such as buildings, port facilities and topography may affect dispersion.
- Properties and spill characteristics of fuel in the event of a release.

### 8.2.8 Hazardous area

A hazardous area is defined by the Dangerous Substances & Explosive Atmosphere Regulations (DSEAR) (2002) as "any place in which an explosive atmosphere may occur in quantities such as to require special precautions to protect the safety of workers". The hazardous areas are classified into zones based on an assessment of the frequency of the occurrence and duration of an explosive gas atmosphere. The zones are as follows:

- Zone 0: An area in which an explosive gas atmosphere is present continuously or for long periods.
- Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
- Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur, it will only exist for a short time.

A DSEAR assessments should be undertaken by PPG to determine bunkering hazardous safety area at ports which wish to undertake Methanol bunkering.

### 8.2.9 Pre-bunkering verification

The compatibility review and pre-bunkering verification should address all relevant shore-to-ship or ship-to-ship considerations, including:

- Confirmation that the receiving ship (and supply ship/bunker vessel, if applicable) can be safely moored and that adequate fendering or spacing is provided between the ships or to the facility to prevent damage. Any restrictions on length should be noted. Moorings should be sufficient to keep the ship/s restrained for anticipated wind, tide and weather conditions, and any expected surges from passing ships. The overhanging of mooring should be avoided as far as practicable.
- The relative freeboard of the ship/s or facility should allow hoses to reach from the bunker supply connection to the bunker receiving connection with sufficient slack to allow for any expected relative motion between the two. Any restrictions on freeboard should be noted. Saddles or hose supports should be considered.
- The manifold arrangements, spill containment systems and hose connections for the supply source and the receiving ship should be confirmed including emergency release (hose breakaway) arrangements.



- The use of non-sparking material during hose connection and disconnection is to be considered. The means for electrical bonding, insulation and means to prevent electrical arcing are addressed.
- Confirmation that both the supply source and receiving ship have compatible communications, including control/monitoring and Emergency Shut Down (ESD) functions. The required connections and interfaces are provided so that both the bunker supplier and receiver can monitor the bunkering operation, and both can initiate an ESD of the complete transfer operation.
- Confirmation that the size and scope of the hazardous areas on both the supply source and the receiving ship are compatible (i.e., that the size of one is not beyond the size of the other). The goal is to keep any sources of ignition from either the supplier or receiving ship outside of the other's hazardous area.
- When vapor return is required, then confirmation is needed that the supply source can accept returned vapor and that the vapor return systems are compatible. Sufficient space for receipt of the vapor is to be considered. The volume of vapor is 1:1.4 times more than the volume it replaces. When vapor is returned to the same discharge tank of a bunker tanker, the process is to be closely monitored.
- Confirmation that both the supply source and receiving ship possess inerting and purging capabilities.
- Confirmation of firefighting and emergency procedures.

### 8.2.10 Methanol bunker checklist

Checklists are useful in confirming the completion of all proper steps before and after an operation. These confirm to the person-in-charge and other parties involved that the procedure has been performed correctly, completely and in the proper sequence. The sample checklist in Appendix C for methanol bunkering operations and can be used as a template to create the actual checklists that should be more detailed with specific information on the ship, bunker supply and location. Additional guidance can be found in MSC.1/Circ. 1621.

### 8.2.11 Transfer operations

During transfer operations of bunkers, cargo handling operations must be stopped unless it can be demonstrated by risk assessment that the cargo operations being undertaken simultaneously do not increase any of the risks involved from the bunkering operations. The Harbour/Dock Master must review that assessment and make a decision in conjunction with the local Health & Safety team and any other competent managers. On no account should any cargo operations involving dangerous goods be conducted simultaneously. The ship and tanker must have suitable risk assessments and operating procedures for methanol in place to ensure that the transfer can be safely undertaken.

The Master is responsible for the shipboard operation, as is the master of the bunker vessels and/or driver/operator for the road tanker or shoreside facility. The Harbour Master and if applicable, any terminal representative, are responsible for ensuring the berth is suitable for methanol bunkering operations to take place, the Harbour Master ultimately has overall authority for the operation and determining if it shall proceed or not.

A person-in-charge (PIC) should be appointed for the methanol supplier's side and the receiving side. These individuals have the responsibility for the methanol delivery on the supplier's side and loading on the ship's side. The PICs should work closely with the ship's master. Typically, the ship PIC is an officer specifically trained in bunkering operations, monitoring and control systems, emergency equipment, spill prevention, spill detection and is assigned to the ship. Each PIC should communicate with each other and share important information pertaining to the emergency response and associated

equipment of the operations. Refer also to IGF Code 18.4.1 (MVR 5C-13-18/4.1) for the PIC bunkering operation responsibilities.

Methanol facilities and methanol fuelled ships may only require a few people each during a typical bunkering operation, but additional crew may be necessary for normal ship operations and should be available in case of emergency or other circumstances. The number of bunker supplier personnel depends on the method of supply (e.g., road tanker, vessel/barge, or fixed facility). Actual manning requirements depend on the bunker procedure, facilities, and regulatory requirements. All personnel involved in the bunkering operation should have the necessary training and certification to fulfil their roles.

### 8.2.12 Procedures and manuals

Manuals and procedures should be readily available during bunker operations. Before beginning any bunker operations, both the supplier and the receiver should ensure that the receiving ship's procedure is compatible with the supplier's transfer procedure and the procedure to be followed is agreed upon by both parties.

Port State regulatory requirements will typically require operational procedures and manuals for bunkering ships such as:

- Methanol Fuel Transfer Systems Operation Manual.
  - List of personnel qualified to conduct methanol bunkering operations.
  - Duties and responsibilities of all personnel involved.
  - Emergency contact information.
  - Bunkering parameters.
  - Limitations on bunkering operations identified in risk assessments or regulatory guidance.
- Emergency Response Plan/Procedures/Manual.
- Maintenance Procedures/Manual/s.

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## 10 Abbreviations/Acronyms

ACOP	Approved Code of Practice
ADR	Agreement concerning the International Carriage of Dangerous Goods by Road
ATEX	European Directives for Controlling Explosive Atmospheres
BFO	Bunker Fuel Oil
DCE	Dangerous Cargo Endorsement
DfT	Department for Transport
DNV	Det Norske Veritas
DSEAR	Dangerous Substances & Explosive Atmosphere Regulations
ESD	Emergency Shut Down
EU	European Union
FAME	Fatty Acid Methyl Ester
GT	Gross Tonnage
GtGP	Guide to Good Practice
HASAWA	Health and Safety at Work (etc) Act 1974
HFO	Heavy Fuel Oil
IAPH	International Association of Ports and Harbours
ICS	International Chamber of Shipping
IFO	Intermediate Fuel Oil
IGC	International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
IGF	International Code of Safety for Ships using Gases or other Low-flashpoint Fuels
IMO	International Maritime Organization
IOPP	International Oil Pollution Prevention
ISGOTT	International Safety Guide for Oil Tankers and Terminals
ISM	International Safety Management
LNG	Liquefied Natural Gas
LO/TO	Lock-Out/Tag-Out
LO	Lubricating Oil/Lube Oil
MARPOL	International Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency
MDO	Marine Diesel Oil
MFO	Marine Fuel Oil/Heavy Fuel Oil
MGO	Marine Gas Oil
MSC	Marine Safety Committee (IMO)
MSMS	Marine Safety Management System
MSN	Merchant Shipping Notice
NCP	National Contingency Plan
NH <sub>3</sub>	Ammonia
OCIMF	Oil Companies International Marine Forum
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-operation
PE	Personal Protective Equipment
PIC	Person/s In Charge

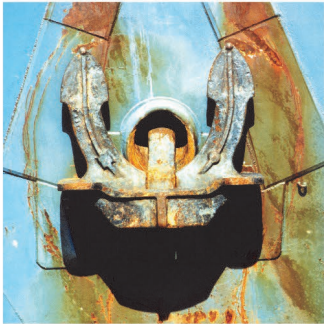
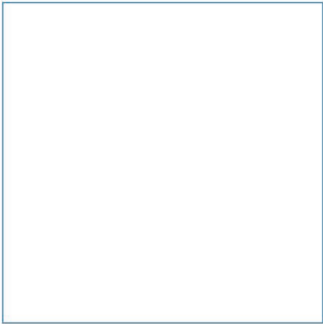
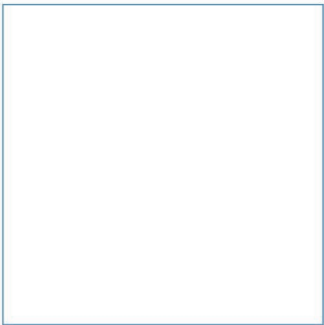
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PMSC	Port Marine Safety Code
PPE	Personal protective equipment,
PPG	Peel Ports Group
PVC	Polyvinyl Chloride
SMS	Safety Management Systems
SOPEP	Shipboard Oil Pollution Emergency Plan
STCW	Standards of Training, Certification and Watchkeeping
STS	Ship To Ship
SWA	Stop Work Authority
UK	United Kingdom
UNCLOS	United Nations Convention on the Law of the Sea
VPQ	Vessel Particulars Questionnaire

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

# Appendices



Innovative Thinking - Sustainable Solutions

# A ISGOTT Bunker Checklist



## BUNKERING SAFETY CHECK-LIST FOR BUNKER DELIVERY TO MARITIME SHIPS

(Chapter 25.4.3 ISGOTT)

Port: ..... Date: .....

Ship: ..... Barge: .....

Master: ..... Master: .....

### 1. Bunkers to be Transferred

Grade	Tonnes	Volume at Loading Temp	Loading Temperature	Maximum Transfer Rate	Maximum Line Pressure
Fuel Oil					
Gas Oil/Diesel					
Lub. Oil in Bulk					

### 2. Bunker Tanks to be Loaded

Tank No	Grade	Volume of Tank @ ____ %	Vol. of Oil in Tank before Loading	Available volume	Volume to be Loaded	Total Volumes Grade

### 3. Checks by Barge Prior to Berthing

Bunkering	Ship	Barge	Code	Remarks
1. The barge has obtained the necessary permissions to go alongside receiving ship.				
2. The fenders have been checked, are in good order and there is no possibility of metal to metal contact.			R	
3. Adequate electrical insulating means are in place in the barge-to-ship connection. (34)				
4. All bunker hoses are in good condition and are appropriate for the service intended. (7)				

4. Checks Prior to Transfer (cont.)

Bunkering	Ship	Barge	Code	Remarks
5. The barge is securely moored. (2)				
6. There is a safe means of access between the ship and barge. (1)				
7. Effective communications have been established between Responsible Officers. (3)			A R	(VHF/UHF Ch ... ). Primary System: Backup System: Emergency Stop Signal:
8. There is an effective watch on board the barge and on the ship receiving bunkers. (22)				
9. Fire hoses and fire-fighting equipment on board the barge and ship are ready for immediate use. (5)				
10. All scuppers are effectively plugged. Temporarily removed scupper plugs will be monitored at all times. Drip trays are in position on decks around connections and bunker tank vents. (10) (11)			R	
11. Initial line up has been checked and unused bunker connections are blanked and fully bolted. (13)				
12. The transfer hose is properly rigged and fully bolted and secured to manifolds on ship and barge. (7)				
13. Overboard valves connected to the cargo system, engine room bilges and bunker lines are closed and sealed. (16)				
14. All cargo and bunker tank hatch lids are closed. (15)				
15. Bunker tank contents will be monitored at regular intervals.			A R	at intervals not exceeding ..... Minutes
16. There is a supply of oil spill clean-up material readily available for immediate use.				
17. The main radio transmitter aerials are earthed and radars are switched off. (42)				
18. Fixed VHF/UHF transceivers and AIS equipment are on the correct power mode or switched off. (40)				

Bunkering	Ship	Barge	Code	Remarks
19. Smoking rooms have been identified and smoking restrictions are being observed. (36)			A R	Nominated Smoking Rooms Tanker: Barge:
20. Naked light regulations are being observed. (37)			R	
21. All external doors and ports in the accommodation are closed. (17)			R	
22. Material Safety Data Sheets (MSDS) for the bunker transfer have been exchanged where requested. (26)			R	
23. The hazards associated with toxic substances in the bunkers being handled have been identified and understood. (27)			R	H <sub>2</sub> S Content ... Benzene Content ...



**DECLARATION**

We have checked, where appropriate jointly, the items of the Check-List in accordance with the instructions and have satisfied ourselves that the entries we have made are correct to the best of our knowledge.

We have also made arrangements to carry out repetitive checks as necessary and agreed that those items coded 'R' in the Check-List should be re-checked at intervals not exceeding ..... hours.

If, to our knowledge, the status of any item changes, we will immediately inform the other party.

<b>For ship</b>	<b>For barge</b>
Name: .....	Name: .....
Rank: .....	Position or Title: .....
Signature: .....	Signature: .....
Date: .....	Date: .....
Time: .....	Time: .....

**Record of repetitive checks:**

Date:								
Time:								
Initials for Ship:								
Initials for barge:								



## B LNG Bunker Ship to Ship Checklist

### PART A: Planning Stage Checklist

This part of the checklist should be completed in the planning stage of an LNG bunker operation.  
It is a recommended guideline for the, in advance, exchange of information necessary for the preparation of the actual operation.

Planned date and time: \_\_\_\_\_

Port and Berth: \_\_\_\_\_

LNG receiving ship: \_\_\_\_\_

LNG bunker vessel: \_\_\_\_\_

	Check	Ship	Bunker Vessel	Terminal	Code	Remarks
1	Competent authorities have granted permission for LNG transfer operations for the specific location and time.				P	
2	The terminal has granted permission for LNG transfer operations for the specific location and time.				P	
3	Competent authorities' requirements are being observed.					e.g. Port byelaws.
4	Local terminal requirements are being observed.					e.g. Terminal regulations
5	All personnel involved in the LNG bunker operation have the appropriate training and have been instructed on the particular LNG bunker equipment and procedures.	For the Ship	For the Bunker Vessel	For the Terminal		
6	The ship's and LNG bunker vessel's class approved bunker plan and operations manual are available.					
7	The ship and LNG bunker vessel have agreed upon the mooring and fendering arrangement.				A	
8	The LNG bunker vessel has obtained the necessary permissions to go alongside the LNG receiving ship.					
9	The bunker operation area can be sufficiently illuminated.				A	



	Check	Ship	Bunker Vessel	Terminal	Code	Remarks
10	All LNG transfer and gas detection equipment is certified, in good condition and appropriate for the service intended.	For the Ship	For the bunker vessel		A	
11	The procedures for bunkering, cooling down and purging operations have been agreed upon by ship and LNG bunker vessel.				A	
12	The system and method of electrical insulation have been agreed upon by ship and LNG bunker vessel.				A	
13	The restricted area has been agreed upon and designated.				A	Restricted Area: _____ _____
14	Regulations with regards to ignition sources can be observed.	For the Ship	For the Bunker Vessel	For the Terminal	A	
15	All mandatory firefighting equipment is ready for immediate use.	For the Ship	For the Bunker Vessel	For the Terminal		

**For registration of the, in the planning, involved representatives:**

Ship	Bunker Vessel	Terminal
Name	Name	Name
Rank	Position	Position
Date	Date	Date
Time	Time	Time

## PART B: Planned Simultaneous Activities

(If applicable this part should be completed before actual transfer operations start)

Date and time: \_\_\_\_\_

Port and Berth: \_\_\_\_\_

LNG receiving ship: \_\_\_\_\_

LNG bunker vessel: \_\_\_\_\_

	Check	Ship	Bunker Vessel	Terminal	Code	Remarks
16	Planned simultaneous bunker operations of other fuels during LNG bunkering are in accordance with ship's approved operational documentation.					If applicable.
17	Planned simultaneous cargo operations during LNG bunkering are in accordance with the ship's approved operational documentation.				A	If applicable.
18	Competent authorities have granted permission for simultaneous bunker and/or cargo operations whilst LNG bunkering.				P	If applicable.
19	Safety procedures and mitigation measures for simultaneous activities, as mentioned in the ship's approved operational documentation, are agreed upon and are being observed by all parties involved.				A R	If applicable.

## PART C: Pre Transfer Checklist

(This part should be completed before actual transfer operations start)

	Check	Ship	Bunker Vessel	Terminal	Code	Remarks
20	Part A of this checklist has been used prior and preparatory of the actual operation.	For the Ship	For the Bunker Vessel	For the Terminal		If applicable
21	Competent authorities have been notified of the start of LNG bunker operations as per local regulations.					Time notified: _____ hrs
22	The terminal has been notified of the start of LNG bunker operations as per terminal regulations.					Time notified: _____ hrs
23	Present weather and wave conditions are within the agreed limits.				A R	
24	The ship and the LNG bunker vessel are securely moored. Regulations with regards to mooring arrangements are observed. Sufficient fendering is in place.				R	
25	There is a safe means of access between the ship and the LNG bunker vessel.				R	
26	All mandatory firefighting equipment is ready for immediate use	For the Ship	For the Bunker Vessel	For the Terminal		
27	The bunker operation area is sufficiently illuminated.				A R	
28	The ship and LNG bunker vessel are able to move under their own power in a safe and non-obstructed direction.	For the Ship	For the Bunker Vessel		R	
29	Adequate supervision of the bunker operation by responsible officers is in place, both on the ship and at the LNG bunker vessel.					
30	An effective means of communication between the responsible operators and supervisors at the ship and LNG bunker vessel has been established and tested. The communication language has been agreed upon.				A R	VHF / UHF Channel: _____ Language: _____ Primary System: _____ Backup System: _____
31	The emergency stop signal and shutdown procedures have been agreed upon, tested, and explained to all personnel involved. Emergency procedures and plans and the contact numbers are known to the persons in charge.				A	Emergency Stop Signal: _____
32	The predetermined restricted area has been established. Appropriate signs mark this area.				A	

	Check	Ship	Bunker Vessel	Terminal	Code	Remarks
33	The restricted area is free of other ships, unauthorized persons, objects and ignition sources.				R	
34	Safety procedures and mitigation measures for the prevention of falling objects are agreed upon and are being observed by all parties involved.				R	
35	On the ship an effective deck watch is established.					The deck watch pays particular attention to moorings, fenders and simultaneous activities.
36	Both on the ship and LNG bunker vessel an effective LNG bunker watch is established.					The LNG bunker watch pays particular attention to hoses, manifold, and bunker controls.
37	External doors, portholes and accommodation ventilation inlets are closed as per operations manual.				R	At no time they should be locked
38	The gas detection equipment has been operationally tested and found to be in good working order.					
39	Material Safety Data Sheets (MSDS) for the delivered LNG fuel are available.				A	
40	Regulations with regards to ignition sources are observed.				R	
41	Appropriate and sufficient suitable protective clothing and equipment is ready for immediate use.					
42	Personnel involved in the connection and disconnection of the bunker hoses and personnel in the direct vicinity of these operations make use of sufficient and appropriate protective clothing and equipment.					
43	A [powered] emergency release coupling ([P]ERC) is installed and is ready for immediate use					If applicable.
44	The water spray system has been tested and is ready for immediate use.					If applicable.
45	Spill containment arrangements are of an appropriate material and volume, in position, and empty.					
46	The hull and deck protection against low temperature is in place.					If applicable.
47	Bunker pumps and compressors are in good working order.				A	If applicable.
48	All control valves are well maintained and in good working order.					

	Check	Ship	Bunker Vessel	Terminal	Code	Remarks
49	Bunker system gauges, high level alarms and high-pressure alarms are operational, correctly set and in good working order.					
50	The ship's bunker tanks are protected against inadvertent overfilling at all times, tank content is constantly monitored and alarms are correctly set.				R	Intervals not exceeding _____ minutes
51	All safety and control devices on the LNG installations are checked, tested and found to be in good working order.					
52	Pressure control equipment and boil off or re-liquefaction equipment is operational and in good working order.					
53	The vapour connections are properly connected and supported.					If applicable.
54	Both on the ship and at the LNG bunker vessel the ESDs, automatic valves or similar devices have been tested, have found to be in good working order, and are ready for use. The both ESD systems are linked. The closing rates of the ESDs have been exchanged.				A	ESD Ship: _____ seconds  ESD LNG bunker vessel: _____ seconds
55	Initial LNG bunker line up has been checked. Unused connections are closed, blanked and fully bolted.					
56	LNG bunker hoses, fixed pipelines and manifolds are in good condition, properly rigged, supported, properly connected, leak tested and certified for the LNG transfer.					
57	The LNG bunker connection between the ship and the LNG bunker vessel is provided with dry disconnection couplings.					
58	The LNG bunker connection between the ship and the LNG bunker vessel has adequate electrical insulating means in place.					
59	Dry breakaway couplings in the LNG bunker connections are in place, have been visually inspected for functioning and found to be in a good working order.				A	
60	The ship's emergency fire control plans are located externally.					Location: _____
61	An International Shore Connection has been provided.					
62	Competent authorities have been informed that bunker transfer operations are commencing and have been requested to inform other vessels in the vicinity.					

## PART D: LNG transfer data and simultaneous operations

(This part should be completed before actual transfer operations start)

### Agreed starting temperatures and pressures

Note the agreed Physical Quantity Unit (PQU):       m3       Tonnes       \_\_\_\_\_

	Ship		LNG supplying bunker vessel		
LNG tank:start temperature:					°C / °F*
LNG tank: start pressure:					bar / psi* (rel)
LNG tank: available (rest) capacity					PQU

\*: delete as appropriate

### Agreed bunker operations

	Tank 1	Tank 2	
Agreed quantity to be transferred:			PQU
Starting pressure at the manifold:			bar / psi* (rel)
Starting rate:			PQU per hour
Max transfer rate:			PQU per hour
Topping up rate:			PQU per hour
Max pressure at manifold:			bar / psi* (rel)

\*: delete as appropriate

### Agreed maximums and minimums

	Maximum	Minimum	
Pressures during bunkering:			bar / psi* (rel)
Pressures in the LNG bunker tanks:			bar / psi* (rel)
Temperatures of the LNG:			°C / °F*
Filling limit of the LNG bunker tanks:			%

\*: delete as appropriate

**Agreed simultaneous LNG bunker / Oil bunker operations**

(Note that for oil bunker operations a separate bunker checklist should be completed)

Oil bunker activity	Ship	Bunker vessel	Terminal

**Agreed simultaneous LNG bunker / Cargo operations**

Cargo activity	Ship	Bunker vessel	Terminal

**Restrictions in LNG bunker / Cargo operations**

Restricted activity	Ship	Bunker vessel	Terminal

**Declaration**

We, the undersigned, have checked the above items in Parts B, C and D in accordance with the instructions and have satisfied ourselves that the entries we have made are correct.

We have also made arrangements to carry out repetitive checks as necessary and agreed that those items coded 'R' in the checklist should be re-checked at intervals not exceeding \_\_\_\_\_ hours.

If, to our knowledge, the status of any item changes, we will immediately inform the other party.

Ship	Bunker vessel	Terminal
Name	Name	Name
Rank	Position	Position
Signature	Signature	Signature
Date	Date	Date
Time	Time	Time

Record of repetitive checks								
Date								
Time								
Initials for ship								
Initials for bunker vessel								
Initials for terminal								

**Guideline for completing this checklist**

The presence of the letters 'A' or 'R' in the column entitled 'Code' indicates the following:

- A ('Agreement').  
This indicates an agreement or procedure that should be identified in the 'Remarks' column of the checklist or communicated in some other mutually acceptable form.
- R ('Re-check').  
This indicates items to be re-checked at appropriate intervals, as agreed between both parties, at periods stated in the declaration.
- P ('Permission')  
This indicates that permission is to be granted by authorities.

The joint declaration should not be signed until both parties have checked and accepted their assigned responsibilities and accountabilities. When duly signed, this document is to be kept at least one year on board of the LNG receiving vessel.



## PART E: After LNG Transfer Checklist

(This part should be completed after transfer operations have been completed)

	Check	Ship	Bunker Vessel	Terminal	Code	Remarks
63	LNG bunker hoses, fixed pipelines and manifolds have been purged and are ready for disconnection.				A	
64	Remote and manually controlled valves are closed and ready for disconnection.				A	
65	After disconnection the restricted area has been deactivated. Appropriate signs have been removed.				A	
66	Competent authorities have been notified that LNG bunker operations have been completed and have been requested to inform other vessels in the vicinity.					Time notified: _____ hrs
67	The terminal has been notified that LNG bunker operations have been completed.					Time notified: _____ hrs
68	Near misses and incidents have been reported to competent authorities.					Report nr: _____

### Declaration

We, the undersigned, have checked the above items in Part E in accordance with the instructions and have satisfied ourselves that the entries we have made are correct.

Ship	Bunker vessel	Terminal
Name	Name	Name
Rank	Position	Position
Signature	Signature	Signature
Date	Date	Date
Time	Time	Time

**Guideline for completing this checklist**

The presence of the letters 'A' or 'R' in the column entitled 'Code' indicates the following:

- A ('Agreement').  
This indicates an agreement or procedure that should be identified in the 'Remarks' column of the checklist or communicated in some other mutually acceptable form.
- R ('Re-check').  
This indicates items to be re-checked at appropriate intervals, as agreed between both parties, at periods stated in the declaration.
- P ('Permission')  
This indicates that permission is to be granted by authorities.

The joint declaration should not be signed until both parties have checked and accepted their assigned responsibilities and accountabilities. When duly signed, this document is to be kept at least one year on board of the LNG receiving vessel.

## **GUIDELINES**

### **GENERAL**

The responsibility and accountability for the safe conduct of operations while a ship is performing an LNG bunkering is shared jointly between the ship's masters and, if applicable, the terminal representative if the ships are moored alongside a terminal. Before the LNG bunker operations commence, the masters and, if applicable, the terminal representative should:

- Agree in writing on the transfer procedures, including the maximum loading or unloading rates;
- Agree in writing on the action to be taken in the event of an emergency, and
- Complete and sign the LNG bunker checklist Ship to Ship.

The term "terminal" must be understood as any organization responsible for the location of the bunkering.

For Inland navigation, the term "ship" must be understood as an inland waterway vessel and the term "ship's master" must be understood as the boat master according to navigational regulations

For the checks which are not applicable for all ships, "if applicable" is added in the last column. The "if applicable" marked checks are not mandatory, users can skip these checks by mentioning N/A. in the remark column.

## STRUCTURE OF THE CHECKLIST

The LNG Bunker Checklist – Ship to Ship comprises of five parts:

**PART 'A' – Planning Stage Checklist** addresses the considerations to be made during the planning stage of LNG bunker operations. This part of the checklist can be used as a guideline for an exchange of knowledge and agreements on safety items during the planning stage of a LNG bunkering before the LNG bunker vessel arrives alongside the LNG fuelled ship on the bunker location. The advised time of processing this part of the checklist is during the order placement for the bunkering.

**Part 'B' – Planned Simultaneous Activities** exchanges the planning of simultaneous bunker or cargo operations during the LNG bunkering. Simultaneous activities are only allowed if approved in the ship's operational documentation and performed conform the ship's operational documentation. The mitigation of risk is based on risk assessment and the mitigation measures to comply with are stated in the ship's operational documentation.

**Part 'C' – Pre Transfer Checklist** identifies the required physical checks and elements that are verified verbally just before the LNG bunkering commences.

The safety of operations requires that all relevant statements are considered and the associated responsibility and accountability for compliance is accepted, either jointly or singly. Where either party is not prepared to accept an assigned accountability, a comment must be made in the remarks column and due consideration should be given to assessing whether operations can proceed.

Where a particular item is considered to be not applicable to the ship, the LNG bunker vessel or to the planned operation, a note to this effect should be entered in the 'Remarks' column.

**Part 'D' – LNG transfer data and simultaneous operations** contains the transfer data to be agreed upon. In this section the information over temperature, density, volume, transfer rate, pressure and the physical quantity unit to be used for the LNG bunkering, and simultaneous operations exchanged and agreed upon.

**Part 'E' – After LNG Transfer Checklist** contains the considerations to be made after the LNG bunker operations for the disconnecting of the bunker connections and finishing the total operations.

## USAGE OF THE SHIP TO SHIP LNG BUNKERING CHECKLIST

The following guidelines have been produced to assist in the joint use of LNG Bunker Checklist – Ship to Ship:

The ship's master and all under their command must adhere strictly to these requirements throughout the vessels stay alongside. If applicable, the terminal representative must ensure that shore personnel do likewise. Each party commits to co-operate fully in the mutual interest of achieving safe and efficient operations.

The ship's masters, and if applicable, the terminal representative, can designate responsible persons in charge of bunkering operations and authorize them to complete and sign the LNG bunker checklist.

Responsibility and accountability for the statements within the LNG Bunker Checklist – Ship to Ship is assigned within the document. The acceptance of responsibility is confirmed by ticking or initialling the appropriate box and finally signing the declaration at the end of the checklist. Once signed, this details the minimum basis for safe operations that has been agreed upon through the mutual exchange of critical information.

Some of the checklist statements are directed to considerations for which the ship to be fuelled has sole responsibility and accountability. For some checklist statements either the LNG bunker vessel or terminal has sole responsibility and accountability. Some checklist statements assign a joint responsibility and accountability. Greyed-out boxes are used to identify statements that generally may not be applicable to one party, although the ship, bunker vessel or terminal may tick or initial such sections if they so wish.

Where mentioned in the box; "for the ship", "for the bunker vessel" or "for the terminal", the involved parties only check and sign for their own responsibilities.

The assignment of responsibility and accountability does not mean that the other party is excluded from carrying out checks in order to confirm compliance. It is intended to ensure clear identification of the party responsible for initial and continued compliance throughout the ship's stay at the bunker location.

The responsible supervisor should personally check all considerations lying within the responsibility of the LNG fuelled ship. Similarly, all considerations which are the LNG vessel or, if applicable, the terminal's responsibility should be personally checked by the LNG bunker vessel's supervisor or, if applicable, the terminal representative. In fulfilling these responsibilities, representatives should assure themselves that the standards of safety on both sides of the operation are fully acceptable.

This can be achieved by means such as:

- Confirming that a competent person has satisfactorily completed the checklist;
- Sighting appropriate records;
- By joint inspection, where deemed appropriate.

Before the start of operations, and from time to time thereafter for mutual safety, the LNG bunker vessel officer and, if applicable, a member of the terminal's staff and, where appropriate, a responsible ship's officer, may conduct an inspection of the ship and bunker vessel to ensure that the vessel and the bunker vessel are effectively managing their obligations, as accepted in the LNG Bunker Checklist – Ship to Ship. Where basic safety requirements are found to be out of compliance, either party may require that the LNG bunker operations are stopped until corrective action is satisfactorily implemented.

## **CODING OF ITEMS**

The presence of the letters 'A', 'P' or 'R' in the column entitled 'Code' indicates the following:

- A 'Agreement' - This indicates that the referenced consideration should be addressed by an agreement or procedure that should be identified in the 'Remarks' column of the checklist or communicated in some other mutually acceptable form.
- P 'Permission' - In the case of a negative answer to the statements coded 'P', no operations are to be conducted without the written permission from the appropriate authority.
- R 'Re-check' - This indicates items to be re-checked at appropriate intervals, as agreed between both parties and stated in the declaration.

The joint declaration should not be signed until all parties have checked and accepted their assigned responsibilities and accountabilities.

## EXPLANATION OF THE CHECKS

### Part 'A' – Planning Stage Checklist

- 1 Competent authorities have granted permission for LNG transfer operations for the specific location and time.**  
Competent authority may be consulted about what other authorities need to approve the bunker operations for the specific location, time and parties involved.
- 2 The terminal has granted permission for LNG transfer operations for the specific location and time.**  
Competent authority may be consulted if in doubt of whom to contact at the terminal.
- 3 Competent authorities' requirements are being observed.**  
Ports have specific port regulations and port byelaws. Competent authority may be consulted if in doubt about the local regulations. In States that are signatories to SOLAS, the ISPS Code requires for seagoing vessels that the Ship Security Officer and the Port Facility Security Officer co-ordinate the implementation of their respective security plans with each other.
- 4 Local terminal requirements are being observed.**  
The terminal may be consulted if in doubt about the terminal regulations
- 5 All personnel involved in the LNG bunker operation have the appropriate training and have been instructed on the particular LNG bunker equipment and procedures.**  
Although all personnel that are involved in LNG bunker operations should comply with mandatory training requirements, they should also be familiarized with the specific LNG bunker equipment and procedures for this bunker operation. For this item, the involved parties only check and sign for their own responsibilities
- 6 The ship's and LNG bunker vessel's class approved bunker plan and operations documentation are available.**  
The LNG bunkering requirements in the ship's operational documentation should be exchanged with all involved parties. If requested the bunker plan and the operational documentation and its content can be shown to the competent authorities.
- 7 The ship and LNG bunker vessel have agreed upon the mooring and fendering arrangement**  
Regard should be given to the need for adequate fendering arrangements.  
Ships should remain adequately secured in their moorings. Alongside piers or quays, ranging of the ship should be prevented by keeping all mooring lines taut. Attention should be given to the movement of the ship caused by wind, currents, tides or passing ships and the operation in progress.  
Wire ropes and fibre ropes should not be used together in the same direction (i.e. as breast lines, spring lines, head or stern lines) because of the difference in their elastic properties.  
Once moored, ships fitted with automatic tension winches should not use such winches in the automatic mode. Means should be provided to enable quick and safe release of the ship in case of an emergency. In ports where anchors are required to be used, special consideration should be given to this matter. Anchors not in use should be properly secured. Irrespective of the mooring method used, the emergency release operation should be agreed upon, taking into account the possible risks involved.
- 8 The LNG bunker vessel has obtained the necessary permissions to go alongside the LNG receiving ship.**  
Ports have specific port regulations and port byelaws. Port authority may be consulted if in doubt about the local regulations.

**9 The bunker location can be sufficiently illuminated.**

The manifold areas on board should be safely and properly illuminated during darkness. If this requirement is not met, additional lightening must be provided.

**10 All LNG transfer and gas detection equipment is certified, in good condition and appropriate for the service intended.**

A list of certification dates, expiry dates and next upcoming intermediate certification dates for the bunkering used equipment should be provided and exchanged. The validation of the certificates has to be performed before LNG bunkering commences. For this item, the involved parties only check and sign for their own responsibilities.

**11 The procedures for bunkering, cooling down and purging operations have been agreed upon by ship and LNG bunker vessel.**

The procedures for the intended LNG bunker operation should be pre planned. They should be discussed and agreed upon by the ship, bunker vessel and if applicable shore representatives prior to the start of the operations. Agreed arrangements should be formally recorded and signed by the ship, LNG bunker vessel and if applicable the terminal representatives. Any change in the agreed procedure that could affect the operation should be discussed by the involved parties and agreed upon. After agreement by the involved parties, the substantial changes should be laid down in writing as soon as possible and in sufficient time before the change in procedure takes place.

**12 The system and method of electrical insulation have been agreed upon by ship and bunker vessel.**

The system and method of electrical insulation in the LNG bunker connection should be pre planned. They should be discussed and agreed upon by the ship, bunker vessel and if applicable shore representatives prior to the start of the operations.

**13 The restricted area has been agreed upon and designated.**

The risk assessment for the LNG bunkering of the LNG fuelled ship and the risk assessment for the bunker vessel provide safety distances and restricted areas. The restricted areas are required in the ship's operational documentation. If applicable restricted area requirements from the LNG bunker vessel, terminal operator and local authorities should be taken into account and incorporated.

The requirements for the restricted area round the LNG bunker location on board of the ships and on the shore should be exchanged, agreed and designated between the parties involved in the LNG bunkering.

**14 Regulations with regards to ignition sources can be observed.**

These include but are not limited to smoking restrictions and regulations with regards to naked light, mobile phones, pagers, VHF and UHF equipment, radar and AIS equipment.

Smoking on board the ships may only take place in places specified by the master in consultation with the truck and terminal representative.

No smoking is allowed on the shore except in places specified by the bunker station representative in consultation with the masters and terminal operator.

Places that are directly accessible from the outside should not be designated as places where smoking is permitted. Buildings, places and rooms designated as areas where smoking is permitted should be clearly marked as such. For this item, the involved parties only check and sign for their own responsibilities

A naked light or open fire comprises the following: flame, spark formation, naked electric light or any surface with a temperature that is equal to or higher than the minimum ignition temperature of the products handled in the operation. The use of naked lights or open fires on board the ships is prohibited in the restricted area, unless all applicable regulations have been met and it has been agreed upon by the port authority, the masters of both ships and the terminal representative.



In the restricted area:

- Telephones should comply with the requirements for explosion-proof construction.
- Mobile phones and pagers should not be used unless approved for such use by a competent authority.
- Damaged units, even though they may be capable of operation, should not be used.
- The use of portable electrical equipment and wandering leads is not allowed during LNG bunkering and the equipment should be excluded from the zone.
- Telephone cables in use in the ship/shore communication system should preferably be routed outside the exclusion zone. Wherever this is not feasible, the cable should be so positioned and protected that no danger arises from its use.
- Unless the masters of both ships, in consultation with the terminal representative, have established the conditions under which the installation may be used safely, fixed VHF/UHF and AIS equipment should be switched off or on low power (1 watt or less) and the ship's main radio station should not be used during the ship's stay in port, except for receiving purposes. The main transmitting aerials should be disconnected and earthed.
- Portable VHF/UHF sets should be of a safe type which is approved by a competent authority.
- VHF radio-telephone sets may only operate in the internationally-agreed wave bands.
- Satellite communications equipment may be used normally, unless advised otherwise.
- The ship's radar installation should not be used unless the master, in consultation with the bunker station operator and the terminal representative, has established the conditions under which the installation may be used safely.
- Window type air conditioning units should be disconnected from their power supply.

**15 All mandatory firefighting equipment is ready for immediate use.**

Firefighting equipment on board should be correctly positioned and ready for immediate use.

Adequate and suitable units of fixed or portable equipment should be stationed conform ship's operational documents. The ship's fire main systems should be pressurised or be capable of being pressurised at short notice.

For seagoing vessels a set of fire control plans should be permanently stored in a prominently marked weather-tight enclosure outside the deckhouse for the assistance of shore side firefighting personnel. A crew list should also be included in this enclosure.

If applicable firefighting equipment on the terminal should be correctly positioned and ready for immediate use.

## Part 'B' – Planned simultaneous activities

**16 Planned simultaneous bunker operations of other fuels during LNG bunkering are in accordance with the ship's approved operational documentation.**

The planning of simultaneous bunker operations during LNG bunkering should be exchanged and recorded in part D of this checklist. The ship and the bunker vessel have to check if the planned simultaneous activities conform to the approved ship's operational documentation, such as the approved bunker manual and operational procedures of both ships.

**17 Planned simultaneous cargo operations during LNG bunkering are in accordance with ship's approved operational documentation**

The planning of simultaneous cargo operations during LNG bunkering should be exchanged and recorded in part D of this checklist. The ship, the bunker vessel and the terminal have to check if the planned simultaneous activities are in accordance with the approved ship's operational documentation such as the bunker manual and operational procedures of both ships.

**18 Local authorities have granted permission for simultaneous bunker and/or cargo operations whilst the LNG bunkering.**

Port authority may be consulted about port regulations and what other authorities need to approve the planned simultaneous activities.

**19 Safety procedures and mitigation measures for simultaneous activities, as mentioned in the ship's approved operational documentation, are agreed upon and are being observed by all parties involved.**

Based on risk assessment, the approved operational documentation of the LNG fuelled ship and LNG bunker vessel, contains risk mitigation measures for simultaneous activities. Such limitations should be clearly understood by all parties. The criteria for simultaneous activities should be noted in part D of this checklist.

The LNG bunker operations should be suspended when the limitations cannot be met.

## Part 'C' – Pre Transfer Checklist

### 20 Part A is used prior and preparatory of the actual operation

PART A: Planning Stage Checklist addresses the considerations to be made during the planning stage of LNG bunker operations. This part of the checklist can be used as a guideline for an exchange of knowledge and agreements on safety items during the planning stage of a LNG bunkering. The advised time of processing this part of the checklist is during the order placement for the bunkering.

The use of Part A is not mandatory. In this item, the involved parties only check if Part A is used for their own planning

### 21 Competent authorities have been notified of the start of LNG bunker operations as per local regulations.

Competent authority may be consulted if in doubt of whom to contact as per local regulations.

### 22 The terminal has been notified of the start of LNG bunker operations as per terminal regulations.

The terminal may be consulted if in doubt about the terminal regulations.

### 23 Present weather and wave conditions are within the agreed limits.

There are numerous factors that will help determine whether LNG bunker operations should continue.

Discussion between the ship, the bunker vessel and if applicable the terminal should identify limiting factors which could include:

- Wind speed/direction and the effect on the bunker connections.
- Wind speed/direction and the effect on mooring integrity.
- Wind speed/direction and the effect on gangways.
- Swell effects at exposed locations on mooring integrity or gangway safety.

Such limitations should be clearly understood by all parties. The criteria for stopping bunkering, disconnecting hoses or arms and vacating the berth should be written in the 'Remarks' column of the checklist. The bunker operations should be suspended on the approach of an electrical storm.

In case of a strong gale warning or deteriorating weather conditions emergency towing pennants should be prepared and a proper look out to the mooring lines is required.

### 24 The ship and the LNG bunker vessel are securely moored. Regulations with regards to mooring arrangements are observed. Sufficient fendering is in place.

In answering this question, due regard should be given to the need for adequate fendering arrangements. The ships should remain adequately secured in her moorings. Alongside piers or quays, ranging of the ship should be prevented by keeping all mooring lines taut. Attention should be given to the movement of the ships caused by wind, currents, tides or passing ships and the operation in progress.

Wire ropes and fibre ropes should not be used together in the same direction (i.e. as breast lines, spring lines, head or stern lines) because of the difference in their elastic properties.

Once moored, ships fitted with automatic tension winches should not use such winches in the automatic mode. Irrespective of the mooring method used, the emergency release operation in case of an emergency should be agreed upon, taking into account the possible risks involved.

Anchors not in use should be properly secured.

### 25 There is a safe means of access between the ship and the LNG bunker vessel.

The access should be positioned as far away from the LNG bunker manifolds as practicable.

The means of access between the ships should be safe and may consist of an appropriate gangway or accommodation ladder with a properly secured safety net fitted to it.

Particular attention to safe access should be given where the difference in freeboard height between the point of access on the vessels is large, or is likely to become large.

When shore access facilities are applicable but not available and a ship's gangway is used, there should be an adequate landing area on the berth so as to provide the gangway with a sufficient clear run of space and

to maintain safe and convenient access to the ship at all states of tide and changes in the ship's freeboard. A lifebuoy should be available on board the ship near the gangway or accommodation ladder. The access should be safely and properly illuminated during darkness. Persons who have no legitimate business on board, or who do not have the master's permission, should be refused access to the ship. In addition to the means of access, a safe and quick emergency escape route should be available on board. On board the ships, it may consist of a lifeboat ready for immediate use, preferably near the accommodation of the ship.

**26 All mandatory firefighting equipment is ready for immediate use**

Firefighting equipment on board should be correctly positioned and ready for immediate use. Adequate and suitable units of fixed or portable equipment should be stationed conform ship's operational documents. The ship's fire main systems should be pressurised or be capable of being pressurised at short notice.

For seagoing vessels a set of fire control plans should be permanently stored in a prominently marked weather-tight enclosure outside the deckhouse for the assistance of shore side firefighting personnel. A crew list should also be included in this enclosure.

If applicable both ship and shore should ensure that their fire main systems can be inter-connected in a quick and easy way utilising, if necessary, the international shore fire connection. If applicable firefighting equipment on the shore should be correctly positioned and ready for immediate use. The shore fire main systems should be pressurised or be capable of being pressurised at short notice. For this item, the involved parties only check and sign for their own responsibilities

**27 The bunker location is sufficiently illuminated.**

The bunker location should be safely and properly illuminated during darkness.

**28 The ship and the LNG bunker vessel are able to move under their own power in a safe and non-obstructed direction.**

The ships should be able to move under their own power at short notice, unless the ship has been granted permission to immobilise by the Port Authority. Certain conditions may have to be met for permission to be granted. All involved parties of the LNG bunkering should be informed and agree.

**29 Adequate supervision of the bunker operation by responsible officers is in place, both on the ship and at the LNG bunker vessel.**

The LNG bunker operation should be under constant control and supervision on both the ship and the LNG bunker vessel. Supervision should be aimed at preventing the development of hazardous situations. However, if such a situation arises, the controlling personnel should have adequate knowledge and the means available to take corrective action.

The controlling personnel on the ship and bunker vessel should maintain effective communications with their respective supervisors.

All personnel connected with the operations should be familiar with the dangers of the substances handled. At all times during the ship's stay at the bunker location, a sufficient number of personnel should be present on board the ship and on the LNG bunker vessel to deal with an emergency.

**30 An effective means of communication between the responsible operators and supervisors at the ship and bunker vessel has been established and tested. The communication language has been agreed upon.**

Communication should be maintained in the most efficient way between the responsible officer on duty on the ship and the LNG bunker vessel.

When telephones are used, the telephone both on board and ashore should be continuously manned by a person who can immediately contact his respective supervisor. Additionally, the supervisor should have a facility to override all calls. When RT/VHF systems are used, the units should preferably be portable and carried by the supervisor or a person who can get in touch with his respective supervisor immediately.

Where fixed systems are used, the guidelines for telephones should apply.

The selected primary and back-up systems of communication should be recorded on the checklist and necessary information on telephone numbers and/or channels to be used should be exchanged and recorded.

The telephone and portable RT/VHF systems should comply with the appropriate (explosion proof) safety requirements.

**31 The emergency stop signal and shutdown procedures have been agreed upon, tested, and explained to all personnel involved. Emergency procedures and plans and the contact numbers are known to the persons in charge.**

The agreed signal to be used in the event of an emergency arising ashore or on board should be clearly understood by shore and ship personnel.

An emergency shutdown procedure should be agreed upon by the ship and the LNG bunker vessel and should be formally recorded and signed by both the ship and LNG bunker vessel representative.

The agreement should state the circumstances in which operations have to be stopped immediately.

Due regard should be given to the possible introduction of dangers associated with the emergency shutdown procedure.

**32 The predetermined restricted area has been established. Appropriate signs mark this area.**

The risk assessment for the LNG bunkering of the LNG fuelled ship and LNG bunker vessel provide safety distances and restricted areas. The restricted areas are addressed in the ship's operational documentation. If applicable restricted area requirements from the LNG bunker vessel operator, terminal operator and local authorities should be taken into account and incorporated

The requirements for the restricted area around the LNG bunker location on board of the ship and on the shore should be established and clearly marked

**33 The restricted area is free of other ships, unauthorized persons, objects and ignition sources.**

Prior to operations all unauthorised persons should be directed to leave the marked exclusion zone.

Unauthorised objects or ignition sources should be removed out of the zone. During bunker operations this should be re-checked at regular intervals.

**34 Safety procedures and mitigation measures for the prevention of falling objects are agreed upon and are being observed by all parties involved.**

Means and procedures should be in place to prevent people (personnel/passengers) causing falling objects. Operational procedures should be in place to avoid falling objects due to ship's operations. The bunker vessel should have mitigation measures in place to lower the effects of falling objects.

**35 On the ships an effective deck watch is established.**

The deck watch pays particular attention to moorings, fenders and simultaneous activities.

**36 Both on the ship and LNG bunker vessel an effective LNG station watch is established.**

The LNG bunker watch pays particular attention to LNG hoses, LNG manifold, and LNG bunker controls.

**37 External doors, portholes and accommodation ventilation inlets are closed as per operation manual.**

External doors, windows and portholes in the accommodation should be closed during LNG bunker operations when required in the operational documentation of the ship. These doors should be clearly marked as being required to be closed during such operations, but at no time should they be locked.

This requirement does not prevent reasonable access to spaces during operations, but doors should not be left open unattended.

Engine Room vents may be left open. However, consideration should be given to closing them where such action would not adversely impact the safe and efficient operation of the engine room spaces served.

**38 The gas detection equipment has been operationally tested and found to be in good working order.**

The equipment provided should be capable of measuring natural gas.

Suitable equipment should be available to calibrate the gas detection and measuring equipment.

A bump test (quick test on proper working) or calibration should be carried out before the operation commences. Span gas should be available to enable calibration of gas detection equipment. Fixed gas detection equipment should be calibrated for natural gas prior to commencement of operations. The alarm function should have been tested and the details of the last test should be exchanged.

Portable gas detection instruments, suitable and calibrated for natural gas, capable of measuring flammable levels, should be available.

**39 Material Safety Data Sheets (MSDS) for the delivered LNG fuel are available.**

MSDS should be available on request to the LNG fuelled ship, terminal and LNG bunker vessel.

As a minimum, such information sheets should provide the constituents of the product by chemical name, name in common usage, UN number and the maximum concentration of any toxic components, expressed as a percentage by volume or as ppm, as appropriate.

**40 Regulations with regards to ignition sources are observed.**

These include but are not limited to smoking restrictions and regulations with regards to naked light, mobile phones, pagers, VHF and UHF equipment, radar and AIS equipment.

Smoking on board the ships, if allowed, may only take place in places specified by the master in consultation with the bunker vessel.

Smoking on the shore, if allowed, may only take place in places specified by the terminal operator.

Places, which are directly accessible from the outside, should not be designated as places where smoking is permitted. Places and rooms designated as areas where smoking is permitted are clearly marked as such.

A naked light or open fire comprises the following: flame, spark formation, naked electric light or any surface with a temperature that is equal to or higher than the minimum ignition temperature of the products handled in the operation. There are no naked lights or open fires in the restriction area.

In the restriction area:

- Telephones comply with the requirements for explosion-proof construction.
- Mobile phones and pagers are not used unless approved for such use by a competent authority.
- Damaged units, even though they may be capable of operation, are not used.
- The use of portable electrical equipment and wandering leads is not allowed during LNG bunkering and the equipment should be excluded from the zone.
- Telephone cables in use in the ship/ship or ship/shore communication system are routed outside the exclusion zone. Wherever this is not feasible, the cable is so positioned and protected that no danger arises from its use.
- Unless the masters of both ships, in consultation with the terminal representative, have established the conditions under which the installation may be used safely, fixed VHF/UHF and AIS equipment should be switched off or on low power (1 watt or less) and the ship's main radio station should not be used during the ship's stay in port, except for receiving purposes. The main transmitting aerials should be disconnected and earthed.
- Portable VHF/UHF sets are of a safe type which is approved by a competent authority.
- VHF radio-telephone sets will only operate in the internationally-agreed wave bands.
- Satellite communications equipment may be used normally, unless advised otherwise.
- The ship's radar installation is not in use, unless the master, in consultation with the bunker vessel operator and the terminal representative, has established the conditions under which the installation may be used safely.
- Window type air conditioning units are disconnected from their power supply.

- 41 Appropriate and sufficient suitable protective clothing and equipment is ready for immediate use.**  
Suitable protective equipment, eye protection and protective clothing appropriate to the specific dangers of LNG, should be available in sufficient quantity for operational personnel.  
Storage places for this equipment on board of the ship should be protected from the weather and be clearly marked.  
Personnel required to use a breathing apparatus during operations or emergency response should be trained in its safe use. Untrained personnel and personnel with facial hair should not be selected for activities involving the use of breathing apparatus.
- 42 Personnel involved in the connection and disconnection of the bunker hoses and personnel in the direct vicinity of these operations make use of sufficient and appropriate protective clothing and equipment.**  
All personnel directly involved in the operation should utilise appropriate equipment and clothing whenever the situation requires.
- 43 A (powered) emergency release coupling {(P)ERC} is installed and is ready for immediate use**  
If applicable an emergency release coupling is installed and ready for immediate use. This (P)ERC can be activated by ESD or by forces on- or movements of the bunker connection outside a predetermined range. The (P)ERC should be of a dry disconnect type, during the emergency release the line will be closed by a valve on both sides of the coupling. After an emergency release of the coupling, a check of the system, and after solving the problem that caused the release, the coupling can be reinstalled. A freefall of the coupling after an emergency release should be avoided.
- 44 The water spray system has been tested and is ready for immediate use.**  
Water spray systems should be regularly tested. Details of the last tests should be exchanged.  
During bunker operations the systems should be kept ready for immediate use.
- 45 Spill containment arrangements are of an appropriate material and volume, in position, and empty.**  
The ship's manifolds should ideally be provided with fixed and for LNG suitable drip trays. In the absence of fixed containment, suitable portable drip trays should be used.  
All drip trays should be emptied in an appropriate manner whenever necessary.  
In all cases LNG must be prevented to affect the deck in case of a spill. This can, for example, be achieved by using a low temperature resistance gutter, suitable drip trays or pouring water on deck. When LNG is handled the scuppers may be kept open, provided that an ample supply of water is available at all times in the vicinity of the manifolds.
- 46 The hull and deck protection against low temperature is in place.**  
When a hull or deck protection system is required in the ship's operational documentation, it shall be used conform the operational documentation.
- 47 Bunker pumps and compressors are in good working order.**  
Agreement in writing should be reached on the maximum allowable working pressure in the LNG bunker line system during operations.
- 48 All control valves are well maintained and in good working order.**  
All ship and bunker station LNG transfer system control valves and their position-indicating systems should be regularly tested. Details of the last tests should be exchanged.
- 49 Bunker system gauges, high level alarms and high-pressure alarms are operational, correctly set and in good working order.**  
Ship and LNG vessel LNG transfer system gauges and alarms should be regularly checked to ensure they are in good working order.  
In cases where it is possible to set alarms to different levels, the alarm should be set to the required level.

**50 The ship's bunker tanks are protected against inadvertent overfilling at all times, tank content is monitored constantly and alarms are correctly set.**

Owing to the reliance placed on gauging systems for LNG bunker operations, it is important that such systems are fully operational and that back-up is provided in the form of an independent overfill alarm arrangement. The alarm should provide audible and visual indication and should be set at a level which will enable operations to be shut down prior to the tank being overfilled. Under normal operations, the bunker tank should not be filled higher than the level at which the overfill alarm is set.

Individual overfill alarms should be tested at the tank to ensure their proper operation prior to commencing bunkering unless the system is provided with an electronic self-testing capability which monitors the condition of the alarm circuitry and sensor and confirms the instrument set point.

**51 All safety and control devices on the LNG installations are checked, tested and found to be in good working order.**

Automatic shutdown systems are designed to shut the liquid valves and trip the bunker pumps if the liquid level or pressure in the bunker tank should rise above the maximum permitted levels. These levels must be accurately set and the operation of the device should be tested before bunker operations commence. If the ship and LNG bunker vessel shutdown systems are to be inter-connected, then their operation must be checked before LNG transfer begins.

**52 Pressure control equipment and boil off or re-liquefaction equipment is operational and in good working order.**

Pressure control is one of the most critical processes during LNG bunker operations. It is important that such systems are fully operational and that back up is provided in case of a failure of the system.

There are many pressure control systems: spray lines in the top of the tank, vapour return, re-liquefaction, CNG storage or vapour processing. The used pressure control system should be exchanged and be agreed upon. It should be verified that re-liquefaction and boil off control systems, if required, are functioning correctly prior to commencement of operations.

The pressure alarms should provide audible and visual indication and should be set at a level which will enable operations to be shut down prior to the opening of the PV valves to avoid natural gas emission. Under normal operations, the pressure in the bunker tank should not exceed the pressure limits in the ship's operational documentation.

Individual high and low pressure alarms should be tested at the tank to ensure their proper operation prior to commencing bunkering unless the system is provided with an electronic self-testing capability which monitors the condition of the alarm circuitry and sensor and confirms the instrument set point.

**53 The vapour connections are properly connected and supported.**

Close liaison on vapour management should be maintained between the vessels and a methodology should be agreed upon prior to the start of the bunkering. The minimum and maximum operation pressure and any other constraints associated with the operation of the vapour return system should be discussed and agreed upon by officers of both ships.

**54 Both on the ship and at the LNG bunker vessel the ESDs, automatic valves or similar devices have been tested, have been found to be in good working order, and are ready for use.**

**The both ESD systems are linked. The closing rates of the ESDs have been exchanged.**

Automatic shutdown valves may be fitted in the ship and the systems of the LNG bunker station. Among other parameters, the action of these valves can be automatically initiated by a certain level being reached in the tank being loaded, either on board or ashore.

The closing rate of any automatic valves should be known and this information should be exchanged.

Where automatic valves are fitted and used, the cargo-handling rate should be so adjusted that a pressure



surge evolving from the automatic closure of any such valve does not exceed the safe working pressure of the LNG bunker system.

A written agreement should be made between the ship and bunker vessel indicating whether the cargo-handling rate will be adjusted or alternative systems will be used. The safe cargo-handling rate should be noted in the agreement.

The both ESD systems should be linked.

Where possible, ship and bunker station emergency shutdown systems should be tested before commencement of the LNG bunkering.

**55 Initial LNG bunker line up has been checked. Unused connections are closed, blanked and fully bolted.**

Before connection both the ship and bunker vessel LNG bunker systems must be isolated and empty, checked and found to be safe to remove blank flanges.

Both ship and bunker vessel LNG bunker systems should be isolated from other ship systems.

Unused bunker line connections should be closed and blanked. Blank flanges should be fully bolted and other types of fittings, if used, properly secured.

**56 LNG bunker hoses, fixed pipelines and manifolds are in good condition, properly rigged, supported, properly connected, leak tested and certified for the LNG transfer.**

Hoses should be in a good condition and properly fitted and rigged so as to prevent strain and stress beyond design limitations.

All flange connections should be fully bolted and any other types of connections should be properly secured. It should be ensured that the hoses and pipelines are constructed of a material suitable for the substance to be handled, taking into account its temperature and the maximum operating pressure. LNG Bunker hoses should be indelibly marked so as to allow the identification of the products for which they are suitable, specified maximum working pressure, the test pressure and last date of testing at this pressure, and, if used at temperatures other than ambient, maximum and minimum service temperatures.

**57 The LNG bunker connection between the ship and the LNG bunker vessel is provided with dry disconnection couplings.**

The LNG bunker hose or arm should be provided with means to avoid release of LNG or natural gas during disconnection after the bunkering.

The means should provide protection against:

- Spill or emission due to unexpected and uncontrolled release of product from the bunker system during disconnecting in case the bunkering system is not properly emptied after use.
- Injury to personnel due to pressure in the system suddenly being released in an uncontrolled manner during disconnecting.

**58 The LNG bunker connection between the ship and the LNG bunker vessel has adequate electrical insulating means in place.**

Unless measures are taken to break the continuous electrical path between ship and bunker vessel, pipework provided by the ship/bunker vessel hoses, stray electric currents, can cause electric sparks at the flange faces when hoses are being connected and disconnected.

The passage of these currents is usually prevented by an insulating flange inserted at the ship line to the manifold and/or in the line of the bunker vessel. Alternatively the electrical discontinuity may be provided by the inclusion of one length of electrically discontinuous hose in each hose string.

It should be ascertained that the means of electrical discontinuity is in place, that it is in good condition and is not being by-passed by contact with an electrically conductive material.

**59 Dry breakaway couplings in the LNG bunker connections are in place, have been visually inspected for functioning and found to be in a good working order.**

To mitigate on an event which approaches the limits of the design-operating envelope of the bunker connection, means should be in place to ensure that the mechanical integrity of the LNG bunker connection is not compromised. These means should provide protection against:

- Spill or emission due to unexpected and uncontrolled release of product from the bunker system due to overstretching the bunker connection.
- Injury to personnel due to pressure in the system suddenly being released in an uncontrolled manner.

The dry breakaway coupling will break due to forces on- or movements of the bunker connection outside a predetermined range. The coupling should be of a dry disconnect type, during the emergency break the line will be closed by a valve on both sides of the coupling. After the emergency break of the coupling, and when the problem that caused the break is solved, the broken parts should be replaced. A freefall of the coupling after an emergency break should be avoided.

**60 The ship's emergency fire control plans are located externally.**

For seagoing vessels a set of fire control plans should be permanently stored in a prominently marked weather-tight enclosure outside the deckhouse for the assistance of shore side fire-fighting personnel. A crew list should also be included in this enclosure.

**61 An International Shore Connection has been provided.**

If applicable both ship and shore should ensure that their fire main systems can be inter-connected in a quick and easy way utilising, if necessary, the international shore fire connection.

**62 Competent authorities have been informed that bunker transfer operations are commencing and have been requested to inform other vessels in the vicinity.**

When local regulations or the port byelaws enforce the notification of vessels in the direct vicinity, these ships have to be informed of the LNG bunker activity. When the involved parties are not obliged to inform ships in the vicinity, they can, upon reporting the commence of the LNG bunker operations, advise the port authority to do so.

## **Part 'D' – LNG Transfer Data**

### **Agreed starting temperatures and pressures**

Parties should agree upon the LNG transfer data and the condition of the LNG and atmosphere in the bunker station tanks and ship's bunker tanks.

### **Agreed bunker operations**

Parties should agree upon bunker activities. In order to agree upon the quantity of LNG that is to be transferred, parties should agree upon a 'Physical Quantity Unit'; e.g. cubic meters, tonnes.

### **Agreed maximums and minimums**

Parties should agree upon all maximum and minimum LNG pressures and fuelling limits.

### **Agreed simultaneous LNG bunker / Oil bunker operations (Simbops)**

Parties should agree upon all simultaneous bunker operations. Simultaneous bunker operations of different fuels during LNG bunkering should be addressed and performed in accordance with ship's approved operational documentation. The individual bunker operations should be under separate supervision and should have a separate dedicated deck watch.

### **Agreed simultaneous LNG bunker / Cargo operations (Simops)**

Parties should agree upon all simultaneous cargo operations during the LNG bunkering. Simultaneous cargo operations during LNG bunkering should be addressed and performed in accordance with ship's approved operational documentation. The cargo operations should be under separate supervision and should have a separate dedicated deck watch.

### **Restrictions in LNG bunker / Cargo operations**

Parties should agree upon all restrictions due Simbops or Simops. Based on risk assessment, risks and necessary mitigation measures should be addressed in the approved operational documentation of the ships. Restrictions should be exchanged and taken into account during the operations in accordance with ship's approved operational documentation.

## Part 'E' – After LNG Transfer Checklist

**63 LNG bunker hoses, fixed pipelines and manifolds have been purged and are ready for disconnection.**

Before the bunker connection is disconnected, it must be ensured that no liquid is left in the bunker system. The pressure in the bunker connection should be released into the ship's bunker tank or into the tank of the bunker vessel as per ship's operational documentation.

**64 Remote and manually controlled valves are closed and ready for disconnection.**

Before the bunker connection is disconnected, it must be ensured that all valves are closed, or operated as per ship's operational documentation.

**65 After disconnection the restricted area has been deactivated. Appropriate signs have been removed.**

After the disconnection and securing of the LNG bunker connection, the safety zone can be deactivated and the signs can be removed. The status of the safety zone can be restored to the status required in the ship's operational documentation.

**66 Competent authorities have been notified that LNG bunker operations are completed and have been requested to inform other vessels in the vicinity..**

Where required, authorities should be informed of completion of the LNG bunker operation. When local regulations or the port byelaws enforce the notification of vessels in the direct vicinity, these ship have to be informed of the completion of the LNG bunker activity. When the involved parties are not obliged to inform ships in the vicinity, they can, upon reporting the completion of the LNG bunker operations, advise the port authority to do so.

**67 The terminal has been notified that LNG bunker operations have been completed.**

Where required, the terminal should be informed of completion of the LNG bunker operation.

**68 Near misses and incidents have been reported to local authorities.**

Authorities must be informed of near misses and incidents directly when the event occurs.

## Abbreviations and definitions

Bunker operation area:	The area with operational LNG bunker activity. Including connections on both side of the bunker line, the bunker line and the bunker control and watch keeping area.
ESD	Emergency Shut Down Device
Leak tested	Procedure to check the integrity of the LNG bunker line up
Line up	The system of all pipes, hoses, bunker arms, connections and valves that are positioned and used for an LNG bunker transfer
(P)ERC	(Powered) Emergency release Coupling
Physical Quantity Unit (PQU)	The predetermined unit for the agreement on the quantity to bunker
Purging	To blow or pressurise a line up with Nitrogen to leak test, dry and inert the line up before bunkering or to empty, and gas free the line up before disconnecting.
Rel:	Relative, In this document used to agree the mentioned pressures are relative (overpressure) and not absolute
restricted area	The safety zone where ignition sources are not allowed
Terminal	In this document terminal also referred to any organization responsible of the location of the bunkering
Topping up	The last phase of the LNG bunkering where the maximum filling percentage is nearly reached. During this phase the bunker rate is reduced

# C Methanol Bunker Checklist

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## **Ship Bunker Loading**

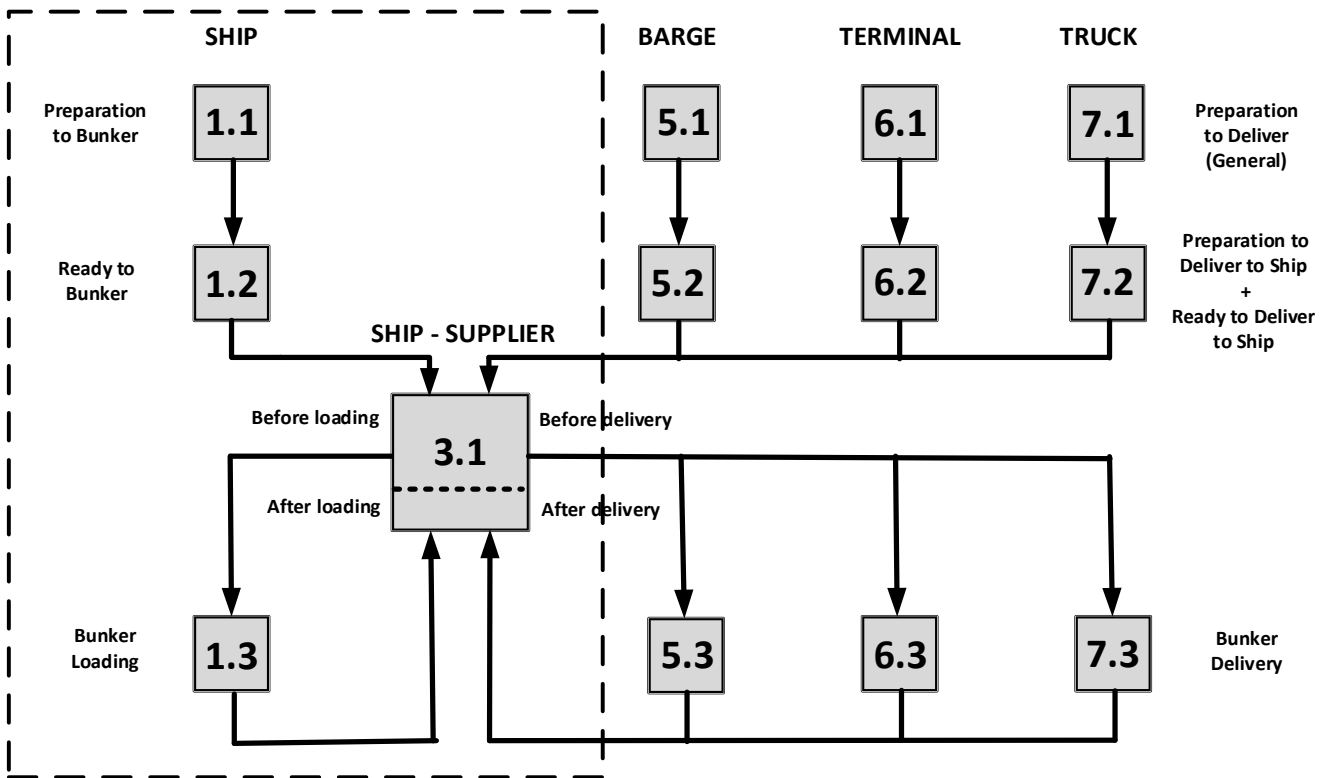
Checklist Pack

July 2020



## Ship Bunker Loading – Checklist Pack

This Checklist Pack contains the Ship specific Checklists 1.1, 1.2 and 1.3 to be completed by the Ship PIC plus the Ship-Supplier Checklist 3.1 which would be completed jointly with the Supplier (Barge, Terminal or Truck as appropriate) PIC.



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## Checklist 1.1

Ship - Preparation to Bunker

July 2020



Ship	
Name:	
Flag:	
IMO No.:	
Methanol Bunkers	
Bunker Port:	
Bunkering Location / Berth:	
Intended Bunker Date and Time:	
Supplier:	
Ordered Quality Grade:	
Ordered Quantity (m <sup>3</sup> ):	
Advised Delivery Mode:	Barge / Truck / Terminal

Ship – Preparation to Bunker Bulk Supply Checklist			Completion by Ship PIC or other authorised person		
			Response	Remarks	
<b>1</b>	<b>Personnel</b>				
.1	Ship PIC - assigned			Y / N	
	Bunker Loading Team – roles assigned, training completed				
.2	Name:	Role:	Role Trained:		
		Ship PIC	Y / N		
			Y / N		
			Y / N		
			Y / N		
			Y / N		
			Y / N		

<b>2</b>	<b>Emergency Preparedness</b>				
.1	A Risk Assessment has been performed to the Administration's satisfaction - valid for the intended bunker loading operation including location, delivery mode and the conditions under which that loading is to be undertaken		Y / N		
.2	Emergency Response Procedure current, available to, and understood by, all Bunker Loading Team personnel		Y / N		
.3	ESD criteria established and documented for the intended bunkering		Y / N		
.4	Fire detection sensors covering bunker manifold and bunker piping areas, together with associated alarms, confirmed in working order and tested	Temperature triggered	Y / N		
		Vapour triggered	Y / N		
.5	Fixed firefighting equipment covering bunker manifold and bunker piping areas confirmed in working order	ARAFFF system	Y / N		
		Water spray	Y / N		
.6	Bunker manifold portable firefighting equipment available		Y / N		
.7	Safety equipment: clear signage, unobstructed access, adequately stocked and functionality tested	Shower stations	Y / N		
		Eye wash stations	Y / N		

.8	PPE available for Bunker Loading Team personnel in accordance with Bunker Loading Procedure and all in required order	Y / N	
.9	Fixed methanol vapour and liquid detection sensors, together with associated audible and visual alarms at all locations, in working order and tested	Y / N	
.10	Personal methanol vapour meter devices available for Bunker Loading Team personnel in accordance with Bunker Loading Procedure and in working order and tested	Y / N	
.11	Onboard zones - hazardous, safety, security - planned in accordance with Bunker Loading Procedure	Y / N	
.12	Emergency response training scenarios completed according to schedule	Y / N	
.13	Scenario training records up-to-date and documented	Y / N	

<b>3</b>	<b>Bunker Loading System</b>		
.1	Bunker Loading Procedure covers the intended bunkering operation – including location, delivery mode and the conditions under which that loading is to be performed	Y / N	
.2	Bunker Loading Procedure available to, and understood by, all Bunker Loading Team personnel	Y / N	
.3	Bunker capacity and piping / instrumentation plans (P&ID) posted at	Bunker Control Station	Y / N
		Bunker Manifolds	Y / N
.4	Bunker Control Station – access unobstructed, lighting and, if fitted, ventilation in working order	Y / N	
.5	Bunker Control Station – bunker piping valve remote controls and position indicators in working order and tested	Y / N	
.6	Bunker Control Station – instrumentation and alarms in working order and tested	Y / N	
.7	Communications system equipment fully charged, in working order and tested	Primary System	Y / N
		Backup System	Y / N
.8	Bunker tank fittings in working order and tested	Tanks inspected:	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
		Manual filling valves	Y / N
		Remote operated filling valves	Y / N / NA
		Level indicator 1	Y / N
		Level indicator 2	Y / N
		High level alarm - visual	Y / N
		High level alarm - audible	Y / N
		High-High level alarm - visual	Y / N
		High-High level alarm - audible	Y / N
		High-High level alarm – filling valve trip	Y / N
		Tank vapour pressure	Y / N
		Tank vapour high pressure alarm	Y / N
Contents temperature	Y / N		
.9	If installed: independent tanks - additional checks	Tanks inspected	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
		Securing arrangements in order	Y / N
		Earthing connection in order	Y / N
.10	Bunker manifold and bunker piping	All manifold pipe ends securely blanked	Y / N
		Bunker piping in order	Y / N
		Valves in working order	Y / N

	Valve remote operation mechanisms in working order and tested from all locations	Y / N	
.11	Bunker manifold and bunker piping: instrumentation and alarms in working order and tested	Y / N	
.12	If applicable: monitoring arrangements in respect of methanol leakage – gas or liquid - into the annular space of any double walled bunker piping, and associated alarms and shut-downs, in working order and tested	Y / N / NA	
.13	Bunker piping pressure relief valves in working order	Y / N	
.14	ESD system and components – Ship: in working order	Y / N	
.15	Ship vapour handling system in working order	Y / N	
.16	Ship vapour handling system instrumentation: in working order and tested	Y / N	
.17	Condition of vent heads and adjacent areas checked and in order	Y / N	
.18	If to be used: vapour handling system connection to Supplier - in working order	Y / N / NA	
.19	If installed and to be used: vapour processing device and associated instrumentation and alarms - in working order and tested as appropriate	Y / N / NA	
.20	All bunker tanks inerted – head space O <sub>2</sub> content does not exceed 8%	Y / N	
.21	Bunker piping is inerted - O <sub>2</sub> content does not exceed 8%	Y / N	
.22	Bunker tanks and bunker piping O <sub>2</sub> monitoring device(s) in working order and tested	Y / N	
.23	Inert gas generator, associated O <sub>2</sub> monitoring device and alarm / venting arrangements in working order and tested to produce inert gas at not more than 5% O <sub>2</sub> content	Y / N / NA	
	or	Y / N / NA	
	Available onboard quantity of stored inert gas is sufficient in accordance with the Bunker Loading Procedure	_____ kg	
.24	Spill control arrangements around bunker manifold, bunker piping / valves / fittings, and bunker tank vent heads in order	Y / N	
.25	Drip trays in order and empty	Y / N	
.26	Drip tray run-down lines to holding tank(s) unobstructed	Y / N	
.27	Holding tank level in accordance with Bunker Loading Procedure and inerted – head space not more than 8% O <sub>2</sub> content	Y / N	
.28	Holding tank level indicator and alarm in working order and tested	Y / N	
.29	Spill control materials, clean-up equipment and bins available in accordance with Bunker Loading Procedure	Y / N	
.30	Scupper plugs available as required	Y / N	
.31	Access in way of bunker manifold and bunkering work areas in order	Y / N	
.32	Lighting in way of bunker manifold and bunkering work areas in working order	Y / N	
.33	If fitted: ventilation at bunker manifold and bunkering work area together with associated alarms, in working order and tested as appropriate	Y / N / NA	
.34	Electrical equipment and trunking in bunker manifold and bunker piping areas in order	Y / N	
.35	If ship's lifting equipment and slings to be used at intended bunkering: in working order and tested as required	Y / N / NA	

.36	If CCTV is to be used to monitor bunkering: in working order and tested	Y / N / NA	
.37	If to be used: ship's methanol bunker sampling device in working order with required fittings and sample containers	Y / N / NA	
.38	Maintenance manual: inspections, maintenance and servicing of bunkering system components completed to date and documented as required by Bunker Loading Procedure	Y / N	

<b>4 Bunker Loading Plan</b>			
.1	Intended bunker quantity (m <sup>3</sup> ) and quality specification confirmed with Supplier	Y / N	
		Total _____ m <sup>3</sup>	
.2	Intended onboard distribution, filling sequence and required flow rates (start, main, topping off) documented	Y / N	
.3	Spare capacity - to 98% of total volume - of bunker tanks to be loaded confirmed	Tank:	Spare capacity m <sup>3</sup>
		1	
		2	
		3	
		4	
		5	
		6	
Total:			
.4	Maximum allowable bunkering flow rates; initial, main, topping off as required together with flow rate change points for each tank to be loaded informed to and confirmed with Supplier	Y / N	
.5	Maximum allowable bunker piping pressures (bar) advised to and confirmed with Supplier	Confirmed	Y / N
		During delivery	_____ bar
		If ESD actuated	_____ bar
.6	Ship - Supplier ESD compatibility confirmed with Supplier	Y / N	
.7	Bunker manifold arrangement and fittings: compatibility with supplier's delivery arrangements - confirmed with Supplier	Y / N	
.8	Ship - Supplier bunker line isolation arrangement confirmed with Supplier	Y / N	
.9	If to be used: ship's lifting equipment - lift weight / radius limitations advised to and confirmed with Supplier	Y / N / NA	
.10	If to be used: vapour handling system - compatibility of connection with supply facility's system and isolation arrangements confirmed with Supplier	Y / N / NA	

<b>5 Simultaneous Operations during Bunker Loading</b>							
.1	Planned bunkering period	Start	Date	Time	DD:MM	HH:MM	
		Finish	Date	Time	DD:MM	HH:MM	
.2	Details of other Ship operations planned to be undertaken simultaneously to bunker loading:					Y / NA	
	1:	Start	Date	Time	DD:MM	HH:MM	
		Finish	Date	Time	DD:MM	HH:MM	
	2:	Start	Date	Time	DD:MM	HH:MM	
		Finish	Date	Time	DD:MM	HH:MM	
	3:	Start	Date	Time	DD:MM	HH:MM	
		Finish	Date	Time	DD:MM	HH:MM	
	4:	Start	Date	Time	DD:MM	HH:MM	
		Finish	Date	Time	DD:MM	HH:MM	
	.3	Permission obtained from the relevant port authority for each of the above operations to be undertaken simultaneously to bunker loading					Y / N / NA

.4	Restrictions / requirements in relation to each of the above simultaneous operations have been documented and procedures will be put in place to ensure that those restrictions / requirements are adhered to	Op 1	Y / N	
		Op 2	Y / N	
		Op 3	Y / N	
		Op 4	Y / N	
.5	Supplier informed of these simultaneous operations and resulting implications on bunker loading	Y / N / NA		
.6	Ship informed by Supplier of simultaneous operations on their side during bunker loading and procedures will be put in place to cover those	Y / N / NA		

<b>6 Bunker Port Contacts</b>				
.1	Contact information duly documented for	Agent:	Y / N	
		Bunker supplier:	Y / N	
		Port authority -bunkering	Y / N	
		Other 1:	Y / N / NA	
		Other 2:	Y / N / NA	
		Other 3:	Y / N / NA	

<b>7 Local Restrictions / Requirements</b>				
.1	Established whether there are any additional local restrictions / requirements as regards bunker loading and if there are then those have been documented and procedures will be put in place to ensure that those restrictions / requirements will be adhered to	Y / N		

<b>8 Preparation Review</b>				
.1	Any Preparation to Bunker Checklist negative findings together with subsequent resolving actions have been duly documented as required by Bunker Loading Procedure and are now resolved	Y / N		

	<b>Preparation to Bunker Checklist to be satisfactorily completed and signed by Ship PIC</b>	Name:		
		Rank:		
		Signature:		
		Date:		

---

## Checklist 1.2

Ship – Ready to Bunker

July 2020



Ship	
Name:	
Flag:	
IMO No.:	
Methanol Bunkers	
Bunker Port:	
Bunkering Location / Berth:	
Bunker Date:	
Supplier:	
Ordered Quality Grade:	
Ordered Quantity (m <sup>3</sup> ):	
Delivery Mode:	Barge / Truck / Terminal

Ship – Ready to Bunker Bulk Supply Checklist		Completion by Ship PIC or other authorised person	
		Response	Remarks
.1	Confirmed that there have been no changes from previously established Preparation to Bunker Checklist status	Y / N	
.2	Ship – shore moorings secure	Y / N / NA	
.3	Ship – shore fenders deployed as required	Y / N / NA	
.4	Ship – shore access secured	Y / N / NA	
.5	Ship – barge moorings secure	Y / N / NA	
.6	Ship – barge fenders deployed as required	Y / N / NA	
.7	Ship – barge access secured	Y / N / NA	
.8	Onboard zoning in place	Hazardous	Y / N
		Safety	Y / N
		Security	Y / N
.9	Hot work prohibition in force in accordance with Bunker Loading Procedure	Y / N	
.10	Smoking, naked light and electrical / electronic equipment prohibitions in force in accordance with Bunker Loading Procedure	Y / N	
.11	Accommodation doors and openings secured in accordance with Bunker Loading Procedure	Y / N	
.12	Lighting and ventilation in use as required	Y / N	
.13	Bunker tanks to be loaded: current fill status checked and compared to transfer plan confirming adequate capacity for the quantity of bunkers to be loaded	Y / N	
.14	Bunker manifold connections confirmed as blanked and with stop valves shut	Y / N	
.15	Bunker piping – all valves confirmed as shut	Y / N	
.16	If to be used: ship's lifting equipment ready to be used	Y / N / NA	
.17	If to be used: vapour processing device ready to be used as required	Y / N / NA	
.18	If to be used: vapour handling system connection to supply facility – ready to be deployed	Y / N / NA	
.19	If to be used: inert gas generator ready to be used as required	Y / N	
.20	Spill control arrangements	Scupper plugs in place	Y / N
		Save-alls clean and empty	Y / N
		Drip tray drain valves open	Y / N
		Holding tank level acceptable	Y / N



		Spill control materials deployed	Y / N	
.21	Fixed firefighting equipment ready and checked	ARAFF system	Y / N	
		Water spray	Y / N	
.22	Bunker manifold portable firefighting equipment in place		Y / N	
.23	Safety equipment checked as ready for use	Showers	Y / N	
		Eye-wash stations	Y / N	
.24	Bunker Loading Team: each person - personal PPE in accordance with Bunker Loading Procedure		Y / N	
.25	Bunker Loading Team: each person - personal methanol vapour meters carried in accordance with Bunker Loading Procedure and functioning		Y / N	
.26	Ship PIC communication arrangements with all Bunker Loading Team personnel checked		Y / N	
.27	If applicable: simultaneous operations procedures in place		Y / N / NA	
.28	If applicable: procedures in place covering local restrictions / requirements		Y / N / NA	
.29	Any Ready to Bunker Checklist negative responses now resolved		Y / N	

	<b>Ready to Bunker Checklist to be satisfactorily completed and signed by Ship PIC</b>	Name:		
		Rank:		
		Signature:		
		Date & Time:		

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## Checklist 1.3

Ship – Bunker Loading

July 2020



Ship	
Name:	
Flag:	
IMO No.:	
Methanol Bunkers	
Bunker Port:	
Bunkering Location / Berth:	
Bunker Date:	
Supplier:	
Ordered Quality Grade:	
Ordered Quantity (m <sup>3</sup> ):	
Delivery Mode:	Barge / Truck / Terminal
Barge Name / Truck Registration:	

Ship – Bunker Loading Bulk Supply Checklist		Completion by Ship PIC or other authorised person	
		Response	Remarks
<b>1</b>	<b>Preliminary Checks</b>		
.1	Ready to Bunker Checklist satisfactorily completed	Y / N	
.2	Ship-Supplier Bunker Safety Checklist satisfactorily completed	Y / N	

<b>2</b>		<b>Bunker Loading - Process Monitoring</b>	
.1	Initial bunker gauging completed	Y / N HH:MM	
.2	Ship bunker manifold stop valve confirmed to supply facility as open and that bunker loading can commence	Y / N HH:MM	
.3	Bunker loading rates - advised as required to supply facility over bunker loading operation	Y / N	
.4	Bunker loading rates – controlled by supply facility in accordance with Ship requirements	Y / N	
.5	Bunker piping pressure monitored as being within required limits	Y / N	
.6	Bunker tank head space pressures and vent line pressure monitored as being within required limits	Y / N	
.7	Bunker tank filling monitored	Y / N	
.8	Tank 1: _____	Initial contents (m <sup>3</sup> )	
		Start loading time	HH:MM
		End loading time	HH:MM
		Final contents (m <sup>3</sup> )	
.9	Tank 2: _____	Initial contents (m <sup>3</sup> )	
		Start loading time	HH:MM
		End loading time	HH:MM
		Final contents (m <sup>3</sup> )	
.10	Tank 3: _____	Initial contents (m <sup>3</sup> )	
		Start loading time	HH:MM
		End loading time	HH:MM
		Final contents (m <sup>3</sup> )	

.11	Tank 4: _____	Initial contents (m <sup>3</sup> )		
		Start loading time	HH:MM	
		End loading time	HH:MM	
		Final contents (m <sup>3</sup> )		
.12	Tank 5: _____	Initial contents (m <sup>3</sup> )		
		Start loading time	HH:MM	
		End loading time	HH:MM	
		Final contents (m <sup>3</sup> )		
.13	Tank 6: _____	Initial contents (m <sup>3</sup> )		
		Start loading time	HH:MM	
		End loading time	HH:MM	
		Final contents (m <sup>3</sup> )		
.14	Advised by supply facility that bunker loading pumping finished	Y / N HH:MM		
.15	Final bunker gauging completed	Y / N HH:MM		

<b>3</b>	<b>MARPOL Sample</b>		
.1	MARPOL Sample sampling device observed to be appropriately positioned and installed	Y / N	
.2	Sampling observed to commence on start of bunker loading	Y / N	
.3	Over whole of bunker loading operation sampling device observed to be operating as required and not tampered with	Y / N	
.4	Sampling observed to stop only at end of bunker loading	Y / N	
.5	MARPOL Sample observed as correctly prepared from Primary Sample, sealed and labelled	Y / N	

<b>4</b>	<b>Ship Bunker Sampling</b>		
.1	Ship also to draw sample of bunkers as loaded	Y / N	
.2	Sampling commenced – time	HH:MM	
.3	Operation and integrity of Ship’s sampling device monitored as performing correctly at start of sampling	Y / N	
.4	Over bunker loading operation Ship’s sampling device observed to be operating as required and not tampered with	Y / N	
.5	Sampling stopped – time	HH:MM	
.6	Sample safety removed from device, prepared, labelled and stored in accordance with Bunker Loading Procedure	Y / N	

<b>5</b>	<b>Bunker Loading - Safety Monitoring</b>		
.1	Bunker Loading Team all in place and generally monitoring Ship related aspects over the full duration of the bunker loading operation – either directly or by CCTV as appropriate	Y / N	
.2	Ship access arrangements and lighting levels are maintained sufficient to readily monitor the bunker loading operation	Y / N	
.3	Ship PIC and other Bunker Loading Team personnel are solely assigned to the bunker loading operation and during that period have no other duties	Y / N	
	The status / condition of the following are monitored on a routine basis and reported immediately to Ship PIC if found deficient / not acceptable:		
.4	Integrity of bunker manifold connection, sampling devices and bunker piping including fittings		
.5	If applicable: monitoring of annular space condition of any double walled bunker piping		
.6	Fixed methanol vapour detection sensor readings		

.7	Personal methanol vapour meter readings						
.8	External events which could affect ship or bunkering safety						
.9	Compliance with ship's hazardous, safety and security zoning and related prohibitions						
.10	Fire detection sensor readings						
.11	Moorings: ship – shore						
.12	If applicable: Moorings: ship - barge						
.13	Fenders: ship – shore						
.14	If applicable: Fenders: ship - barge						
.15	Relative movement: ship – shore						
.16	If applicable: Relative movement: ship - barge						
.17	Bunker delivery hose loadings						
.18	If used: ship's lifting gear – applied loadings within rating						
.19	Bunker connection isolation						
.20	Communications: Ship – Supplier						
.21	Ship – shore access arrangements						
.22	Bunker tank inert gas oxygen content						
.23	If used: vapour processing device operation						
.24	If used: vapour handling system connection to supply facility – integrity, loading and isolation						
.25	Condition of save-alls and drip trays						
.26	Holding tank level						
.27	If undertaken: simultaneous operations progressing in accordance with Ship's procedures						
.28	If applicable: Ship's procedures are being applied to ensure that local restrictions / requirements are complied with						
.29	No deficiencies / not acceptable findings reported during bunker loading operation					Y / N	
.30	ESD was not triggered during the bunkering					Y / N	
.31	SBC was not triggered during the bunkering					Y / N	

<b>6</b>	<b>Bunker Loading Shutdown</b>						
.1	Bunker hose purging and clearing back to supply facility completed as agreed					Y / N	
.2	Bunker tank head space and piping confirmed as fully inerted at not more than 8% O <sub>2</sub>					Y / N	
.3	Bunker piping valves and manifold stop valve shut					Y / N	
.4	Bunker hose and ESD link disconnected as agreed					Y / N	
.5	Manifold blank on					Y / N	
.6	If used: vapour return to supply facility disconnected, blanked and stowed					Y / N / NA	
.7	If used: vapour processing device shut-down					Y / N / NA	
.8	Clean up completed as necessary of manifold area, save-alls and drip trays. Drip tray drain valves shut					Y / N	
.9	Spill control materials cleared away, scupper plugs removed					Y / N	
.10	Bunker Loading Team stood down					HH:MM	

<b>7</b>	<b>Personnel Changes during Bunker Loading</b>						
.1	Ship PIC change	In-coming Ship PIC: Name / Rank					
		In-coming Ship PIC fully briefed	Out-going			Y / N	
			In-coming			Y / N	

		Time of take-over as Ship PIC	HH:MM	
.2	Bunker Loading Team changes: Incoming personnel (A):	Out-going: Name / Role		
		In-coming: Name / Role		
		Trained for role	Y / N	
		PPE worn / in use	Y / N	
		Personal methanol vapour meter in use	Y / N	
.3	Bunker Loading Team changes: Incoming personnel (B):	Out-going: Name / Role		
		In-coming: Name / Role		
		Trained for role	Y / N	
		PPE worn / in use	Y / N	
		Personal methanol vapour meter in use	Y / N	
.4	Bunker Loading Team changes: Incoming personnel (C):	Out-going: Name / Role		
		In-coming: Name / Role		
		Trained for role	Y / N	
		PPE worn / in use	Y / N	
		Personal methanol vapour meter in use	Y / N	
.5	Supplier PIC change advised	Time of change-over	HH:MM	
		Contact established with in-coming Supplier PIC	Y / N	

<b>8</b>	<b>Bunker Loading Completion</b>		
.1	Oil Record Book duly completed	Y / N	
.2	Bunker Delivery Note received and duly filed	Y / N	
.3	MARPOL Sample received, signed-for and duly stored	Y / N	
.4	Commercial sample(s) received, signed-for and duly stored	Y / N	
.5	If appropriate: Letter of Protest issued	Y / N	
.6	Ship – Supplier Bunker Completion Checklist completed	Y / N	
.7	Bunker Loading Procedure report completed and distributed as required	Y / N / NA	
.8	Post bunkering follow-up actions, as required by Bunker Loading Procedure, completed	Y / N / NA	

	<b>Bunker Loading Checklist completed and signed by Ship PIC</b>	Name:	
		Rank:	
		Signature:	
		Date & Time:	

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## Checklist 3.1

Supplier -Ship

Bunker Safety + Bunker Completion

July 2020



Ship		
Name:		
Flag:		
IMO No.:		
Methanol Bunkers		
Bunker Port:		
Bunkering Location / Berth:		
Bunker Date:		
Supplier:		
Supplier Address:		
Supplier Registration No.:		
Quality Grade:		
Ordered Quantity (m <sup>3</sup> )		
Delivery mode details (as applicable):	Barge	Barge name(s) and identifying marks:
	Truck	Operating Company & Vehicle registration number(s):
	Terminal	

Supplier and Ship - Bunker Safety (Bulk Supply) Checklist		Response		Remarks
		Supplier PIC	Ship PIC	
<i>To be satisfactorily completed by both parties before Supplier commences physical bunker delivery to Ship</i>				Supplier PIC is the Barge / Truck / Terminal PIC as applicable
<b>1</b>	<b>Pre-bunkering Meeting</b>			
.1	Access arrangements Ship-Supplier satisfactory	Y / N	Y / N	
.2	Pre-bunkering meeting held between Ship PIC and Supplier PIC	Y / N	Y / N	
.3	Supplier PIC has confirmed that their Ready to Deliver to Ship Checklist has been satisfactorily completed and copy provided to Ship	Y / N	Y / N	
.4	Ship PIC has confirmed that their Ready to Bunker Checklist has been satisfactorily completed and copy provided to Supplier	Y / N	Y / N	
.5	Bunker quality grade and quantity (m <sup>3</sup> )	Agreed	Y / N	Y / N
		Quality grade ref.		
		Quantity (m <sup>3</sup> )		
.6	Pre-delivery documentation (including MSDS and bunker requisition) has been provided by the Supplier and received by the Ship and are in order	Y / N	Y / N	
.7	Written transfer plan, including hose connection / disconnection duties and maximum bunker pressures and transfer rates at all stages of the delivery, agreed	Y / N	Y / N	
.8	If to be used: vapour return arrangements to supply facility agreed	Y / N	Y / N	
		NA	NA	
.9	Working language, time and hand signals agreed	Y / N	Y / N	



.10	Communication arrangements agreed	Primary System	Y / N	Y / N	
		Backup System	Y / N	Y / N	
.11	Written emergency plan agreed		Y / N	Y / N	
.12	ESD and SBC criteria agreed		Y / N	Y / N	
.13	Port and emergency services contact arrangements agreed		Y / N	Y / N	
.14	External criteria causing bunker delivery to be shut-down, including weather conditions, sea / river conditions, other ship movements, agreed		Y / N	Y / N	
.15	If ship lifting equipment to be used to bring the delivery facility's bunker delivery hose onboard: relevant arrangements agreed		Y / N NA	Y / N NA	
.16	Bunker delivery hose draining and purging procedure at completion of bunkering agreed		Y / N	Y / N	
.17	Supply gauging arrangements agreed		Y / N	Y / N	
.18	If applicable: permitted simultaneous Ship operations and related controls advised to Supplier		Y / N NA	Y / N NA	
.19	If applicable: permitted simultaneous Supplier operations and related controls advised to Ship		Y / N NA	Y / N NA	
.20	If applicable: Ship compliance arrangements with local restrictions / requirements advised to Supplier		Y / N NA	Y / N NA	
.21	If applicable: Supplier compliance arrangements with local restrictions / requirements advised to Ship		Y / N NA	Y / N NA	

<b>2</b>	<b>Preparation to Bunker: Supplier and Ship Joint Actions</b>				
.1	Communication arrangements tested and confirmed as satisfactory	Primary System	Y / N	Y / N	
		Backup System	Y / N	Y / N	
.2	If supply facility lifting equipment has been used to handle the bunker delivery hose: lifting, holding and supporting arrangements confirmed as satisfactory		Y / N	NA	
.3	If ship lifting equipment has been used to handle the supply facility's bunker delivery hose: lifting, holding and supporting arrangements confirmed as satisfactory		Y / N	Y / N	
.4	Bunker delivery hose test marked as required and in satisfactory condition (external and internal)		Y / N	Y / N	
.5	Bunker delivery hose connection to ship's bunker manifold confirmed as satisfactory		Y / N	Y / N	
.6	Bunker delivery hose insulation at connection confirmed as satisfactory		Y / N	Y / N	
.7	ESD and SBC installation confirmed as satisfactory		Y / N	Y / N	
.8	ESD links established, tested and confirmed as satisfactory		Y / N	Y / N	
.9	If to be used: vapour return line to supply facility confirmed as satisfactorily connected and isolated		Y / N NA	Y / N NA	
.10	Ship's bunker piping system set-up ready to commence loading from Barge		NA	Y / N	
.11	Barge's bunker delivery system set-up ready to commence delivery to Ship		Y / N	NA	

<b>Bunker Safety Checklist to be satisfactorily completed and signed by both Ship PIC and Supplier PIC before the Ship's manifold stop valve is opened and the Supplier commences bunker delivery</b>		Name:			
		Rank / Position:			
		Signature:			
		Date & Time:			
<b>Supplier and Ship - Bunker Completion Checklist</b>		<b>Response</b>		<b>Remarks</b>	
		<b>Supplier PIC</b>	<b>Ship PIC</b>		
.1	Supplier pumping completed	Y / N	Y / N		
.2	Bunker delivery hose drained and purged as agreed	Y / N	Y / N		
.3	Supplier has advised that bunkering is completed	Y / N	Y / N		
.4	Bunker manifold valves shut	NA	Y / N		
.5	Bunker delivery hose and ESD link disconnected as agreed	Y / N	Y / N		
.6	If used: vapour handling system connection disconnected	Y / N	Y / N		
.7	Bunker Delivery Note provided by the Supplier	Y / N	Y / N		
.8	MARPOL Sample provided by the Supplier	Y / N	Y / N		
.9	Any incidents or near misses reported to relevant authorities as required	Y / N NA	Y / N NA		
<b>Bunker Completion Checklist to be completed and signed by both Supplier PIC and Ship PIC</b>		Name:			
		Rank / Position:			
		Signature:			
		Date & Time:			

# D Ship to Road Tanker Checklist

### PART A: Planning Stage Checklist

This part of the checklist should be completed in the planning stage of an LNG bunker operation.  
It is a recommended guideline for the, in advance, exchange of information necessary for the preparation of the actual operation.

Planned date and time: \_\_\_\_\_

Designated LNG bunker location: \_\_\_\_\_

LNG receiving ship: \_\_\_\_\_

LNG supplying bunker truck: \_\_\_\_\_

	Check	Ship	LNG Truck	Terminal	Code	Remarks
1	Competent authorities have granted permission for LNG transfer operations for the specific location and time.				P	
2	The terminal has granted permission for LNG transfer operations for the specific location and time.				P	
3	Competent authorities have been notified of the start of LNG bunker operations as per local regulations.					Day/time notification: _____ Day time notified: _____
4	The terminal has been notified of the start of LNG bunker operations as per terminal requirements.					Day/time notification: _____ Day time notified: _____
5	Competent authorities requirements are being observed.					e.g. Port byelaws.
6	Local terminal requirements are being observed.					e.g. Terminal regulations
7	All personnel involved in the LNG bunker operation have the appropriate training and have been instructed on the specific LNG bunker equipment and procedures.	For the Ship:	For the Truck	For the Terminal		
8	The bunker location is accessible for the LNG supplying tank truck and the total truck weight does not exceed the maximum permitted load of the quay or jetty.					

9	The bunker operation area can be sufficiently illuminated					
10	All LNG transfer and gas detection equipment is certified, in good condition and appropriate for the service intended.	For the Ship:	For the Truck			
11	The procedures for bunkering, cooling down and purging operations have been agreed upon.				A	Reference to procedures::
12	The system and method of electrical insulation have been agreed upon by ship and truck.				A	Method:
13	The restricted area on the shore has been agreed upon by ship, truck and terminal				A	Safety zone: _____ mtr / ft
14	Regulations with regards to ignition sources can be observed.	For the Ship:	For the Truck	For the terminal		
15	All in local requirements required firefighting equipment is ready for immediate use.	For the Ship:	For the Truck	For the terminal		If applicable

**For registration of the, in the planning, involved representatives:.**

Ship	LNG Truck	Terminal
Name	Name	Name
Rank	Position	Position
Date	Date	Date
Time	Time	Time

## PART B: Pre Transfer Checklist

(This mandatory part should be completed before actual transfer operations start)

Date and time: \_\_\_\_\_

Designated LNG bunker location: \_\_\_\_\_

LNG receiving ship: \_\_\_\_\_

LNG supplying tank truck: \_\_\_\_\_

	Check	Ship	LNG Truck	Terminal	Code	Remarks
16	Part A is used prior and preparatory of the actual operation	For the Ship:	For the Truck	For the Terminal		If applicable
17	Present weather and wave conditions are within the agreed limits.				A R	
18	The LNG receiving ship is securely moored. Regulations with regards to mooring arrangements are observed. Sufficient fendering is in place.				R	
19	There is a safe means of access between the ship and shore. When mandatory, there is a safe emergency escape route between ship and shore				R	
20	All mandatory firefighting equipment is ready for immediate use	For the Ship:	For the Truck	For the Terminal		
21	The bunker operation area is sufficiently illuminated.				A R	
22	The ship and truck are able to move under their own power in a safe and non-obstructed direction.	For the Ship:	For the Truck		R	
23	Adequate supervision of the bunker operation is in place both on the ship and at the LNG tank truck and an effective watch is being kept at all time.					
24	An effective means of communication between the responsible operators and supervisors on the ship and at truck has been established and tested. The communication language has been agreed upon.				A R	VHF / UHF Channel: ____ Language: _____  Primary System: _____  Backup System: _____
25	The emergency stop signal and shutdown procedures have been agreed upon, tested,				A	Emergency Stop Signal:

	Check	Ship	LNG Truck	Terminal	Code	Remarks
	and explained to all personnel involved. Emergency procedures and plans and the contact numbers are known to the persons in charge.					_____
26	The predetermined restricted area zone has been established. Appropriate signs mark this area.				A	
27	The restricted area is free of unauthorized persons, objects and ignition sources.				R	
28	External doors, portholes and accommodation ventilation inlets are closed as per operations manual.				R	At no time they should be locked
29	The gas detection equipment has been operationally tested and found to be in good working order.					
30	Material Safety Data Sheets (MSDS) for the delivered LNG fuel are available.				A	
31	Regulations with regards to ignition sources are observed.				R	
32	Appropriate and sufficient suitable protective clothing and equipment is ready for immediate use.					
33	Personnel involved in the connection and disconnection of the bunker hoses and personnel in the direct vicinity of these operations make use of sufficient and appropriate protective clothing and equipment.					
34	A (powered) emergency release coupling {(P)ERC} is installed and is ready for immediate use					If applicable
35	The water spray system has been tested and is ready for immediate use.					If applicable.
36	Spill containment arrangements are of an appropriate material and volume, in position, and empty.					
37	Hull and deck protection against low temperature is in place.					If applicable.
38	Bunker pumps and compressors are in good working order.				A	If applicable.
39	All control valves are well maintained and in good working order.					
40	Bunker system gauges, high level alarms and high-pressure alarms are operational, correctly set and in good working order.					
41	The ship's bunker tanks are protected against inadvertent overfilling at all times, tank content is constantly monitored and alarms are correctly set.				R	Intervals not exceeding _____ minutes
42	All safety and control devices on the LNG installations are checked, tested and found to					

	Check	Ship	LNG Truck	Terminal	Code	Remarks
	be in good working order.					
43	Pressure control equipment and boil off or re-liquefaction equipment is operational and in good working order.					If applicable
44	Both on the ship and at the tank truck the ESDs, automatic valves or similar devices have been tested, have found to be in good working order, and are ready for use. The both ESD systems are linked. The closing rates of the ESDs have been exchanged.				A	ESD Ship: _____ seconds ESD Truck: _____ seconds
45	Initial LNG bunker line up has been checked. Unused connections are closed, blanked and fully bolted.					
46	LNG bunker hoses, fixed pipelines and manifolds are in good condition, properly rigged, supported, properly connected, leak tested and certified for the LNG transfer.					
47	The LNG bunker connection between the ship and the truck is provided with dry disconnection couplings.					If applicable.
48	The LNG bunker connection between the ship and the LNG bunker truck has adequate electrical insulating means in place.					
49	Dry breakaway couplings in the LNG bunker connections are in place, have been visually inspected for functioning and found to be in a good working order.				A	
50	The tank truck is electrically grounded and the wheels are chocked.					
51	The tank truck engine is off during the connection and disconnection of the LNG bunker hoses.					
52	The tank truck engine is switched off during purging or LNG transfer.					Unless the truck engine is required for the purging or transfer of LNG.
53	If mandatory the ship's emergency fire control plans are located externally.					Location: _____
54	An International Shore Connection has been provided.					If applicable
55	Competent authorities have been informed that bunker transfer operations are commencing and have been requested to inform other vessels in the vicinity.					Date /time of the notification _____



## PART C: LNG Transfer Data

(This part should be completed before actual transfer operations start)

### Agreed starting temperatures and pressures

Note the agreed Physical Quantity Unit (PQU):  m<sup>3</sup>  Tonnes  \_\_\_\_\_

	Ship		Truck		
LNG tank: start temperature:					°C / °F*
LNG tank: start pressure:					bar / psi* (rel)
LNG tank: available (rest) capacity					PQU

\*: delete as appropriate

### Agreed bunker operations

Note the agreed Physical Quantity Unit (PQU):  m<sup>3</sup>  Tonnes  \_\_\_\_\_

	Tank 1	Tank 2	
Agreed quantity to be transferred:			PQU
Starting pressure at the manifold:			bar / psi* (rel)
Starting rate:			PQU per hour
Max transfer rate:			PQU per hour
Topping up rate:			PQU per hour
Max pressure at manifold:			bar / psi* (rel)

\*: delete as appropriate

### Agreed maximums and minimums

	Maximum	Minimum	
Pressures during bunkering:			bar / psi* (rel)
Pressures in the LNG bunker tanks:			bar / psi* (rel)
Temperatures of the LNG:			°C / °F*
Filling limit of the LNG bunker tanks:			%

\*: delete as appropriate

**Declaration**

We, the undersigned, have checked the above items in chapter I parts A, B and C in accordance with the instructions and have satisfied ourselves that the entries we have made are correct.

We have also made arrangements to carry out repetitive checks as necessary and agreed that those items coded 'R' in the checklist should be re-checked at intervals not exceeding \_\_\_\_\_ hours.

If, to our knowledge, the status of any item changes, we will immediately inform the other party.

Ship	LNG Truck	Terminal
Name	Name	Name
Rank	Position	Position
Signature	Signature	Signature
Date	Date	Date
Time	Time	Time

Record of repetitive checks								
Date								
Time								
Initials for ship								
Initials for truck								
Initials for terminal								

**Guideline for completing this checklist**

The presence of the letters 'A' or 'R' in the column entitled 'Code' indicates the following:

- A ('Agreement').  
This indicates an agreement or procedure that should be identified in the 'Remarks' column of the checklist or communicated in some other mutually acceptable form.
- R ('Re-check').  
This indicates items to be re-checked at appropriate intervals, as agreed between both parties, at periods stated in the declaration.
- P ('Permission')  
This indicates that permission is to be granted by authorities.

The joint declaration should not be signed until both parties have checked and accepted their assigned responsibilities and accountabilities. When duly signed, this document is to be kept on board of the LNG receiving vessel conform applicable regulations or company requirements.

## Part D: After LNG Transfer Checklist

(This part should be completed after transfer operations have been completed)

	Check	Ship	LNG Truck	Terminal	Code	Remarks
57	LNG bunker hoses, fixed pipelines and manifolds have been purged and are ready for disconnection.				A	
58	Remote and manually controlled valves are closed and ready for disconnection.				A	
59	After disconnection the restricted area has been deactivated. Appropriate signs have been removed.				A	
60	Competent authorities have been notified that LNG bunker operations have been completed.					Time of notification _____ hrs
61	The terminal has been notified that LNG bunker operations have been completed.					Time of notification: _____ hrs
62	Competent authorities have been informed that bunker transfer operations have ceased and have been requested to inform other vessels in the vicinity.					
63	If applicable near misses and incidents have been reported to competent authorities.					Report nr: _____

### Declaration

We, the undersigned, have checked the above items in chapter II in accordance with the instructions and have satisfied ourselves that the entries we have made are correct.

Ship	LNG Truck	Terminal
Name	Name	Name
Rank	Position	Position
Signature	Signature	Signature
Date	Date	Date
Time	Time	Time

## Guideline for completing this checklist

The presence of the letters 'A' or 'R' in the column entitled 'Code' indicates the following:

- A ('Agreement').  
This indicates an agreement or procedure that should be identified in the 'Remarks' column of the checklist or communicated in some other mutually acceptable form.
- R ('Re-check').  
This indicates items to be re-checked at appropriate intervals, as agreed between both parties, at periods stated in the declaration.
- P ('Permission')  
This indicates that permission is to be granted by authorities.

The joint declaration should not be signed until both parties have checked and accepted their assigned responsibilities and accountabilities. When duly signed, this document is to be kept at least one year on board of the LNG receiving vessel.

## GUIDELINES

### GENERAL

The responsibility and accountability for the safe conduct of operations while a ship is performing an LNG bunkering is shared jointly between the ship's master, the LNG bunker truck operator and, if applicable, the terminal representative. Before the LNG bunker operations commence, the ship's master, the LNG bunker truck operator and, if applicable, the terminal representative should:

- Agree in writing on the transfer procedures, including the maximum loading or unloading rates;
- Agree in writing on the action to be taken in the event of an emergency, and
- Complete and sign the LNG bunker checklist Truck to Ship.

The term "terminal" must be understood as any organization responsible of the location of the bunkering

For Inland navigation, the term "ship" must be understood as an inland waterway vessel and the term "ship's master" must be understood as the boat master according to navigational regulations

For the checks which are not applicable for all ships, "if applicable" is added in the last column. The "if applicable" marked checks are not mandatory, users can skip these checks by mentioning N.A. in the remark column.

### STRUCTURE OF THE CHECKLIST

The LNG Bunker Checklist – Truck to Ship comprises of four parts.

The first part: **PART A: Planning Stage Checklist** addresses the considerations to be made during the planning stage of LNG bunker operations. This part of the checklist can be used as a guideline for an exchange of knowledge and agreements on safety items during the planning stage of a LNG bunkering. The advised time of processing this part of the checklist is during the order placement for the bunkering.

The second part: **Part B: Pre Transfer Checklist**, identifies the required physical checks and elements that are verified verbally just before the LNG bunkering commences. The safety of operations requires that all relevant statements are considered and the associated responsibility and accountability for compliance is accepted, either jointly or singly. Where either party is not prepared to accept an assigned accountability, a comment must be made in the remarks column and due consideration should be given to assessing whether operations can proceed. Where a particular item is considered to be not applicable to the ship, the LNG bunker truck or to the planned operation, a note to this effect should be entered in the 'Remarks' column.

The third part: **Part C: LNG Transfer Data** contains the transfer data to be agreed upon. In this section the information on temperature, density, volume, transfer rate, pressure and the physical quantity unit to be used for the LNG bunkering, are exchanged and agreed upon.

The final part of the checklist **Part D: After LNG Transfer Checklist** contains the considerations to be made after the LNG bunker operations for the disconnecting of the bunker connections and finishing the total operations.

## **USAGE OF THE TRUCK TO SHIP LNG BUNKERING CHECKLIST**

The following guidelines have been produced to assist in the joint use of LNG Bunker Checklist – Truck to Ship:

The ship's master and all under his command must adhere strictly to these requirements throughout the ship's stay alongside. The LNG bunker truck operator and, if applicable, the terminal representative must ensure that truck personnel and if applicable shore personnel do likewise. Each party commits to co-operate fully in the mutual interest of achieving safe and efficient operations.

The ship's master, the LNG bunker truck operator and, if applicable, the terminal representative, can designate responsible persons in charge of bunkering operations and authorize them to complete and sign the LNG bunker checklist.

Responsibility and accountability for the statements within the LNG Bunker Checklist – Truck to Ship is assigned within the document. The acceptance of responsibility is confirmed by ticking or initialling the appropriate box and finally signing the declaration at the end of the checklist. Once signed, this details the minimum basis for safe operations that has been agreed upon through the mutual exchange of critical information.

Some of the checklist statements are directed to considerations for which the ship has sole responsibility and accountability. For some checklist statements either the LNG bunker truck or terminal has sole responsibility and accountability. Some checklist statements assign a joint responsibility and accountability. Greyed-out boxes are used to identify statements that generally may not be applicable to one party, although the ship, truck or terminal may tick or initial such sections if they so wish.

Where mentioned in the box; "for the ship", "for the truck" or "for the terminal", the involved parties only check and sign for their own responsibilities

The assignment of responsibility and accountability does not mean that the other party is excluded from carrying out checks in order to confirm compliance. It is intended to ensure clear identification of the party responsible for initial and continued compliance throughout the ship's stay at the bunker location.

The ship's master should personally check all considerations lying within the responsibility of the LNG fuelled ship. Similarly, all considerations which are the LNG bunker truck or, if applicable, the terminal's responsibility should be personally checked by the LNG bunker truck operator or, if applicable, the terminal representative. In fulfilling these responsibilities, representatives should assure themselves that the standards of safety on both sides of the operation are fully acceptable.

This can be achieved by means such as:

- Confirming that a competent person has satisfactorily completed the checklist;
- Sighting appropriate records;
- By joint inspection, where deemed appropriate.

Before the start of operations, and from time to time thereafter for mutual safety, the LNG bunker truck operator and, if applicable, a member of the terminal's staff and, where appropriate, a responsible ship's officer, may conduct an inspection of the ship and truck to ensure that the vessel and truck are effectively managing their obligations, as accepted in the LNG Bunker Checklist – Truck to Ship. Where basic safety requirements are found to be out of compliance, either party may require that the LNG bunker operations are stopped until corrective action is satisfactorily implemented.

## **CODING OF ITEMS**

The presence of the letters 'A', 'P' or 'R' in the column entitled 'Code' indicates the following:

- A 'Agreement' - This indicates that the referenced consideration should be addressed by an agreement or procedure that should be identified in the 'Remarks' column of the checklist or communicated in some other mutually acceptable form.
- P 'Permission' - In the case of a negative answer to the statements coded 'P', no operations are to be conducted without the written permission from the appropriate authority.
- R 'Re-check' - This indicates items to be re-checked at appropriate intervals, as agreed between both parties and stated in the declaration.

The joint declaration should not be signed until all parties have checked and accepted their assigned responsibilities and accountabilities.

## EXPLANATION OF THE CHECKS

### Part A: Planning Stage Checklist

- 1 Competent authorities have granted permission for LNG transfer operations for the specific location and time.**  
Port authority may be consulted about which other authorities need to approve the bunker operations for the specific location, time and parties involved.
- 2 The terminal has granted permission for LNG transfer operations for the specific location and time.**  
Port authority may be consulted if in doubt of whom to contact at the terminal.
- 3 Competent authorities have been notified of the start of LNG bunker operations as per local regulations.**  
Port authority may be consulted if in doubt of whom to contact as per local regulations.
- 4 The terminal has been notified of the start of LNG bunker operations as per terminal regulations.**  
The terminal may be consulted if in doubt about the terminal regulations.
- 5 Competent authorities requirements are being observed.**  
Ports have specific port regulations and port byelaws. Port authority may be consulted if in doubt about the local regulations. In states that are signatories to SOLAS, the ISPS Code requires for seagoing vessels that the Ship Security Officer and the Port Facility Security Officer co-ordinate the implementation of their respective security plans with each other.
- 6 Local terminal requirements are being observed.**  
The terminal may be consulted if in doubt about the terminal regulations.
- 7 All personnel involved in the LNG bunker operation have the appropriate training and have been instructed on the particular LNG bunker equipment and procedures.**  
Although all personnel that are involved in LNG bunker operations should comply with mandatory training requirements, they should also be familiarized with the specific LNG bunker equipment and procedures for this bunker operation. For this item, the involved parties only check and sign for their own responsibilities
- 8 The bunker location is accessible for the LNG supplying tank truck and the total truck weight does not exceed the maximum permitted load of the quay or jetty.**  
If in doubt contact the terminal or the port authority to inquire about the maximum permitted load of the place in question.
- 9 The bunker operation area can be sufficiently illuminated.**  
The manifold areas, both on board and ashore, should be safely and properly illuminated during darkness. If this requirement is not met, additional lightening must be provided.

**10 All LNG transfer- and gas detection equipment is certified, in good condition and appropriate for the service intended.**

A list of certification dates, expiry dates and next upcoming intermediate certification dates for the bunkering used equipment should be provided and exchanged. The validation of the certificates has to be performed before LNG bunkering commences. For this item, the involved parties only check and sign for their own responsibilities

**11 The procedures for bunkering, cooling down and purging operations have been agreed upon.**

The procedures for the intended LNG bunker operation should be pre planned. They should be discussed and agreed upon by the ship, truck and if applicable shore representatives prior to the start of the operations. Agreed arrangements should be formally recorded and signed by the ship, LNG bunker truck and if applicable the terminal representatives. Any change in the agreed procedure that could affect the operation should be discussed by the involved parties and agreed upon. After agreement by the involved parties, the substantial changes should be laid down in writing as soon as possible and in sufficient time before the change in procedure takes place.

**12 The system and method of electrical insulation have been agreed upon by ship and truck.**

The system and method of electrical insulation in de LNG bunker connection should be pre planned. They should be discussed and agreed upon by the ship, truck and if applicable shore representatives prior to the start of the operations.

**13 The restricted area on the shore has been agreed upon by ship, truck and terminal.**

The risk assessment for the LNG bunkering of the LNG fuelled ship provide safety distances and a restricted area. The restricted area are required in the ship's operational documentation. If applicable restricted area requirements from the LNG bunker truck operator, terminal operator and local authorities should be taken into account and incorporated.

The requirements for the restricted area around the LNG bunker location on board of the ship and on the shore should be exchanged, agreed upon and designated between the parties involved in the LNG bunkering.

**14 Regulations with regards to ignition sources can be observed.**

These include but are not limited to smoking restrictions and regulations with regards to naked light, mobile phones, pagers, VHF and UHF equipment, radar and AIS equipment.

Smoking on board the ship may only take place in places specified by the master in consultation with the truck and terminal representative.

No smoking is allowed on the shore except in places specified by the terminal representative in consultation with the master and truck operator.

For this item, the involved parties only check and sign for their own responsibilities

Places that are directly accessible from the outside should not be designated as places where smoking is permitted. Buildings, places and rooms designated as areas where smoking is permitted should be clearly marked as such.

A naked light or open fire comprises the following: flame, spark formation, naked electric light or any surface with a temperature that is equal to or higher than the minimum ignition temperature of the products handled in the operation.

The use of naked lights or open fires on board the ship is prohibited in the exclusion zone, unless all applicable regulations have been met and it has been agreed upon by the port authority, LNG tank truck operator, the ship's master and the terminal representative.

In the exclusion zone:

- Telephones should comply with the requirements for explosion-proof construction.
- Mobile phones and pagers should not be used unless approved for such use by a competent authority.



- Damaged units, even though they may be capable of operation, should not be used.
- The use of portable electrical equipment and wandering leads is not allowed during LNG bunkering and the equipment should be excluded from the zone.
- Telephone cables in use in the ship/shore communication system should preferably be routed outside the exclusion zone. Wherever this is not feasible, the cable should be so positioned and protected that no danger arises from its use.
  
- Unless the master, in consultation with the truck operator and terminal representative, has established the conditions under which the installation may be used safely, fixed VHF/UHF and AIS equipment should be switched off or on low power (1 watt or less) and the ship's main radio station should not be used during the ship's stay in port, except for receiving purposes. The main transmitting aerials should be disconnected and earthed.
- Portable VHF/UHF sets should be of a safe type which is approved by a competent authority.
- VHF radio-telephone sets may only operate in the internationally-agreed wave bands.
- Satellite communications equipment may be used normally, unless advised otherwise.
- The ship's radar installation should not be used unless the master, in consultation with the truck operator and the terminal representative, has established the conditions under which the installation may be used safely.
- Window type air conditioning units should be disconnected from their power supply.

**15 All in local requirements required firefighting equipment is ready for immediate use.**

Firefighting equipment on board should be correctly positioned and ready for immediate use.

Adequate and suitable units of fixed or portable equipment should be stationed conform ship's operational documents. The ship's fire main systems should be pressurised or be capable of being pressurised at short notice.

For this item, the involved parties only check and sign for their own responsibilities

For seagoing vessels a set of fire control plans should be permanently stored in a prominently marked weather-tight enclosure outside the deckhouse for the assistance of shore side fire fighting personnel. A crew list should also be included in this enclosure.

If applicable both ship and shore should ensure that their fire main systems can be inter-connected in a quick and easy way utilising, if necessary, the international shore fire connection.

Underneath the items of the planning stage checklist, a register form is included for the registration of the representatives involved in the planning.

**Part B: Pre Transfer Checklist**

**16 Part A is used prior and preparatory of the actual operation**

PART A: Planning Stage Checklist addresses the considerations to be made during the planning stage of LNG bunker operations. This part of the checklist can be used as a guideline for an exchange of knowledge and agreements on safety items during the planning stage of a LNG bunkering. The advised time of processing this part of the checklist is during the order placement for the bunkering.

The use of Part A is not mandatory. In this item, the involved parties only check if Part A is used for their own planning

**17 Present weather and wave conditions are within the agreed limits.**

There are numerous factors that will help determine whether LNG bunker operations should continue.

Discussion between the ship, the truck operator and if applicable the terminal should identify limiting factors which could include:

- Wind speed/direction and the effect on the bunker connections.

- Wind speed/direction and the effect on mooring integrity.
- Wind speed/direction and the effect on gangways.
- Swell effects at exposed locations on mooring integrity or gangway safety.

Such limitations should be clearly understood by all parties. The criteria for stopping bunkering, disconnecting hoses or arms and vacating the berth should be written in the 'Remarks' column of the checklist.

The bunker operations should be suspended on the approach of an electrical storm.

In case of a strong gale warning or deteriorating weather conditions emergency towing pennants should be prepared and a proper look out to the mooring lines is required.

**18 The LNG receiving ship is securely moored. Regulations with regards to mooring arrangements are observed. Sufficient fendering is in place.**

In answering this question, due regard should be given to the need for adequate fendering arrangements. The ship should remain adequately secured in her moorings. Alongside piers or quays, ranging of the ship should be prevented by keeping all mooring lines taut. Attention should be given to the movement of the ship caused by wind, currents, tides or passing ships and the operation in progress.

Wire ropes and fibre ropes should not be used together in the same direction (i.e. as breast lines, spring lines, head or stern lines) because of the difference in their elastic properties.

Once moored, ships fitted with automatic tension winches should not use such winches in the automatic mode. Irrespective of the mooring method used, the emergency release operation in case of an emergency should be agreed upon, taking into account the possible risks involved.

Anchors not in use should be properly secured.

**19 There is a safe means of access between the ship and shore.**

The access should be positioned as far away from the LNG bunker manifolds as practicable.

The means of access to the ship should be safe and may consist of an appropriate gangway or accommodation ladder with a properly secured safety net fitted to it.

Particular attention to safe access should be given where the difference in level between the point of access on the vessel and the jetty or quay is large, or is likely to become large.

When shore access facilities are not available and a ship's gangway is used, there should be an adequate landing area on the berth so as to provide the gangway with a sufficient clear run of space and so maintain safe and convenient access to the ship at all states of tide and changes in the ship's freeboard.

A lifebuoy should be available on board the ship near the gangway or accommodation ladder.

The access should be safely and properly illuminated during darkness.

Persons who have no legitimate business on board, or who do not have the master's permission, should be refused access to the ship.

The LNG truck operator or if applicable the terminal should control access to the jetty or berth in agreement with the ship.

In addition to the means of access, a safe and quick emergency escape route should be available both on board and ashore. On board the ship, it may consist of a lifeboat ready for immediate use, preferably near the accommodation of the ship

**20 All mandatory firefighting equipment is ready for immediate use**

Firefighting equipment on board should be correctly positioned and ready for immediate use.

Adequate and suitable units of fixed or portable equipment should be stationed conform ship's operational documents. The ship's fire main systems should be pressurised or be capable of being pressurised at short notice.

For seagoing vessels a set of fire control plans should be permanently stored in a prominently marked weather-tight enclosure outside the deckhouse for the assistance of shore side firefighting personnel. A crew list should also be included in this enclosure.

The LNG bunker truck mandatory firefighting equipment should be correctly positioned and ready for immediate use.

If applicable both ship and shore should ensure that their fire main systems can be inter-connected in a quick and easy way utilising, if necessary, the international shore fire connection.

If applicable firefighting equipment on the shore should be correctly positioned and ready for immediate use. The shore fire main systems should be pressurised or be capable of being pressurised at short notice. For this item, the involved parties only check and sign for their own responsibilities

**21 The bunker operation area is sufficiently illuminated.**

The bunker location should be safely and properly illuminated during darkness.

**22 The ship and truck are able to move under their own power in a safe and non-obstructed direction.**

The ship should be able to move under its own power at short notice, unless the ship has been granted permission to immobilise by the Port Authority. Certain conditions may have to be met for permission to be granted. All involved parties of the LNG bunkering should be informed and agree.

The LNG bunker truck should be able to move under its own power at short notice. It should be possible in case of an emergency to remove the shocks under the wheels immediately.

For this item, the involved parties only check and sign for their own responsibilities

**23 Adequate supervision of the bunker operation is in place both on the ship and at the LNG tank truck and an effective watch is being kept at all time.**

The LNG bunker operation should be under constant control and supervision on the ship and at the LNG bunker vessel. Supervision should be aimed at preventing the development of hazardous situations. However, if such a situation arises, the controlling personnel should have adequate knowledge and the means available to take corrective action.

The controlling personnel on the ship and at the truck should maintain effective communications with their respective supervisors.

All personnel connected with the operations should be familiar with the dangers of the substances handled. At all times during the ship's stay at the bunker location, a sufficient number of personnel should be present on board the ship and near the LNG bunker truck to deal with an emergency.

**24 An effective means of communication between the responsible operators and supervisors on the ship and at the truck has been established and tested. The communication language has been agreed upon.** Communication should be maintained in the most efficient way between the responsible officer on duty on the ship and the LNG truck operator.

When telephones are used, the telephone both on board and ashore should be continuously manned by a person who can immediately contact his respective supervisor. Additionally, the supervisor should have a facility to override all calls. When RT/VHF systems are used, the units should preferably be portable and carried by the supervisor or a person who can get in touch with his respective supervisor immediately. Where fixed systems are used, the guidelines for telephones should apply.

The selected primary and back-up systems of communication should be recorded on the checklist and necessary information on telephone numbers and/or channels to be used should be exchanged and recorded.

The telephone and portable RT/VHF systems should comply with the appropriate (explosion proof) safety requirements.

**25 The emergency stop signal and shutdown procedures have been agreed upon, tested, and explained to all personnel involved. Emergency procedures and plans and the contact numbers are known to the persons in charge.**

The agreed signal to be used in the event of an emergency arising ashore or on board should be clearly understood by shore and ship personnel and the truck operator.

An emergency shutdown procedure should be agreed upon between ship and the LNG bunker truck and

should be formally recorded and signed by both the ship and LNG bunker truck representative. The agreement should state the circumstances in which operations have to be stopped immediately. Due regard should be given to the possible introduction of dangers associated with the emergency shutdown procedure.

**26 The predetermined restricted area has been established. Appropriate signs mark this area.**

The risk assessment for the LNG bunkering of the LNG fuelled ship provide safety distances and exclusion zones. The safety zones are addressed in the ship's operational documentation. If applicable safety zone requirements from the LNG bunker truck operator, terminal operator and local authorities should be taken into account and incorporated.

The requirements for the safety zone around the LNG bunker location on board of the ship and on the shore should be established and clearly marked.

**27 The restricted area is free of unauthorized persons, objects and ignition sources.**

Prior to operations all unauthorised persons should be directed to leave the marked exclusion zone.

Unauthorised objects or ignition sources should be removed from the zone. During bunker operations this should be re-checked at regular intervals.

**28 External doors, portholes and accommodation ventilation inlets are closed as per operation manual.**

External doors, windows and portholes in the accommodation should be closed during LNG bunker operations when required in the operational documentation of the ship. These doors should be clearly marked as being required to be closed during such operations, but at no time should they be locked.

This requirement does not prevent reasonable access to spaces during operations, but doors should not be left open unattended.

Engine Room vents may be left open. However, consideration should be given to closing them where such action would not adversely impact the safe and efficient operation of the engine room spaces served.

**29 The gas detection equipment has been operationally tested and found to be in good working order.**

The equipment provided should be capable of measuring natural gas.

Suitable equipment should be available to calibrate the gas detection and measuring equipment.

A bump test (quick test on proper working) or calibration should be carried out before the operation commences.

Span gas should be available to enable calibration of gas detection equipment. Fixed gas detection equipment should be calibrated for natural gas prior to commencement of operations. The alarm function should have been tested and the details of the last test should be exchanged.

Portable gas detection instruments, suitable and calibrated for natural gas, capable of measuring flammable levels, should be available.

**30 Material Safety Data Sheets (MSDS) for the delivered LNG fuel are available.**

MSDS should be available on request to the LNG fuelled ship, terminal and LNG bunker truck.

As a minimum, such information sheets should provide the constituents of the product by chemical name, name in common usage, UN number and the maximum concentration of any toxic components, expressed as a percentage by volume or as ppm, as appropriate.

**31 Regulations with regards to ignition sources are observed.**

These include but are not limited to smoking restrictions and regulations with regards to naked light, mobile phones, pagers, VHF and UHF equipment, radar and AIS equipment.

Smoking on board the ship, if allowed, may only take place in places specified by the master in consultation with the truck and terminal representative.

Smoking on the shore, if allowed, may only take place in places specified by the terminal representative in consultation with the master and truck operator.

Places, which are directly accessible from the outside, should not be designated as places where smoking is permitted. Buildings, places and rooms designated as areas where smoking is permitted are clearly marked as such.

A naked light or open fire comprises the following: flame, spark formation, naked electric light or any surface with a temperature that is equal to or higher than the minimum ignition temperature of the products handled in the operation. There are no naked lights or open fires in the restricted area.

In the restricted area:

- Battery operated hand torches (flashlights) should be of a safe type which is approved by a competent authority. Telephones comply with the requirements for explosion-proof construction.
- Mobile phones and pagers are not used unless approved for such use by a competent authority.
- Damaged units, even though they may be capable of operation, are not used.
- The use of portable electrical equipment and wandering leads is not allowed during LNG bunkering and the equipment should be excluded from the zone.
- Telephone cables in use in the ship/shore communication system are routed outside the exclusion zone. Wherever this is not feasible, the cable is positioned and protected in such way that no danger arises from its use.
- Unless the master, in consultation with the truck operator and terminal representative, has established the conditions under which the installation may be used safely, fixed VHF/UHF and AIS equipment should be switched off or on low power (1 watt or less) and the ship's main radio station should not be used during the ship's stay in port, except for receiving purposes. The main transmitting aerials should be disconnected and earthed.
- Portable VHF/UHF sets are of a safe type that is approved by a competent authority.
- VHF radio-telephone sets will only operate in the internationally-agreed wave bands.
- Satellite communications equipment may be used normally, unless advised otherwise.
- The ship's radar installation is not in use, unless the master, in consultation with the truck operator and the terminal representative, has established the conditions under which the installation may be used safely.
- Window type air conditioning units are disconnected from their power supply.

**32 Appropriate and sufficient suitable protective clothing and equipment is ready for immediate use.**

Suitable protective equipment, eye protection and protective clothing appropriate to the specific dangers of LNG, should be available in sufficient quantity for operational personnel, both on board and ashore for the truck operator.

Storage places for this equipment on board of the ship should be protected from the weather and be clearly marked.

Personnel required to use a breathing apparatus during operations or emergency response should be trained in its safe use. Untrained personnel and personnel with facial hair should not be selected for activities involving the use of breathing apparatus.

**33 Personnel involved in the connection and disconnection of the bunker hoses and personnel in the direct vicinity of these operations make use of sufficient and appropriate protective clothing and equipment.**

All personnel directly involved in the operation should utilise appropriate equipment and clothing whenever the situation requires.

**34 A (powered) emergency release coupling {(P)ERC} is installed and is ready for immediate use.**

If applicable an emergency release coupling is installed and ready for immediate use. This (P)ERC can be activated by ESD or by forces on- or movements of the bunker connection outside a predetermined range. The (P)ERC should be of a dry disconnect type, during the emergency release the line will be closed by a valve on both sides of the coupling. After an emergency release of the coupling, a check of the system, and after solving the problem that caused the release, the coupling can be reinstalled. A freefall of the coupling after an emergency release should be avoided.

- 35 The water spray system has been tested and is ready for immediate use.**  
Water spray systems should be regularly tested. Details of the last tests should be exchanged.  
During operations the systems should be kept ready for immediate use.
- 36 Spill containment arrangements are of an appropriate volume, in position, and empty.**  
The ship's manifolds should ideally be provided with fixed and for LNG suitable drip trays. In the absence of fixed containment, suitable portable drip trays should be used.  
All drip trays should be emptied in an appropriate manner whenever necessary.
- In all cases LNG must be prevented to affect the deck in case of a spill. This can, for example, be achieved by using a low temperature resistance gutter, suitable drip trays or pouring water on deck. When LNG is handled the scuppers may be kept open, provided that an ample supply of water is available at all times in the vicinity of the manifolds.
- 37 Hull and deck protection against low temperature is in place.**  
When a hull or deck protection is required in the ship's operational documentation, it shall be used conform the operational documentation.
- 38 Bunker pumps and compressors are in good working order.**  
Agreement in writing should be reached on the maximum allowable working pressure in the LNG bunker line system during operations.
- 39 All control valves are well maintained and in good working order.**  
All ship and tank truck LNG transfer system control valves and their position-indicating systems should be regularly tested. Details of the last tests should be exchanged.
- 40 Bunker system gauges, high level alarms and high-pressure alarms are operational, correctly set and in good working order.**  
Ship and LNG bunker truck LNG transfer system gauges and alarms should be regularly checked to ensure they are in good working order.  
In cases where it is possible to set alarms to different levels, the alarm should be set to the required level.
- 41 The ship's bunker tanks are protected against inadvertent overfilling at all times, tank content is monitored constantly and alarms are correctly set.**  
Owing to the reliance placed on gauging systems for LNG bunker operations, it is important that such systems are fully operational and that back-up is provided in the form of an independent overfill alarm arrangement. The alarm should provide audible and visual indication and should be set at a level which will enable operations to be shut down prior to the tank being overfilled. Under normal operations, the bunker tank should not be filled higher than the level at which the overfill alarm is set.  
Individual overfill alarms should be tested at the tank to ensure their proper operation prior to commencing bunkering unless the system is provided with an electronic self-testing capability which monitors the condition of the alarm circuitry and sensor and confirms the instrument set point.
- 42 All safety and control devices on the LNG installations are checked, tested and found to be in good working order.**  
Automatic shutdown systems are designed to shut the liquid valves and trip the bunker pumps if the liquid level or pressure in the bunker tank should rise above the maximum permitted levels. These levels must be accurately set and the operation of the device should be tested before bunker operations commence. If the ship and LNG bunker truck shutdown systems are to be inter-connected, then their operation must be checked before LNG transfer begins.
- 43 Pressure control equipment and boil off or re-liquefaction equipment is operational and in good working order.**  
Pressure control is one of the most critical processes during LNG bunker operations. It is important that

such systems are fully operational and that back up is provided in case of a failure of the system.

There are many pressure control systems: spray lines in the top of the tank, vapour return, re-liquefaction, CNG storage or vapour processing. The used pressure control system should be exchanged and be agreed upon. It should be verified that re-liquefaction and boil off control systems, if required, are functioning correctly prior to commencement of operations.

The pressure alarms should provide audible and visual indication and should be set at a level which will enable operations to be shut down prior to the opening of the PV valves to avoid natural gas emission. Under normal operations, the pressure in the bunker tank should not exceed the pressure limits in the ship's operational documentation.

Individual high and low pressure alarms should be tested at the tank to ensure their proper operation prior to commencing bunkering unless the system is provided with an electronic self-testing capability which monitors the condition of the alarm circuitry and sensor and confirms the instrument set point.

**44 Both on the ship and at the tank truck the ESDs, automatic valves or similar devices have been tested, have been found to be in good working order, and are ready for use.**

**The closing rates of the ESDs have been exchanged.**

Automatic shutdown valves may be fitted in the ship and the systems of the LNG bunker truck. Among other parameters, the action of these valves can be automatically initiated by a certain level being reached in the tank being loaded, either on board or ashore.

The closing rate of any automatic valves should be known and this information should be exchanged.

Where automatic valves are fitted and used, the cargo-handling rate should be so adjusted that a pressure surge evolving from the automatic closure of any such valve does not exceed the safe working pressure of either the LNG bunker system.

A written agreement should be made between the ship and tank truck operator indicating whether the cargo-handling rate will be adjusted or alternative systems will be used. The safe cargo-handling rate should be noted in the agreement.

Where possible, ship and truck emergency shutdown systems should be tested before commencing the LNG bunkering.

**45 Initial LNG bunker line up has been checked. Unused connections are closed, blanked and fully bolted.**

Before connection both the ship and truck LNG bunker systems must be isolated and empty, checked and found to be safe to remove blank flanges.

Both ship and truck LNG bunker systems should be isolated from other ship and truck systems.

Unused bunker line connections should be closed and blanked. Blank flanges should be fully bolted and other types of fittings, if used, properly secured.

**46 LNG bunker hoses, fixed pipelines and manifolds are in good condition, properly rigged, supported, properly connected, leak tested and certified for the LNG transfer.**

Hoses should be in a good condition and properly fitted and rigged so as to prevent strain and stress beyond design limitations.

All flange connections should be fully bolted and any other types of connections should be properly secured.

It should be ensured that the hoses and pipelines are constructed of a material suitable for the substance to be handled, taking into account its temperature and the maximum operating pressure. LNG Bunker hoses should be indelibly marked so as to allow the identification of the products for which they are suitable, specified maximum working pressure, the test pressure and last date of testing at this pressure, and, if used at temperatures other than ambient, maximum and minimum service temperatures.

**47 The LNG bunker connection between the ship and the LNG bunker truck is provided with dry**

**disconnection couplings.**

The LNG bunker connection should be provided with means to avoid release of LNG or natural gas during regular disconnection after the bunkering.

The means should provide protection against:

- Spill or emission due to unexpected and uncontrolled release of product from the bunker system during disconnecting in case the bunkering system is not properly emptied after use.
- Injury to personnel due to pressure in the system suddenly being released in an uncontrolled manner during disconnecting.

**48 The LNG bunker connection between the ship and the LNG bunker truck has adequate electrical insulating means in place.**

Unless measures are taken to break the continuous electrical path between ship and truck pipework provided by the ship/truck hoses, stray electric currents can cause electric sparks at the flange faces when hoses are being connected and disconnected.

The passage of these currents is usually prevented by an insulating flange inserted at the ship line to the manifold and/or in the line of the truck. Alternatively, the electrical discontinuity may be provided by the inclusion of one length of electrically discontinuous hose in each hose string.

It should be ascertained that the means of electrical discontinuity is in place, that it is in good condition and is not being by-passed by contact with an electrically conductive material.

**49 Dry breakaway couplings in the LNG bunker connections are in place, have been visually inspected for functioning and found to be in a good working order.**

To mitigate on an event which approaches the limits of the design-operating envelope of the bunker connection, means should be in place to ensure that the mechanical integrity of the LNG bunker connection is not compromised. These means should provide protection against:

- Spill or emission due to unexpected and uncontrolled release of product from the bunker system due to overstretching the bunker connection.
- Injury to personnel due to pressure in the system suddenly being released in an uncontrolled manner.

The dry breakaway coupling will break due to forces on- or movements of the bunker connection outside a predetermined range. The coupling should be of a dry disconnect type, during the emergency break the line will be closed by a valve on both sides of the coupling. After the emergency break of the coupling, and when the problem that caused the break is solved, the broken parts should be replaced. A freefall of the coupling after an emergency break should be avoided.

**50 The tank truck is electrically grounded and the wheels are chocked.**

Before the connection of the LNG bunker line, the LNG bunker truck must be electrically grounded to an suitable earth wire connection point. To avoid an inadvertent movement of the tank truck the wheels should be chocked.

**51 The tank truck engine is off during the connection or disconnection of the LNG bunker hoses.**

In all cases the engine should be switched off during connection or disconnection of the bunker line.

**52 The tank truck engine is switched off during purging or LNG transfer.**

During the LNG bunkering or purging, the tank truck engine must be switched off, unless the running of the engine is necessary for running the bunker pump or compressor.

**53 The ship's emergency fire control plans are located externally.**

For seagoing vessels a set of fire control plans should be permanently stored in a prominently marked weather-tight enclosure outside the deckhouse for the assistance of shore side fire-fighting personnel. A crew list should also be included in this enclosure.

**54 An International Shore Connection has been provided.**



If applicable both ship and shore should ensure that their fire main systems can be inter-connected in a quick and easy way utilising, if necessary, the international shore fire connection.

**55 Competent authorities have been informed that bunker transfer operations are commencing and have been requested to inform other vessels in the vicinity.**

When local regulations or the port byelaws enforce the notification of vessels in the direct vicinity, these ships have to be informed of the LNG bunker activity. When the involved parties are not obliged to inform ships in the vicinity, they can, upon reporting the commence of the LNG bunker operations, advise the port authority to do so.

**Part C: LNG Transfer Data**

In order to agree upon the quantity of LNG that is to be transferred, parties should agree upon a 'Physical Quantity Unit'; e.g. cubic meters, tonnes.

**Agreed starting temperatures and pressures**

Parties should agree upon the LNG transfer data and the condition of the LNG and atmosphere in the truck tank and ship's bunker tanks.

**Agreed bunker operations**

Parties should agree upon the LNG bunker procedure

**Agreed maximums and minimums**

Parties should agree upon all maximum and minimum LNG pressures and fuelling limits.

**Part D: After LNG Transfer Checklist**

**57 LNG bunker hoses, fixed pipelines and manifolds have been purged and are ready for disconnection.**

Before the bunker connection is disconnected, it must be ensured that no liquid is left in the bunker system. The pressure in the bunker connection should be released into the ship's bunker tank or into the tank of the truck as per ship's operational manual.

**58 Remote and manual controlled valves are closed and ready for disconnection.**

Before the bunker connection is disconnected, it must be ensured that all valves are closed, or operated as per ship's operational manual.

**59 After disconnection the restricted area has been deactivated. Appropriate signs have been removed.**

After the disconnection and securing of the LNG bunker connection, the restricted area can be deactivated and the signs can be removed. The status of the restricted area can be restored to the status required in the ship's operational manual.

**60 Competent authorities have been notified that LNG bunker operations have been completed and have been requested to inform other vessels in the vicinity.**

Where required, authorities should be informed of completion of the LNG bunker operation  
When local regulations or the port byelaws enforce the notification of vessels in the direct vicinity, these ships have to be informed of completion of the LNG bunker activity. When the involved parties are not obliged to inform ships in the vicinity, they can, upon reporting the completion of the LNG bunker operations, advise the port authority to do so

**61 The terminal has been notified that LNG bunker operations have been completed.**

Where required, the terminal should be informed of completion of the LNG bunker operation.

**62 If applicable, near misses and incidents have been reported to competent authorities.**

Authorities must be informed of near misses and incidents directly when the event occurs.

**Abbreviations and definitions**

Bunker operation area:	The area with operational LNG bunker activity. Including connections on both side of the bunker line, the bunker line and the bunker control and watch keeping area.
ESD	Emergency Shut Down Device
Leak tested	Procedure to check the integrity of the LNG bunker line up
Line up	The system of all pipes, hoses, bunker arms, connections and valves that are positioned and used for an LNG bunker transfer
(P)ERC	(Powered) Emergency release Coupling
Physical Quantity Unit (PQU)	The predetermined unit for the agreement on the quantity to bunker
Purging	To blow or pressurise a line up with Nitrogen to leak test, dry and inert the line up before bunkering or to empty, and gas free the line up before disconnecting.
Rel:	Relative, In this document used to agree the mentioned pressures are relative (overpressure) and not absolute
restricted area	The safety zone where ignition sources are not allowed
Terminal	In this document terminal also referred to any organization responsible of the location of the bunkering
Topping up	The last phase of the LNG bunkering where the maximum filling percentage is nearly reached. During this phase the bunker rate is reduced

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