

CHAPTER 24

Bunkering Operations

- 24.1 General
- 24.2 Bunkering residual fuel oil or distillates
- 24.3 Liquefied Natural Gas fuelled ships and Liquefied Natural Gas bunkering
- 24.4 Ancillary substances
- 24.5 Alternative fuels
- 24.6 Bunker checklists
- 24.7 Liquefied Natural Gas bunkering safety checklists

Spills and leaks during conventional bunkering of residual fuel oil, such as Heavy Fuel Oil (HFO), or distillates such as Marine Diesel Oil (MDO), are a primary source of oil pollution from ships.

Environmental regulations for the sulphur content of conventional fuels and restrictions on air emissions quantity and quality means that fuels face growing control.

Increasing concern over the impact of the maritime transport industry on the environment has seen the industry moving towards alternative fuels, including hydrogen, methanol and LNG, as a prime source of energy for propulsion and electricity generation.

This chapter provides guidance on planning and carrying out conventional bunkering and the bunkering of alternative fuels and ancillary substances. It includes examples of bunker safety checklists. It aims to ensure that conventional and alternative fuelled ships are re-fuelled in line with the highest levels of safety, environmental protection, integrity and reliability.

This chapter provides recommendations and guidance to personnel involved in bunker operations. The recommendations apply to any bunker transfer including from a bunker vessel, tanker, terminal or truck.

24.1 General

Bunkering is a critical operation and requires care to ensure safety and to reduce the risk of pollution.

Bunkering operations should be planned and carried out in line with legislation, standards and best practice guidelines to minimise the risk from the flammability, toxicity, cryogenic nature, volatility or pressure of the fuels being handled.

Vessel operators should manage the risks by ensuring that the crew is familiar with the management procedures for bunker operations and that they have all completed the appropriate training.

The crew designated to bunkering on board should have no other tasks during the operation. This is particularly important when bunkers are being loaded at the same time as cargo. Spills often occur when staff are distracted by other jobs.

24.1.1 Preparation by the bunker supplier, including the bunker vessel operator

Bunker suppliers and bunker receivers should document their bunkering procedures in their management system and for bunker vessel operators, this should be included in their SMS.

These procedures should ensure that the risks have been assessed and that measures are in place to control them. The procedures should also cover every anticipated form of bunker delivery that is likely to be made, the type of fuel involved and its hazardous properties and the emergency steps for unforeseen events, including spills. This will include bunker deliveries that may be carried out:

- Ship to Ship (STS) between a receiving ship and a bunker vessel, including alongside a berth, while at anchor, offshore, etc.
- By road tanker, whether direct to the receiving ship or through a terminal piping system.
- From a shore tank and fixed piping delivery system.
- For LNG fuel, options also exist for:
 - Multiple road tankers, which can be used to simultaneously deliver LNG bunker fuel from a series of road tanks to the receiving ship via a shore delivery system.
 - Increasingly, emerging technology now provides options for LNG fuel to be delivered in containerised Type C tanks (supported within 20 or 40 foot container frames) that are craned on board via either the shore/terminal or from a barge.

When developing procedures, the bunker supplying company should:

- Identify all documents, information analysis, procedures, licences and accreditations required by the authorities.
- All bunkering procedures should be developed based on a bunkering activity risk assessment.
- Develop an emergency and spill response plan based on a risk assessment.
- Consider applicable chapters in this guide, e.g. hose handling.
- Issue bunkering safety instructions.
- Develop bunkering plans and procedures that cover the specific instructions for the receiving ship and bunker supply facility.
- Check that the receiving ship and the bunker supply facility are compatible.
- Check that bunkering equipment is in good condition and appropriate for the service intended.
- Ensure all bunkering personnel are adequately certified and trained.

24.1.2 Bunkering safety management

A bunkering operations risk assessment should be carried out to ensure that the risk to people, the environment and assets have been eliminated or reduced to a level that is ALARP. Establish the required safety control zones around the bunkering operations.

See chapter 4 with regard to safety management.

Operational checks should be carried out to confirm items identified in the pre-bunkering toolbox talk that could have an impact on the safety of the bunkering operation have been actioned, e.g. hot work restrictions in place. These should be in addition to the following specific bunker operational checks that should be carried out before beginning operations.

24.1.3 Bunker procedures

Before the operation starts, hold a pre-bunker conference between competent representatives from the ship and the bunker facility (barge, terminal or truck). Pre-bunker checks should be carried out:

- Designate the fuel tanks to be loaded.
- Confirm there is enough space for the nominated loading volume.
- Establish the maximum loading volume for each of the designated tanks.
- Check that bunker system valves are correctly lined up.
- Determine the rates for the start of loading, bulk loading and topping-off.
- Set out the tank atmosphere control arrangements.
- Establish the internal tank transfer arrangements.
- Verify the operation and accuracy of the gauging system.
- Confirm the alarm settings on overfill alarm units.
- Agree with the bunker supplier, before starting, to establish and record:
 - The loading procedure.
 - How and where to carry out quantity checks.
 - How and where to carry out quality checks, including installing a sampler if used.
- Establish safe access to and from the ship.
- Decide how to monitor the temperature of the bunkers during loading.
- Set out the communication procedure for the operation, including the emergency stop signal and the steps for emergency disconnection and unberthing.
- Decide the personnel requirements to carry out the operation safely.
- Monitor the bunkering operation and that it conforms to the agreed procedure.
- Verify the procedure for changing bunker tanks during loading.
- Confirm the spill response and containment arrangements.
- Define weather operating limitations.

De-bunkering

Various circumstances can create the need for de-bunkering where bunkers already on board have to be pumped to a receiving facility. Existing bunker procedures cannot be used for de-bunkering unless they are carefully reviewed for suitability. De-bunkering always requires a dedicated specific risk assessment and a plan of approach. Local authorities should be informed.

24.2 Bunkering residual fuel oil or distillates

24.2.1 Precautions

Fuel oil, distillates and their vapours contain components that are hazardous to health. Consequently, sampling under closed conditions is recommended, (see section 1.4.6).

If bunker tank lids or sampling points need to be opened, personnel should remain upwind.

Take the following precautions:

- Wear the correct PPE as required by the ship's SMS and the product SDS (see section 4.8.1).
- Wear a personal H₂S monitor (see section 1.4.6).
- Change out of any oil soaked clothing as soon as possible.
- Keep all doors to the accommodation areas closed during bunkering and ensure the accommodation block is kept at positive pressure.
- Restrict the movement of personnel near the bunker vents.

The principles for loading lubricating oil are the same as residual fuel oil or distillates, so the same safety guidance should be followed.

All fuel oils (residual and distillate) must have a flashpoint above 60°C unless exempted from *International Convention for the Safety of Life at Sea (SOLAS)* Chapter II-2 Regulation 4, 2.1.1, but they are often stored at temperatures close to, or above, the flashpoint. High flashpoint fuels sometimes contain residual quantities of light or toxic material that slowly rise to the surface and vaporise after loading, raising the flammability or toxicity of the vapour space. Although the flashpoint of the fuel is above 60°C, care should be taken because the vapour can be flammable and/or toxic.

Never assume that the vapour spaces in bunker tanks or the emissions from them will be safe because the flashpoint is high or the fuel is not labelled as toxic. For the same reason, ullaging, dipping and sampling procedures should follow the recommendations in sections 2.5 and 12.8. Additional safety guidance can be found in sections 23.4 and 23.5.

Do not smoke near fuel tanks, or other locations where there may be fuel vapours. For more on the flammability hazards of residual fuel oils, see section 1.6.

All marine fuels are pollutants and can damage the environment. They are toxic to marine life and the heavier grades are very difficult to clean up after a spill:

- Use the appropriate bunker checklists.
- Know the procedures for preventing and responding to spills.
- Ensure oil spill equipment is ready and available on both the delivering vessel and receiving ship.
- Ensure proper lines of communication.
- Plug all scuppers and drains on the bunker barge and the receiving ship.
- Periodically drain off any accumulation of oil free water.
- Report spills to the authorities.

In addition to the guidance and checks of section 24.1 for general bunkering operations, the following checks should also be made before the bunkering operation begins:

- Special precautions when loading into double bottom tanks.
- Arrangements for bunker tank ventilation or tank atmosphere control.
- Steps to warn or protect personnel working near tank ventilation outlets.
- Methods for managing bunkers that may contain H₂S.
- Testing procedures for hydrocarbon or H₂S vapours.
- Spill containment arrangements and clean-up equipment that is available and ready, in line with the Ship Oil Pollution Emergency Plan and Shipboard Marine Pollution Prevention Emergency Plan (SOPEP/SMPEP).

During bunkering:

- Keep all bunker fuel away from naked flames, sparks or other sources of ignition.
- Keep all bunker fuel away from heated surfaces.
- Do not smoke on deck.
- Supervise bunker operations properly and continuously.
- Check the bunker rate at the intervals agreed by the Responsible Officers for supplier and receiver.
- Ensure that when changing over from one tank to another, excessive back pressure is not put on the hose or bunker lines.
- Decrease the bunker rate when topping-off tanks to avoid spillage.

- Before disconnecting hoses, all hoses and lines should be drained to the tank or, if applicable, back to the bunker facility (barge or terminal) before hose disconnection.
- Blowing lines with air into a receiving ship's bunker tanks introduces a number of safety risks and is not recommended.
- All unused bunker manifolds and hoses connected to the bunker system should be blanked before transfer.

24.3 Liquefied Natural Gas fuelled ships and Liquefied Natural Gas bunkering

The cryogenic nature and volatility of LNG means that its properties, characteristics and behaviour are very different to conventional marine fuels. This means additional precautions are needed, as described below.

The IMO requires new or existing ships over 500 tonnes, that are converted to use or transport LNG and are engaged in international service, to have been approved by their Flag State or competent authority as meeting the *International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)* or the *International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels (IGF Code)*.

Bunkering facilities and receiving ships should conform to applicable standards.

Mobile facilities, e.g. tank trucks, rail cars and portable tanks, including their tanks, piping, hoses, pumps and valves, should be built to conform to ISO or other recognised standards for handling cryogenic liquids.

The bunkering facility should comply with local codes. If local codes do not address LNG bunkering facilities, the facility operator should obtain a document issued by a competent organisation confirming the facility conforms to the applicable sections of industry standards.

24.3.1 Liquefied Natural Gas bunkering processes and procedures

Figure 24.1 shows the sequence for an LNG bunkering operation carried out between two parties for the first time.

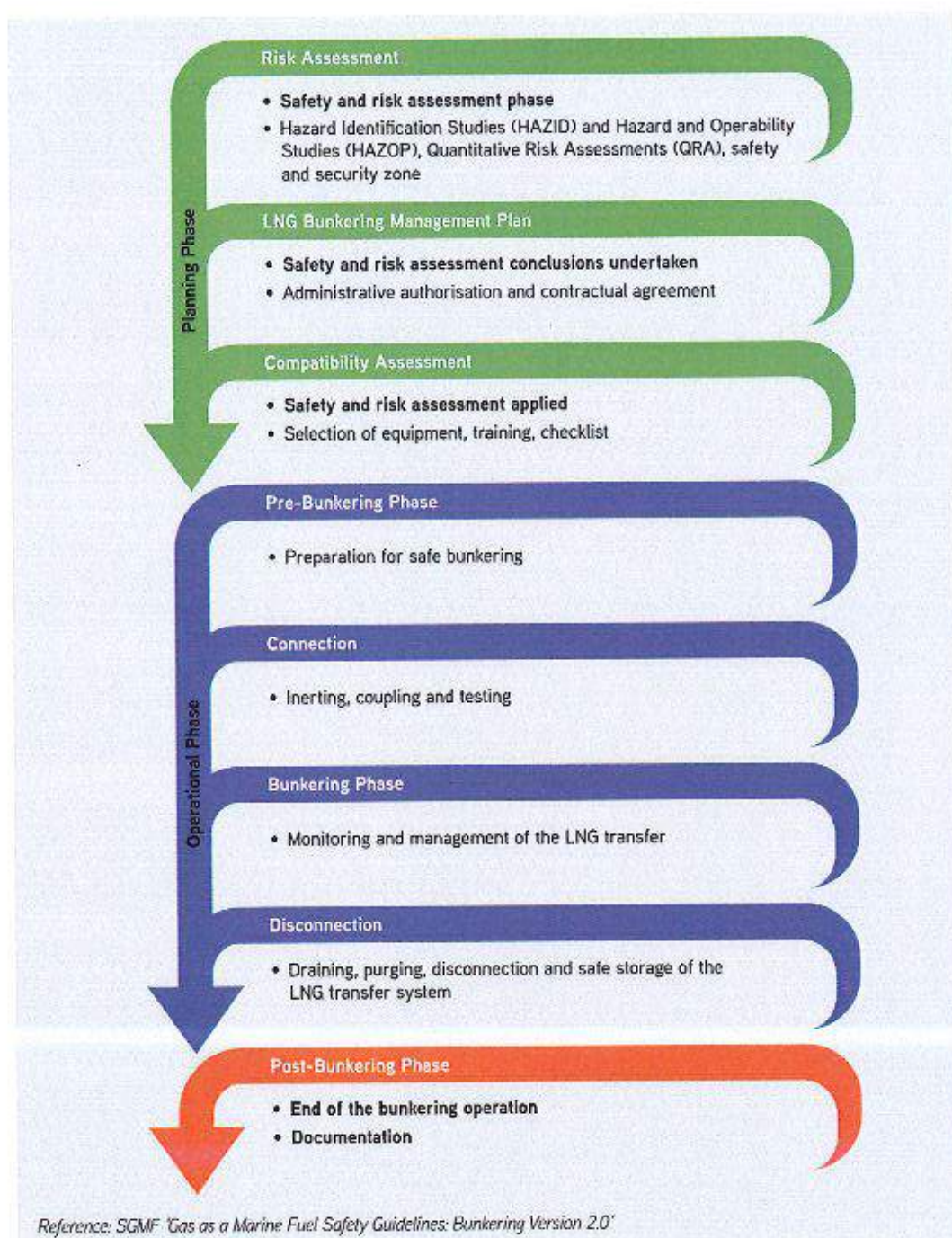


Figure 24.1: Typical LNG bunkering operation sequence

24.3.2 Transfer equipment requirements for Liquefied Natural Gas bunkering

Different types of equipment are used to perform LNG bunker transfers: rigid arms, hybrid systems (rigid structure handling flexible lines) and flexible hoses.

All LNG transfer systems should be equipped with an Emergency Release System (ERS) and ESD system connected via a bunkering safety link. The primary function of the bunkering safety link is to connect the supplier's and receiver's ESD systems, ensuring that in an emergency, either one can initiate a shut down of liquid and vapour transfer in a safe, coordinated and controlled manner.

All transfer equipment shall be adequately supported during transfer operations to perform safely under the operating parameters and designed for LNG use.

The bunkering connections must be of dry-disconnect type.

As recommended by the Society for Gas as a Marine Fuel (SGMF), each transfer arm or hose of the transfer system between the receiving ship manifold and the bunker pipeline should have a single insulation (isolation) flange. The installation should not allow shorting out of this insulation. When bunkering from a mobile facility, the vehicle shall be grounded to an earthing point at the quay to prevent static build-up. The earthing point should conform to local electrical codes. Ship to shore bonding cables/straps should not be used.

If national or local regulations require a bonding cable/strap to be used, the circuit continuity should be made via a certified safe switch (such as one housed inside an inherently safe enclosure) and the connection on the ship should be located away from the hazardous area. The switch should always be open when connecting or disconnecting the bonding strap.

24.3.2.1 Liquefied Natural Gas bunkering risk assessments

An LNG bunkering operation risk assessment should be carried out. Factors to be considered in the assessment should be in accordance with the *Guidelines for systems and installations for supply of LNG as fuel to ships* (ISO/TS 18683). The risk assessment should be conducted by or on behalf of the organisation providing the LNG, or the national or local authorities that have jurisdiction over the safety and security where the bunkering operation takes place.

24.3.2.2 Control zones

A critical difference between LNG and other maritime fuels is that, during a spill, a gas cloud could form, extending the hazard to some distance from the LNG installation. Although this is unlikely to happen, controlling the hazard requires an understanding of the extent of the zone that might be affected.

The decision to establish designated LNG bunkering areas belongs to the port or maritime authorities. However, any proposed bunkering location needs to be checked as suitable for LNG operations.

This decision should be made after a risk assessment. While the ship receiving the LNG is not required to assess the bunkering site, the Master or their representative should check that the conditions at the proposed site are within the limits set out in their bunkering operations procedures and that operations can be conducted safely.

In most cases, personnel involved in bunkering operations will not have the legal authority to require other vessels or personnel to remain outside any of the safety zones, monitoring or security areas that are necessary according to the risk assessment. As a result, personnel involved in the transfer should devise procedures to minimise the risks when a safety zone, monitoring or security area in their provisions is breached. If local authorities set up safety or security zones for the bunkering operation, communication should be established so that enforcement personnel can be notified if any restrictions are violated.

Five control zones are defined:

- | | |
|---------------------------------|---|
| 1. Hazardous zone | A flammable atmosphere may be present at any time. |
| 2. Safety zone | Extending beyond the hazardous zone, special precautions are required because of the hazards of natural gas/LNG during bunkering. |
| 3. Marine exclusion zone | Passing marine traffic may affect the safety of the bunkering operation. |
| 4. Monitoring and security area | Activities, e.g. shoreside traffic, should be monitored to ensure they do not encroach on the safety zone. |
| 5. External zone | Where the risks to individuals, particularly the general public, are controlled by local regulations. |

24.3.2.3 Liquefied Natural Gas bunkering Simultaneous Operations

SIMOPS during regular operations on board tankers, e.g. repairs, taking in stores or bunkering during loading or unloading, are described in chapter 4.

LNG bunkering SIMOPS require specific guidance. If not covered by the risk assessment, operations on the receiving ship could have an impact on the safety level of the LNG bunker facility and transfer system. A spill of LNG and the dispersion of the gas cloud can have an effect on safety on board the receiving ship.

When it is proposed to carry out LNG bunkering operations at the same time as other operations, a further risk assessment should be carried out to demonstrate that the required level of safety can be maintained. Permission is required from the relevant authority before any SIMOPS are carried out.

24.3.2.4 Boil-Off Gas and pressure control

Boil-Off Gas (BOG) is produced by LNG fuel systems when the storage tanks absorb heat from the environment. Additional BOG may be produced during bunkering operations due to flashing, etc. If this BOG is not managed, it may result in an increase of temperature and pressure in the storage tank. Eventually the pressure relief valves may operate, allowing a release of LNG to the environment.

Vapour control during bunkering operations is critical and can be handled in several different ways, including:

- Vapour Return Line (VRL) allowing the vapour displaced from the receiving tank to be returned to the supplier's tank.
- Pressure accumulation in suitably constructed tanks.
- BOG and LNG conditioning provisions, such as sub-cooler.
- Burning of BOG in an approved consumer, such as a Gas Combustion Unit (GCU) or Dual Fuel Diesel Engine (DFDE).
- Cooling via top spraying/filling in the storage tanks.

Personnel responsible for LNG bunkering operations should be fully familiar with the means fitted to their ship or facility to control BOG and the associated procedures.

The IGF Code states that venting of fuel vapour for the control of the tank pressure is not acceptable except in emergency situations and that LNG fuelled ships must be fitted with means of maintaining tank pressure below the set pressure of the relief valves, with the ship in idle condition, for 15 days.

24.3.3 Additional information for Liquefied Natural Gas as a fuel and Liquefied Natural Gas bunkering

The SGMP provides detailed information, advice and guidance to help seafarers involved in LNG bunkering operations act in compliance with the appropriate regulations and industry best practices.

24.4 Ancillary substances

From time to time, tankers may load substances other than fuel. These include:

- Lubrication oil.
- Hydraulic oil.
- Caustic soda.
- Magnesium oxide.

They may be loaded and stored packaged, i.e. in drums or other containers, or they may be loaded and stored in bulk in dedicated tanks. See chapter 13 for further information on carrying and storing hazardous materials. The bunker station for an ancillary substance should be clearly identified with appropriate safety signage.

If an ancillary substance, e.g. lubricating oil, is to be loaded in a way that presents similar hazards as bulk bunker fuel, the requirements for conventional bunkering should apply (see sections 24.1 and 24.2).

For hazardous ancillary substances a health safety and environmental risk assessment should identify hazards and implement risk mitigation.

Risk mitigation measures should be reflected in an ancillary substance bunkering plan, with the requirements of conventional bunkering (see sections 24.1 and 24.2) and the additional requirements due to the hazardous properties of the substance.

Crews should be trained to handle hazardous ancillary substances, including how to deal with medical emergencies resulting from accidental exposure. The required PPE is dictated in the SDS for the substance.

24.5 Alternative fuels

The characteristics and behaviour of alternative fuels, such as Liquefied Petroleum Gas (LPG), hydrogen (H_2), ammonia (NH_3) and methanol (CH_3OH), are significantly different to conventional marine fuels and LNG. Risks should be mitigated and avoided. Throughout the alternative fuel bunkering chain, each element should be carefully designed and constructed. Dedicated safety, operational and maintenance procedures should be in place to be executed by trained personnel.

Most of the guidelines in section 24.1 apply to all possible alternative fuels. Future risk mitigation, guidelines and regulations will be based on growing industry knowledge, standards already existing for other applications, risk assessments, HAZIDs and HAZOPs and other safety management tools as referred to in chapter 4.

See chapter 8 for guidance on the due diligence requirements for introducing alternative and emerging technologies.

24.6 Bunker checklists

Safe bunker operations depend on good communication between the bunker vessel and the receiving ship, from pre-arrival to post-departure, and on compliance with the agreed safe procedures at all stages. The bunker checklists help to ensure that all the appropriate checks are formally agreed, carried out and recorded.

24.6.1 General

The responsibility for the safe conduct of a bunkering operation is shared between the Master of the receiving ship and the Master or manager of the bunker facility. The effective responsibility is usually delegated to designated Responsible Officers on the receiving ship and the bunker facility. Before the bunkering starts, the Responsible Officers should:

- Agree in writing the transfer procedures, including the maximum transfer rates and volumes.
- Agree in writing the action to be taken in an emergency during transfer operations.
- Complete and sign the bunker checklist sections appropriate to the operations.

Detailed instructions for completing the bunker checklist are provided in section 24.6.5, where the process that uses multiple parts (see figure 24.2) for each stage of the proposed operation

is described. Each part contains a number of statements and all relevant statements should be reviewed with the associated responsibility for compliance accepted, either jointly or singly. Each statement provides a reference where guidance on the subject may be found in *ISGOTT Sixth Edition*. This may be shown either as:

1. A complete chapter or technical section with multiple cross references in the sub-paragraphs to the topical issue, e.g. smoking restrictions (4.10).
2. A specific sub-paragraph within a technical section, e.g. fendering (22.4.1).

This guidance is primarily written for tankers at conventional terminals and berths (except where otherwise stated) and, therefore, may not specifically relate to all forms of bunkering operations. However, the guidance is referenced for a general understanding of issues that should be considered, and further aid the preparations for and execution of, a safe operation. For example, references to tanker or terminal in the guidance should be considered in the context of its application to the receiving ship or bunker facility, as appropriate.

Some bunkering operations will involve LNG or other alternative fuels and, where this is the case, guidance on items related to these operations should also be sought from the appropriate industry association e.g. SGMF or the Society of International Gas Tanker and Terminal Operators (SIGTTO).

24.6.2 Bunkering checklist for residual fuel oil and distillates

The bunker checklist is structured for loading bunkers from a bunker vessel, but can be adapted for use when taking bunkers from a jetty or loading bulk lubricating oil or gasoil from a road tanker. These all come under the term 'bunker facility' in this chapter.

The bunker checklist is an official agreement record that helps to ensure the three points in section 24.6.1 are properly facilitated. The compatibility between firefighting or other emergency responses should be checked (see section 9.11) along with the operational parameters (chapter 12).

The bunker checklist may also be seen as a guide for addressing the critical risk management guidelines in chapter 4 and for ensuring other operational safety factors and concerns elsewhere in this publication are considered at the pre-transfer conference. Further guidance is in sections 21.4, 21.5 and 21.6.

The individual sections of the bunker checklist can be used or adapted to supplement any specialised safety checks and procedures that OCIMF, or other appropriate industry guidelines, recommend for any product transfer between a receiving ship and bunker facility.

24.6.3 The principles of the bunker checklist for residual fuel oil and distillates

The bunker checklist uses statements that assign responsibility. Ticking or initialling the appropriate box, and signing the declaration, confirms the acceptance of the appropriate obligations. Once signed it is the minimum basis for safe operations.

The assignment of responsibility and accountability does not mean that the other party is excluded from carrying out checks to confirm compliance. It is intended to clearly identify the party primarily responsible for initial and ongoing compliance checks throughout the transfer.

The Responsible Officers completing the checklist should be the personnel who carry out the bunkering operation or who supervise the nominated crew members doing the work. It is the responsibility of the Master of the receiving ship and the Master or manager of the bunker facility to ensure that only competent people act as their representatives in undertaking the checklist and signing the declaration.

The bunker facility's Responsible Officer should personally check all elements within the responsibility of the bunker facility. Similarly, the receiving ship's Responsible Officer should

personally check everything that is within the responsibility of the ship. The Responsible Officers should assure themselves that the standards of safety on both sides of the operation are fully acceptable. They may do this by:

- Sighting appropriate records.
- Joint inspections, where appropriate.

For mutual safety, before the start of operations and then from time to time, the Responsible Officers should inspect the receiving ship to ensure that it is effectively managing its obligations agreed in the bunker checklist. If basic safety requirements are not being met, either party may stop bunker operations (see sections 4.3 and 7.7) until the situation is corrected. See parts H and I of the checklist.

24.6.4 The composition of the bunker checklist for residual fuel oil and distillates

The bunker checklist for residual fuel oil and distillates has five main sections, some of which include sub-sections specifically applicable to each party:

- Pre-arrival.
- Checks after mooring.
- Checks pre-bunkering, including pre-transfer conference.
- Summary of repetitive checks during bunkering.
- Checks after bunkering.

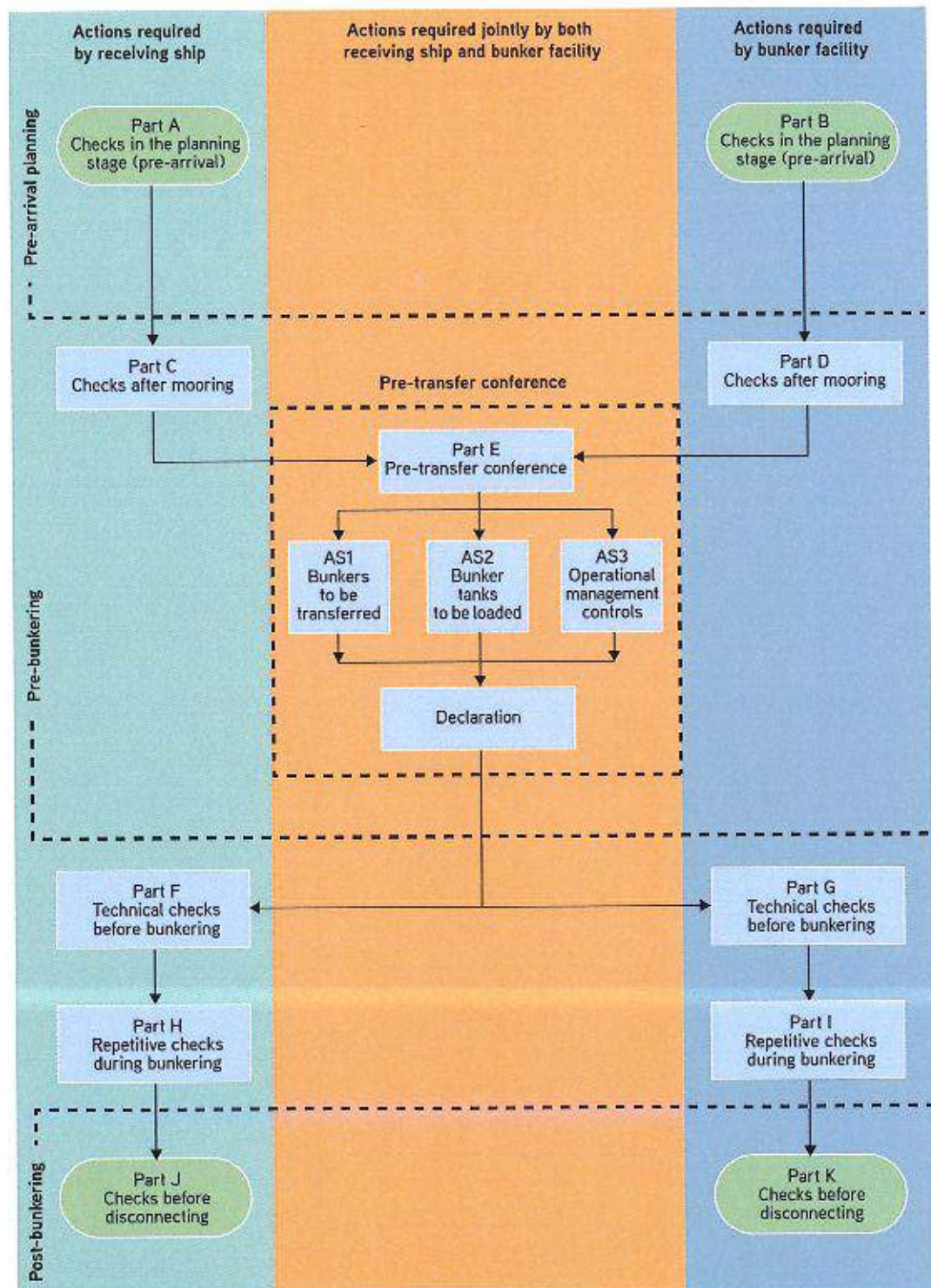


Figure 24.2: Bunker checklist flowchart

The parts of the checklist that apply to a specific process step should be completed before that part of the bunkering process begins.

The receiving ship or bunker facility representatives should keep the original copy of their relevant sub-section (parts) and any declarations, but they should give the other party a copy whenever requested.

Where either the receiving ship or bunker facility is not prepared to accept an assigned responsibility, a comment should be left in the Remarks column. It will then need to be decided whether transfer operations can proceed.

Further, where a particular item is judged not to apply to the receiving ship or bunker facility, or to the planned operation, a note to this effect should be written in the Remarks column.

Any information added to the Remarks column should be clear – any decision about the safety of operations should be based on facts and not assumptions or interpretations.

The safety of operations requires that all relevant statements should be reviewed by each party as appropriate.

Statements should be answered with the Yes box checked, except in the Agreements Parts AS1/AS2/AS3. If that is not possible, an appropriate comment should also be written in the Remarks column. If a 'Yes' answer is not confirmed, it may be appropriate to delay or cancel the transfer operation.

The Agreement Sheets (AS) allow free text to ensure that agreed values and limits are written down and that all parties confirm they understand those values and limits. This should be displayed in the control stations on the receiving ship and the bunker facility, so that all personnel can refer to them.

The joint declaration should be agreed before starting bunkering operations. It should not be signed until all parties have checked and accepted all appropriate checklist sections and their assigned responsibilities and addressed any comments in the Remarks column by formal agreement.

The repetitive checks time period for both parties begins after signing the declaration, regardless of when actual cargo transfer started.

24.6.5 Instructions for completing the bunker checklist

Pre-arrival

The receiving ship should complete part A, then forward it to the bunker facility for review. The bunker facility should complete part B, then forward to the receiving ship for review.

If it is not possible for either party to transmit the completed part A or B then the representative of the receiving ship or the bunker facility (as applicable) should send a message confirming the time and date of completion to the relevant party before arrival. If there are any outstanding issues not marked 'Yes' in the status box, this should be explained in this communication for pre-arrival review by the representatives.

Checks after mooring

The receiving ship should complete part C and give a copy to the bunker facility representative as soon as possible, but no later than at the pre-transfer conference.

The bunker facility should complete part D and give a copy to the receiving ship as soon as possible, but no later than at the pre-transfer conference.

Checks before transfer – the pre-transfer conference

Before the operation starts, a representative of the receiving ship and bunker facility should meet to conduct a pre-transfer conference (see section 24.1.3). The receiving ship and bunker facility should both complete part E as part of the pre-transfer conference, with each party retaining a copy.

During this process, both parties should complete and agree the checklists AS1, AS2 and AS3. These documents summarise the detailed operational factors agreed at the pre-transfer

conference. A copy should be displayed at the control stations on the receiving ship and at the bunker facility, so personnel can refer to them.

Pre-bunkering technical checks

On completion of the pre-transfer conference (including agreements), the representatives of both the receiving ship and bunkering facility should undertake final technical checks immediately before the transfer. Checklists part F (receiving ship) and part G (bunker facility) are provided for this purpose. Before beginning the bunker transfer, each party should confirm satisfactory completion to the other party.

Where it is not possible to satisfactorily tick a Yes box, the issue should be brought to the immediate attention of the other party and corrected before beginning. If it is not possible to correct the issue, a further review should be undertaken to confirm whether the transfer operation can safely proceed and whether additional mitigations are required to be agreed. These may require to be risk assessed and additional documentation provided outlining the steps taken to ensure operational safety.

Copies of completed checklists parts F and G, along with any supporting documentation, should be exchanged before signing the declaration.

The declaration

When completed, each separate part of the checklist should be checked off and initialled by personnel from the receiving ship or bunker facility (or both if appropriate) in the relevant boxes on the declaration form. When all parts are completed, and the times for the repetitive checks noted, the details of the two representatives agreeing to start the operation should be added.

Summary of repetitive checks during and after transfer

The receiving ship should complete the repetitive checks in part H at the agreed intervals and have the record available for review by bunker facility personnel.

The bunker facility should complete the repetitive checks noted in part I at the agreed intervals and have the record available for review by receiving ship personnel.

The receiving ship and bunker facility should both provide a final copy of their parts H and I to the other when operations are completed.

Post-bunkering checks before disconnecting

At the end of the operation, both parties should complete the supplemental declaration when they have confirmed their pre-disconnection checklists (parts J and K) are satisfactory. At that point, they may disconnect.

The receiving ship and bunker facility should keep copies of all checklists and the declarations.

24.7 Liquefied Natural Gas bunkering safety checklists

ISO have produced LNG bunker checklists to support the IGF Code. These are contained in *ISO 20519:2017 Ships and marine technology – Specification for bunkering of liquefied natural gas fuelled vessels*.

In addition, the International Association of Ports and Harbors (IAPH) has developed harmonised checklists for known LNG bunkering scenarios: STS, shore to ship and truck to ship. These checklists are available on the Ingbunkering.org website and aim to standardise procedures across different ports/countries. ISO 20519 allows alternative checklists to be used as long as they contain at least the same information that is listed in its own checklists.

The checklists developed by IAPH may be used in place of the standard ISO 20519 checklist if:

1. Both parties agree to use the alternative checklists.
2. The competent authorities permit their use.
3. The checklists are used from pre-operations through to the completion of the transfer (no mixing of checklists).

ISGOTT Bunker checklist: pre-arrival

Date and time: _____

Port and berth: _____

Receiving ship: _____

Bunker facility: _____

Part A. Checks at the planning stage for the receiving ship			
Item	Check	Status	Remarks
1	Necessary permissions are granted (12.9.1, 21.2.2)	☐ Yes	
2	Local requirements are observed (12.9, 21.2.3, 21.3.1)	☐ Yes	
3	All personnel are aware of operations (23.5.3, 24.1)	☐ Yes	
4	Bunker plan is exchanged (21.2.3, 21.5, 21.6)	☐ Yes	
5	Mooring and fendering arrangement is agreed (22.3.1)	☐ Yes	

Part B. Checks at the planning stage for the bunker facility			
Item	Check	Status	Remarks
6	Necessary permissions are granted (21.2.2)	☐ Yes	
7	Local requirements are observed (12.9, 21.2.2, 21.3.2)	☐ Yes	
8	All personnel are aware of operations (23.5.3)	☐ Yes	
9	Bunker plan is exchanged (21.5, 21.6, 24.1.1)	☐ Yes	
10	Mooring and fendering arrangement is agreed (22.3.2)	☐ Yes	

ISGOTT Bunker checklist: checks after mooring

Date and time: _____

Port and berth: _____

Receiving ship: _____

Bunker facility: _____

Part C. Checks after mooring for the receiving ship			
Item	Check	Status	Remarks
11	Fenders are effective (22.4.1)	☐ Yes	
12	Mooring is effective (22.2, 22.4.3)	☐ Yes	
13	Access between ship and facility is safe (16.4)	☐ Yes	

Part D. Checks after mooring for the bunker facility			
Item	Check	Status	Remarks
14	Fenders are effective (22.4.1)	☐ Yes	
15	Mooring is effective (22.2, 22.4.3)	☐ Yes	
16	Access between ship and facility is safe (16.4)	☐ Yes	

ISGOTT Bunker checklist: pre-transfer conference

Date and time: _____

Port and berth: _____

Receiving ship: _____

Bunker facility: _____

Part E. Pre-transfer conference

Item	Check	Receiving ship status	Bunker facility status	Remarks
17	Effective communications are established (21.1.1, 21.4, 24.1.3)	☐ Yes	☐ Yes	
18	Bunker watch is established (12.1.6.4, 21.4, 23.11)	☐ Yes	☐ Yes	
19	Smoking restrictions and designated smoking areas are established (4.10, 23.10)	☐ Yes	☐ Yes	
20	Naked light restrictions are established (4.10.1, 24.2.1)	☐ Yes	☐ Yes	
21	Safety data sheets are available (1.4.4, 20.1, 21.4)	☐ Yes	☐ Yes	
22	Hazardous properties of the product to be transferred identified in the safety data sheet are discussed (1.2, 1.4, 24.1.2)	☐ Yes	☐ Yes	

AS1. Agreement sheet part 1

Bunkers to be transferred (21.4, 21.5, 21.6)

Product and grade	Tonnes	Volume (in m ³) at loading temperature	Loading temperature	Maximum transfer rate	Maximum line pressure

AS2. Agreement sheet part 2**Bunker tanks to be loaded (volume in m³) (21.4, 21.5, 21.6)**

Tank number	Product and grade	Capacity of tank (volume in m ³)	Volume of oil in the tank before bunkering	Free capacity of tank (volume in m ³)	Volume (in m ³) to be loaded	Final volume (in m ³)

AS3. Agreement sheet part 3**Operational management controls**

Item ref	Agreement	Details	Receiving ship initials	Bunker facility initials
17	Process for starting transfer	Initial flow rate: Increase of flow to full rate: Quantity transferred check intervals:		
18	Process for completing transfer	Slowdown of flow: Transfer stop:		

ISGOTT Bunker checklist: pre-bunkering

Date and time: _____

Port and berth: _____

Receiving ship: _____

Bunker facility: _____

Part F. Receiving ship: technical checks before bunkering			
Item	Check	Status	Remarks
23	Electrical insulation is effective (12.9.5, 17.4.2, 17.4.5, 18.2.14)	☐ Yes	
24	Bunker transfer equipment: (18) • is in good condition • is appropriate • line up is checked • is properly rigged • is secured to manifolds • is fully bolted	☐ Yes	
25	Firefighting equipment is ready for use (5, 23.8)	☐ Yes	
26	Scuppers and savealls are plugged (23.7.4, 23.7.5, 24.2)	☐ Yes	
27	Portable drip trays are correctly positioned and empty (23.7.5)	☐ Yes	
28	Unused bunker connections are blanked and fully bolted (23.7.1, 23.7.6)	☐ Yes	
29	High level and overfill alarm units are operational (12.1.6.6.1, 24.1.3)	☐ Yes	
30	Bunker operation emergency stop is operational (18.5)	☐ Yes	
31	Bunker tank openings are closed (23.3)	☐ Yes	
32	Oil spill clean-up material is available (20.4, 24.2)	☐ Yes	
33	Medium frequency/high frequency radio antennae are isolated (4.11.4, 4.13.2.1)	☐ Yes	
34	Very high frequency and ultra high frequency transceivers are set to low power mode (4.11.6, 4.13.2.2)	☐ Yes	

ISGOTT Bunker checklist: pre-bunkering

Date and time: _____

Port and berth: _____

Receiving ship: _____

Bunker facility: _____

Part G. Bunker facility: technical checks before bunkering			
Item	Check	Status	Remarks
35	Electrical insulation is effective (12.9.5, 17.4.2, 17.4.5, 18.2.14)	☐ Yes	
36	Bunker transfer equipment: (18) • is in good condition • is appropriate • line up is checked • is properly rigged • is secured to manifolds • is fully bolted	☐ Yes	
37	Firefighting equipment is ready for use (5, 19.4, 23.8)	☐ Yes	
38	Scuppers and savealls are plugged (23.7.4)	☐ Yes	
39	Portable drip trays are correctly positioned and empty (23.7.5)	☐ Yes	
40	Unused bunker connections are blanked and fully bolted (23.7.1, 23.7.6)	☐ Yes	
41	High level and overfill alarm units are operational (12.1.6.6.1, 24.1.3)	☐ Yes	
42	Bunker operation emergency stop is operational (18.5)	☐ Yes	
43	Bunker tank openings are closed (23.3)	☐ Yes	
44	Oil spill clean-up material is available (20.4, 24.2)	☐ Yes	
45	Medium frequency/high frequency radio antennae are isolated (4.11.4, 4.13.2.1)	☐ Yes	
46	Very high frequency and ultra high frequency transceivers are in low power mode (4.11.6, 4.13.2.2)	☐ Yes	

ISGOTT Bunker checklist: repetitive checks

Date and time: _____

Port and berth: _____

Receiving ship: _____

Bunker facility: _____

Part H. Receiving ship: repetitive checks during bunkering								
Item ref	Check	Time	Time	Time	Time	Time	Time	Remarks
Interval time:..... hrs								
11	Fendering is effective	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
12	Mooring arrangement is effective	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
13	Access between ship and bunker facility is safe	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
17	Communications are effective	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
19	Smoking restrictions and designated smoking areas are complied with	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
20	Naked light restrictions are complied with	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
26	Scuppers and savealls are plugged	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
AS3	Bunker tank contents are monitored	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
Initials								

ISGOTT Bunker checklist: repetitive checks

Date and time: _____

Port and berth: _____

Receiving ship: _____

Bunker facility: _____

Part I. Bunker facility: repetitive checks during bunkering								
Item ref	Check	Time	Time	Time	Time	Time	Time	Observation
Interval time:..... hrs								
14	Fendering is effective	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
15	Mooring arrangement is effective	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
16	Access between ship and bunker facility is safe	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
17	Communications are effective	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
19	Smoking restrictions and designated smoking areas are complied with	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
20	Naked light restrictions are complied with	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
38	Scuppers and savealls are plugged	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
AS3	Tank contents are monitored	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	
Initials								

ISGOTT Bunker checklist: post-bunkering

Date and time: _____

Port and berth: _____

Receiving ship: _____

Bunker facility: _____

Part J. Receiving ship: checks before disconnecting			
Item	Check	Status	Remarks
47	Bunker hoses, fixed pipelines and manifolds are drained (12.1.14, 18.4, 24.2)	☐ Yes	
48	Remote and manually controlled valves are closed (12.1.6.17, 12.1.14.3, 23.7.6)	☐ Yes	

Part K. Bunkering facility: checks before disconnecting			
Item	Check	Status	Remarks
49	Bunker hoses, fixed pipelines and manifolds are drained (12.1.14, 18.4, 24.2)	☐ Yes	
50	Remote and manually controlled valves are closed (12.1.6.17, 12.1.14.3, 23.7.6)	☐ Yes	

Declaration

We the undersigned have checked the items in the applicable parts A to G as marked and signed below:

	Receiving ship	Bunker facility
Part A. Checks at the planning stage for the receiving ship	☐	☐
Part B. Checks at the planning stage for the bunker facility	☐	☐
Part C. Checks after mooring for the receiving ship	☐	☐
Part D. Checks after mooring for the bunker facility	☐	☐
Part E. Pre-transfer conference	☐	☐
Part F. Receiving ship: technical checks before bunkering	☐	☐
Part G. Bunker facility: technical checks before bunkering	☐	☐

In accordance with the guidance noted in chapter 24 of *ISGOTT*, we are satisfied that the entries we have made are correct to the best of our knowledge and that the receiving ship and bunker facility are in agreement to undertake the transfer operation.

We have also agreed to carry out the repetitive checks noted in parts H and I of the *ISGOTT* bunker checklist, which should occur at intervals of not more than ____ hours for the receiving ship and not more than ____ hours for the bunker facility.

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

Receiving ship	Bunker facility
Name	Name
Rank	Position
Signature	Signature
Date	Date
Time	Time

To be completed after any transfer operation:

	Receiving ship	Bunker facility
Part J. Receiving ship: checks before disconnecting	☐	☐
Part K. Bunkering facility: checks before disconnecting	☐	☐

Receiving ship	Bunker facility
Name	Name
Rank	Position
Signature	Signature
Date	Date
Time	Time