GUIDANCE NOTES
GD004-2026

INTERNATIONAL SHIP CLASSIFICATION

GUIDELINES FOR DEVELOPMENT OF SHIP TO SHIP (STS) OPERATIONS PLAN (LIQUEFIED GAS CARRIERS)

2026

Effective from 15 May 2026

CONTENTS

CHAPTER 1 GENERAL

1.1 Guidelines for Development of Ship to Ship (STS) Operations Plan (Liquefied Gas Carriers), 2021 were issued on 1 September 2021 by ISC in accordance with SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2013), first edition referenced in the footnote of MARPOL Annex I, regulation 41.2.

1.2 The first edition of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2013) was replaced by the second edition in 2025, introducing comprehensive revision and updating, e.g, adding "human factors" etc.

1.3 In view of this, the Guidelines for Development of Ship to Ship (STS) Operations Plan (Liquefied Gas Carriers), 2021 were substantially revised by ISC in accordance with SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition and issued as Guidelines for Development of Ship to Ship (STS) Operations Plan (Liquefied Gas Carriers), 2026.

1.4 In accordance with industry requirements, liquefied gas carriers scheduled to participate in STS operations should carry on board an STS operations plan (hereinafter referred to as the "Plan") approved or verified by the Administration or its authorized organization. Where the critical operation of "ship to ship transfer" is involved in the Safety Management System (SMS) of ship company, the "STS operations Plan" (hereinafter referred to as "the Plan") may be developed by the company in accordance with the sample in the 2026 Guidelines.

1.5 Prior to STS operations of liquefied gas carriers, a comprehensive risk assessment and compatibility review should be conducted to verify the suitability of both vessels for STS operations and identify all items that may require special management. Where the involved vessels have not performed STS operations before, the assessment will require extensive detailed analysis and substantial resources, and the completion of a full risk assessment may take several weeks or even months. ISC has accumulated extensive experience in technical services for STS operations. Upon the authorization or application of the shipowner/shipping company, ISC can provide scheme design, mooring analysis, risk assessment and other services related to STS.

CHAPTER 2 DEVELOPMENT OF THE PLAN

2.1 Scope of Application of the Plan

2.1.1 The Plan applies to liquefied gas carriers engaged in the transfer of liquefied gas cargo at sea.

2.1.2 The risk assessment, safety management of STS operations and relevant procedural requirements specified in the Plan also apply to the guidance for transfer operations of ethane, ethylene, ammonia, carbon dioxide and other chemical gases. It can serve as a reference for LNG, LPG and ammonia bunkering operations, as well as for double banking STS operations between LNG carriers and LNG floating storage units/LNG floating storage and regasification units.

2.2 Requirements of the Plan

2.2.1 The Plan is to be developed in accordance with SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition, in order to provide guidance to the master and STS operator on board the ship.

2.2.2 The Plan is to include at least the following, see detailed requirements given in annex of the Guidelines:

(1) A step-by-step description of the entire STS operation;

(2) Mooring and unmooring procedures and arrangements, including diagrams where necessary, and procedures for tending the moorings during the transfer of cargo;

(3) Cargo and ballast transfer procedures, including those used while underway or anchored;

(4) Procedures for connecting and testing integrity of cargo hoses and hose to manifold interface;

(5) The titles, locations and duties of all persons involved in the STS operation;

(6) Procedures for operating ESD and communication systems and for rapid cessation of operations;

(7) Drip tray arrangement and procedures for emptying;

(8) weather criteria;

(9) procedures for reporting leakage;

(10) contingency plan.

2.2.3 The national or local regulations for transfer of cargo performed within certain Exclusive Economic Zones, Territorial Waters or Port Limits are to be considered while developing the Plan.

2.2.4 The STS operations procedures and requirements as specified in the Plan are to comply fully with the safety requirements for normal cargo operation.

2.2.5 The person in overall advisory control (POAC) of STS operations is to be qualified to perform all relevant duties.

2.2.6 The Plan is to be written in the working language of the ship. If the ship engaged in STS operations has foreign-related requirements and the language used is not English, the text is to include the translation into English.

2.3 Sample of the Plan

2.3.1 The sample of STS operations plan of liquefied gas carriers is given in the annex, which includes the details and requirements for the development of the Plan. Shipowners or management companies are recommended to develop the Plan using the sample and make revisions to the Plan on the basis of the sample according to the particulars of the ship and indicate the management system procedures of the company accurately.

2.3.2 The framework of the Plan includes the following parts:

(1) cover, including names of the company and the ship, IMO number, call sign;

(2) contents, table of contents of the Plan;

(3) record of changes, recording the revision details, including the revised part, title and date;

(4) responsible persons for STS operations, recording all ship's staff that will be involved in ship to ship transfer operation;

(5) text, see 2.3.3 below for details;

(6) appendix, including Ship to Ship Safety Checklist, personnel transfer plan, fender suitability calculations, hose string connection, Liquefied Natural Gas Ship to Ship compatibility questionnaire, human factors, security, record of STS operations, mooring arrangement plan, tank capacity plan, cargo piping diagram and arrangement plan of manifolds and drip-trays.

2.3.3 The text of the Plan includes:

(1) vessel particulars, recording parameters such as size of the ship, tank capacity and manifold height and diameter;

(2) introduction, including terms and bibliography related to STS operations;

(3) general principles, including general description of Person in Overall Advisory Control(POAC), STS Superintendent, human factors (provision and training), risk assessment, safety, emergency and security;

(4) equipment, including fenders, hoses, reducers, mooring equipment, deck lighting and ancillary equipment;

(5) communications, including procedures for communications during each phase of STS operations;

(6) preparations, including conditions, requirements and operational preparations;

(7) manoeuvring and mooring, including procedures for manoeuvring and mooring under different conditions;

(8) cargo transfer, including pre-transfer procedures, planning for cargo transfer, transfer, vapour management, post-cargo transfer for LPG transfer operations, as well as pre-transfer procedures, planning for cargo transfer, transfer, BOG management, post-cargo transfer for LNG transfer operations;

(9) unmooring, including unmooring after underway transfer, unmooring while one ship is at anchor, unmooring from a ship alongside a terminal, and unmooring using quick release arrangements;

(10) personnel transfers, including transfer using a personnel transfer basket and ship's crane, transfer preparations, personnel transfer procedures, and contingency plan.

CHAPTER 3 COMPLIANCE VERIFICATION OF THE PLAN

3.1 ISC carries out compliance verification of the Plan upon authorization or request of the ship owner or ship company. ISC will issue a Statement of Compliance to ships which are verified as satisfying the technical requirements of the Guidelines.

3.2 The Plan verified by ISC should be submitted to ISC for re-verification if any revision is made. However, the update and change of record of STS operations or STS operators and their responsibilities excluded.

ANNEX SHIP TO SHIP OPERATIONS PLAN (LIQUEFIED GAS CARRIERS) (SAMPLE)

Company logo

<u>Company name</u>

Ship to Ship Operations Plan

Ship name	
IMO number	
Call sign	
Ship type (the same as that indicated on the IOPP certificate)	
Port of registry	
Flag	
Deadweight	
Summer loadline draft	

CONTENTS

RECORD OF CHANGES

Change number	Revision details/description	Revised part	Title/Name	Date

RESPONSIBLE PERSONS FOR STS OPERATIONS

The document is to be circulated to all ship's staff that will be involved in ship to ship transfer operation.

Name	Rank	Date joined	Signature and date

1 VESSEL PARTICULARS

Ship data

Length overall (m)	:
Length between perpendiculars (m)	:
Breadth (m)	:
Moulded depth (m)	:
Summer loadline draft (m)	:
Maximum deadweight (t)	:
Gross tonnage	:
Number of liquid phase pipe connections on manifold (single side)	:
Number of gas phase pipe connections on manifold (single side)	:
Manifold dimensions (main connection)	:
Bow to center manifold length (m)	:
Deck cranes (cranes / derricks / quantity)	:
Tank capacity (m^3)	:

The tank capacity plan is shown in Appendix I.2.

Cargo tanks (100% capacity), in m3		
Name of tank	Frame number	Tank capacity
No.1 cargo tank (P)		
No.1 cargo tank (S)		
…		
…		
…		
…		
…		
Total		

2 INTRODUCTION

This document is a ship specific Ship to Ship (STS) operations plan for the transfer of liquefied gases between two ships moored together. The plan was developed using SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition, IMO Manual on Oil Pollution, Section I, Prevention and other publications as referenced. It is recommended to keep the publications mentioned in the Plan on board. The national or local regulations should be followed when cargo transfer is performed within certain Exclusive Economic Zones, Territorial Waters or Port Limits and relevant recommendations in the Plan may be regarded as additional requirements.

The purpose of the Plan is to provide guidance to the master and STS operator on board the ship in conducting the transfer in a safe and efficient manner. All cargo transfers of liquefied gases during STS operations should be recorded in Appendix H Record of STS operations of the Plan. All records should be retained on board for at least 3 years.

A risk assessment is to be carried out before operations commence and a contingency plan is to be put in place to deal with emergencies.

For each ship, a copy of the Plan is to be kept at:

- **Navigation bridge**
- **Cargo control room**
- **Engine control room**

2.1 Terms

Within the Plan, the terms below have the following meaning.

LNG carrier: A tanker carrying liquefied natural gas.

LPG carrier: A tanker carrying liquefied petroleum gas.

Ship to Ship (STS): Where cargo is transferred between ships moored side by side. STS operations may take place when either one ship is at anchor or alongside, or when both are underway. In general, the expression includes the approach manoeuvre, berthing, mooring, hose connecting, cargo transfer, gas/liquid phase hose disconnecting, unmooring and departure manoeuvre.

In this document, STS Operations means Ship to Ship transfer operations, STS Operations plan means the plan of Ship to Ship transfer operations.

STS transfer area/Lightering area/Lightering zone: An area within which an STS operation customarily takes place.Transfer areas should be selected in safe sea areas.In coastal areas they will be agreed with nearby coastal authorities and in accordance with specific port or national regulations.

Transfer at anchor: An operation where a cargo transfer is carried out between ships when they are moored alongside each other and where one of the ships is at anchor, which is an alternative to underway transfer.

At sea: The term "at sea" in the Guidelines is intended to indicate offshore waters or partially sheltered waters. It may be, however, that an STS transfer operation at sea is to be conducted within the jurisdiction of a local (port) authority or national government. In such cases reference has to be made to local regulations and it may also be necessary to obtain local approval.

In port: Under the jurisdiction of a port or harbour authority, including anchor, terminal berth, buoys or dolphins.

Closed operations: Ballasting, loading or discharging operations carried out without opening ullage and sighting ports.

Constant Heading Ship (CHS): During manoeuvring and mooring, the ship that maintains course and speed to allow the Manoeuvring Ship (MS) to approach and moor is referred to as the Constant Heading Ship(CHS). For STS operations at anchor the ship already at anchor is deemed to be the CHS. For STS operations alongside a berth the Berthed Ship is also referred to as the CHS.

Manoeuvring Ship (MS): During manoeuvring and mooring, the ship that approaches the Constant Heading Ship (CHS) for mooring operations is referred to as the Manoeuvring Ship(MS). For STS operations alongside a terminal, the MS is also referred to as the Outer Ship.

Dedicated lightering ship: A ship purposely designed to perform STS operations without external assistance. It is usually fitted with davit-launched primary and secondary fenders, which are capable of being lifted and stowed on board. A dedicated lightering ship is also equipped with its own cargo handling hoses.

Discharging ship/Ship To Be Lightened (STBL): The ship containing cargo to be transferred to the receiving ship.

Receiving Ship/Lightering Ship/Service Ship: The ship to which cargo is transferred from the discharging ship.

Joint Plan of Operation (JPO): An operation-specific plan that should be agreed by all parties to ensure alignment in the operation and includes a compilation of information from relevant sources.

STS transfer organiser: An STS transfer organiser is a shore based operator responsible for arranging an STS operation.The organiser may be an STS service provider.

STS service provider Company: Company contracted to organise and assist with STS operations.The services offered by STS service providers varies and may include essential personnel and equipment needed, such as hoses, fenders and support craft. The STS service provider may also be referred to as an STS contractor or STS resource provider.

Person in Overall Advisory Control (POAC): For transfers at sea involving MARPOL Annex I, chapter 8 cargoes, the person in overall advisory control of an STS operation. It may be one of the Masters (generally the Master of the Manoeuvring Ship) or it may be an STS Superintendent.

STS Superintendent: A person designated to assist a ship's Master in the coordination and supervision of the STS operation. This may include mooring and unmooring of the ships and/or the cargo transfer operation. The STS Superintendent may also be known as Lightering Master, Mooring Master or Transfer Supervisor.

Primary fenders: Fenders towed in the water alongside one ship, capable of absorbing the impact energy of berthing and wide enough to prevent steel-to-steel contact between the ships while alongside one another. Primary fenders are normally pneumatic and pressurised to either 50kPa or 80kPa gauge pressure.

Secondary fenders: Fenders used to prevent contact between the two ships during the mooring and unmooring operations, if they are rolling or not parallel to each other, including portable small fenders. The fenders are most effective when rigged nearer the extremities of the Manoeuvring Ship (MS).

Safe Working Load(SWL): The operating limit to which equipment is tested for day-to-day use. Equipment should never be used beyond its SWL.

Vapour balancing: Cargo operations used to avoid/minimise the release of cargo vapours to the atmosphere by interconnecting the vapour systems, using a dedicated vapour hose, of the receiving and discharging ships.

STS mooring: The process of securing a MS to an anchored ship/underway CHS during STS operations at sea; When at a berth, it means securing the MS to a ship already berthed.

Chock: A guide for a mooring line, enabling the line to be passed through a ship's bulwark or other barrier.

Fairlead: A guide for a mooring line that enables the line to be passed through a ship's bulwark or other barrier (see Chock), or to change direction through a congested area without snagging or fouling.

Threshold Limit Value (TLV): Airborne concentrations of substances under which it is believed that nearly all workers may be exposed day after day with no adverse effect.

Dumb barge: Non-powered (not self-propelled)vessels that are towed or pushed by another vessel, including oil barge.

Reverse lightering: An operation that involves discharge from one or more smaller ships into a larger ship. In this operation the receiving ship is the CHS.This term is used to describe an STS operation carried out for loading an exporting ship in deeper water, at a location where available loading berths do not have sufficient water alongside to safely handle the ship at laden departure draught.

Officer of the Watch (OOW): The officers responsible for safe operations on the bridge and in the engine room.

Underway transfer: An STS operation that is conducted between two ships that are underway. The ships engaged in the transfer may be either steaming or drifting with current and weather.

Lightering Support Vessel (LSV): A vessel employed to transport equipment and personnel to and from the location and to assist ships in the STS operation.

Simultaneous Operations (SIMOPS): Activities that take place at the same time in the same area or that could directly or indirectly affect the safety of any other activity on the ship or at the terminal.

Double banking: An STS operation that is conducted while one ship (usually the larger) is alongside a berth, dolphins or moored to buoys within port limits.

Emergency Release Coupling: The ERC is a dry break coupling that consists of a coupling assembly utilising two valves,where one valve is fitted upstream and the other downstream of the main valve body. It is fitted between the manifold presentation flanges and cargo transfer hoses on one of the ships conducting an STS operation. It is designed to enable the ships to separate in an emergency without the need to disconnect cargo hoses from the manifold presentation flanges. It can be activated either from an Emergency Release System(ERS) operating station or manually.When activated, the ERC valve body is split into two separate sections and both the upstream and downstream valves close automatically to prevent or minimise loss of cargo from the cargo hose and the ship's cargo lines, see Figure 2.1.

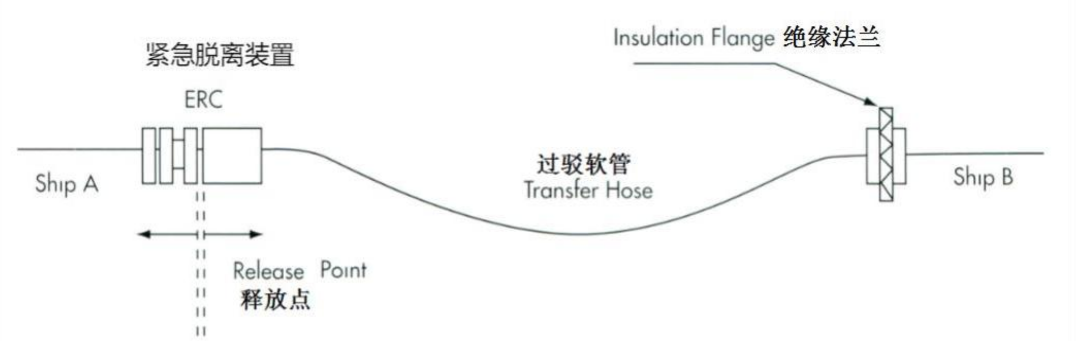


Figure 2.1 Emergency Release Coupling

Emergency Release System (ERS): A system for quickly and safely disconnecting the cargo transfer connection (e.g. marine loading arm or hose) from a ship with minimal product spillage. It consists of an ERC between two interlocked block valves.

Emergency Shutdown System (ESD): ESD systems execute a sequential shutdown of ship pumps and valves in the event of an emergency. Common within the STS transfer of LNG, the ESD systems of both ships are linked to ensure that if the ESD is activated on one ship, the system shutdown sequence is also activated on the other ship.

Vessel Separation Detector (VSD): An automated system used in STS operations to detect whether vessel movements exceed the specified limit. A typical system first issues an initial alarm and stop signal, and then activates the emergency release separation system or other automatic cargo shutdown and disconnection systems.

Boil Off Gas (BOG): LNG carriers are designed to transport liquefied natural gas (LNG) at -163℃, which is approximately the saturation temperature at atmospheric pressure. Although the insulation design of cargo tanks limits the ingress of external heat, even a small amount of heat input will cause vaporization of the cargo. Such heat-absorbing vaporized gas is inevitable and is referred to as boil-off gas (sometimes referred to as vapor). To maintain the cargo tank pressure within a safe range, excess vapor inside the cargo tanks should be vented in a timely manner.

Ship Shore Link (SSL): A connected ship-shore system; during STS operations, it refers to the connected ship-to-ship system.

Personnel Transfer Basket (PTB): A dedicated lifting appliance used for transferring personnel between vessels, normally operated in conjunction with lifting equipment.

2.2 Bibliography

[1] CDI/ICS/OCIMF/SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition.

[2] ISC Guidelines for LNG Fuel Bunkering Operation.

[3] ICS/OCIMF/IAPH International Safety Guide for Oil Tankers and Terminals.

[4] OCIMF Mooring Equipment Guidelines.

[5] SIGTTO Recommendations for Liquefied Gas Carrier Manifolds.

[6] IMO International Convention for the Prevention of Pollution from Ships.

[7] IMO Standard Marine Communication Phrases.

[8] IMO International Regulations for Preventing Collisions at Sea.

[9] IMO International Ship and Port Facility Security Code.

[10] IMO International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.

[11] ICS Guide to Helicopter/Ship Operations.

[12] OCIMF Mooring Load Analysis during Ship to Ship Transfer Operations.

[13] ICS Bridge Procedures Guide.

[14] OCIMF Transfer of Personnel by Crane Between Vessels.

[15] ISC Rules for Ships Using Natural Gas Fuel.

[16] ISC Rules for Liquefied Natural Gas Bunkering Ships.

[17] ISC Rules for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.

[18] IMO
International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.

[19] SIGTTO - ESD Systems - Recommendations for Emergency Shutdown and Related Safety Systems

3 GENERAL PRINCIPLES

3.1 Person in Overall Advisory Control and STS Superintendent

Throughout the STS industry, the titles Person in Overall Advisory Control (POAC) and STS Superintendent are the terms most frequently used to identify the individual(s) providing expert guidance to Masters of ships involved in STS operations.

The Administration, cargo owners or ship's operators should agree and designate a POAC or STS Superintendent. An STS operation should be under the advisory control of a POAC or STS Superintendent. It is not intended that the POAC or STS Superintendent in any way relieves the ships' Masters of any of their duties, requirements or responsibilities.

The POAC or STS Superintendent should have at least the following qualifications:

- An appropriate management level deck licence or certificate meeting international certification standards or as approved by the Administration, with the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) and dangerous cargo endorsements up to date and appropriate for the ships engaged in the STS operation;
- Attendance at suitable ship handling course;
- Conduct of a suitable number of mooring/unmooring operations in similar circumstances and with similar vessels;
- Experience in liquefied gas carrier cargo loading and unloading;
- A thorough knowledge of the geographic transfer area and surrounding areas;
- Knowledge of spill clean-up techniques, including familiarity with the equipment and resources available in the STS contingency plan;
- Knowledge of the STS Plan.

For liquefied gas STS operations, although there are no equivalent regulatory requirements for individuals providing expert guidance, a POAC or STS Superintendent is to be appointed to provide expert guidance to the ships' Masters, with comparable experience in the relevant cargo type.

Roles and responsibilities of a POAC/STS Superintendent vary depending on the cargo type, the complexity of the mooring operation and whether it is conducted at sea or in port limits. The responsibilities of a POAC/STS Superintendent include, but are not limited to:

- Reviewing the location-specific risk assessment;
- Reviewing the Joint Plan of Operations (JPO) and associated risk assessments;
- Verifying that agreed STS operating procedures are followed and that the STS operation is conducted in compliance with applicable regulatory requirements;
- Confirming that required notifications are made to the appropriate authorities;
- Confirming that relevant checklists are completed;

- Overseeing the placement of primary and secondary fenders;
- Sighting and checking mooring equipment;
- Conducting a pre-operations discussion with the responsible persons of all ships, including Lightering Support Vessels (LSVs);
- Confirming that personnel involved in the STS operation are properly briefed and understand their responsibilities;
- Discussing current and forecast environmental conditions and the need for their continuous monitoring throughout the operation(s);
- For at sea transfers, discussing passage planning and agreeing courses and speeds for manoeuvring and mooring operations;
- Confirming joint agreement of the mooring and unmooring plans;
- Reviewing and verifying that any site-specific risk mitigations are in place;
- Supervising ship approach and manoeuvring alongside;
- Confirming the safe connection of transfer hoses/arms and any associated Emergency Release Systems(ERS);
- Verifying that any Emergency Shutdown(ESD)system is connected and tested;
- Confirming that cargo transfer rates are being monitored, together with associated vapour management procedures;
- Verifying that the integrity of the mooring arrangement is continuously monitored;
- Ensuring that contingency plans are activated in the event of an emergency;
- Verifying that cargo transfer lines are drained and purged where required;
- Confirming safe disconnection of hoses/arms;
- Supervising the unmooring and separation of ships;
- If required, supervising the return of primary and secondary fenders and transfer equipment;
- The POAC/STS Superintendent should advise the Master when to suspend or terminate the STS operation.

The POAC/STS Superintendent should have the authority to advise:

- Suspend or terminate the STS operation;
- Amend the STS plan for the particular operation.

To manage the workload on extended STS transfer operations, an assistant is recommended. This could be an STS Superintendent or an assistant with the same qualifications as the POAC. The primary POAC/STS Superintendent who has the overall advisory control should be confirmed to all parties involved in the STS cargo transfer operation.

When the pilot acts concurrently as the POAC/ STS Superintendent, the STS responsibilities of the POAC/ STS Superintendent during berthing or unberthing operations are not to be separated from the pilotage, nor such responsibilities should be transferred to any other person.

3.2 Human factors

Incidents are frequently attributed to human involvement. This gives the impression that people cause incidents. However, most mistakes, actions and decisions are themselves the result of the way the workplace is set up, how work is designed, which equipment and control measures are in place, and how leaders influence the culture in an organisation.

Human factors are the physical, psychological and social characteristics that affect human interaction with equipment, conditions, systems, processes, other individuals and work team(s).

It is the people in operations and support teams who make safety work. However, human error still occurs. By addressing these interactions, human error can be reduced, thereby reducing incidents and improving reliability and productivity. Details on management of human factors are given in Appendix F.

3.2.1 Manning and the prevention of fatigue

A deck, cargo and bridge watch should be established, for the duration of the STS operation and maintained on each ship, whether underway or at anchor. Principles of bridge team management should be observed. Refer to ICS Bridge Procedures Guide. When conducting STS operations in port, including double banking and buoy mooring operations, deck and cargo watchkeeping duties should be maintained by all ships involved.

STS operations place additional demands on ships' crews, as personnel are required for the cargo transfer operations and tending of moorings, in addition to keeping a safe navigational or anchor watch throughout the STS operation.

In the planning phase for an STS operation, in cooperation with the Masters of the ships, the duration and complexity of the operation should be estimated and an assessment made of the additional workloads associated with the planned STS operation. The plan should ensure that all personnel, including POAC/STS Superintendents, do not become fatigued. The minimum rest periods required by applicable legislation should be complied with, particularly when conducting multiple transfers. Additional deck officer(s) and/or an extra Chief Officer may be necessary, depending on a ship's trade and frequency of STS operations. In case the workload is expected to be heavy or operations are likely to be extended, provision of an additional STS POAC/Superintendent will help prevent fatigue during the STS operations.

For extended STS operations, the POAC/STS Superintendent should not have multiple responsibilities and assistance should be provided to ensure safety of the STS operations.

3.2.2 Training of personnel

Crew members engaged in STS operations are required to perform additional or different tasks, roles and responsibilities than they normally would during a port call. There may be emergency scenarios associated with STS operations that are not included in a ship's documented emergency response programme. The ship operator should provide training before the STS operation, or as per company Safety Management System(SMS)for a ship regularly involved in STS operations.

The training requirement for each ship will differ depending on the experience of the individuals on board. It should be noted that factors including location, service provider and equipment to be used may result in additional training being required for experienced personnel. Where there is little, or no, experience with STS operations, additional experienced STS personnel should be provided before the STS operation to assist with training of personnel and performance of the STS operation.

Training should include, but is not limited to:

- Roles and responsibilities of all parties in the STS operation;
- Bridge watchkeeping procedures;
- Deck watchkeeping procedures;
- Machinery operation;
- Mooring and unmooring: procedure for passing lines between ships; quick release systems; properties of mooring lines; fender management; measures to minimise chafing of lines; the risk of snap-back during the cargo transfer, mooring and unmooring operations;
- Operation of cranes during cargo hose handling, hose draining, Personnel Transfer Basket(PTB) operations,including emergency operation, where applicable;
- Personnel transfer;
- Working with support craft, including means of communication and safety precautions;
- Handling of transfer equipment;
- Connection and disconnection of cargo/vapour hoses or arms;
- Vapour management/venting;
- Hose slinging and support arrangements;
- Emergency operations: aborting mooring operations; collision; cargo spill; emergency disconnection; recovery plans and STS operation resumption.

3.3 Risk assessment

STS operations should have a risk management process. The risk assessment should include procedures to identify hazards, assess risks and ensure they are either eliminated or reduced to ALARP. All activities, including those of contractors, should be included in the risk management process.

Refer to chapter 4 of ICS/OCIMF/IAPH International Safety Guide for Oil Tankers and Terminals for more on risk management.

To improve understanding of how STS operations are carried out, all parties should have access to all relevant risk assessments before the operation.

Masters of ships engaged in STS operations are responsible for reviewing the risk assessment report to confirm that all hazard factors have been identified and that mitigation measures have been implemented to reduce associated risks. During the risk assessment process, full consideration must be given to factors including ship compatibility, equipment reliability, crew competence, and anticipated weather conditions.

3.3.1 Risk assessment of transfer location

STS operations frequently take place in locations beyond the assistance of normal port services. An initial, site specific,risk assessment should be undertaken for each STS location. The outcome of the risk assessment should be used to develop operational procedures specific to the location, including risk mitigation measures to ensure risks are managed to ALARP.

When any condition relating to identified hazards changes, or a new hazard is identified, the risk assessment should be updated.When considering the suitability of a proposed transfer location, it is recommended that a mooring load analysis study is carried out to identify environmental operating limits. For more on this, see OCIMF Mooring Load Analysis during Ship to Ship Transfer Operations.

The risk assessment should be documented and include likelihood and consequence risk ratings for hazards that apply to the location.The risk assessment should document the residual risks following the application of controls and/or mitigation measures. The risk assessment should consider:

- Local legislative requirements;
- Prevailing environmental conditions including: metocean conditions; visibility; weather forecasting;
- Whether berthing and un-berthing operations are conducted with ships underway, at anchor or alongside a jetty;
- Local area limits to conduct STS operation. Should the STS operation break out of the agreed area, implement mitigation measures to return the ships to the designated area; Ensure adequate site is selected; Ensure sufficient manoeuvring room is available at the selected site;
- Navigational hazards in the vicinity of the location;
- Operational geographical limits as per local authority;
- The transfer area should be defined in the JPO and marked by position coordinates.Turning points and turning methods should be clear and agreed.
- Whether cargo transfer operations are conducted while both ships are underway, at anchor or alongside;
- Traffic density in the vicinity of the location, including the presence of other STS activities;

- Spill and dispersion trajectories and potential environmental impacts (special attention for sensitive and marine protected areas in the vicinity);
- Requirement for availability and effectiveness of any additional spill response resources at the location;
- Availability and capability of support craft and tugs at the location; Adequate tug/support vessel; Tug/support vessel failure response plans;
- Availability and effectiveness of support elements provided by local subcontractors;
- Exposure of location to security threats, including local political instability, civil unrest, or war;
- Operational environmental limits, including abort criteria;
- The use of new and emerging technology to reduce identified risk during STS transfer operations for all cargo types (refer to section 2.3 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition). Examples are: the use of dry break couplings, including a Vessel Separation Detector (VSD); mooring line load monitoring systems; enhanced mooring systems.

3.3.2 Risk assessment of Ship to Ship operation

An operation specific risk assessment should be undertaken before starting an STS operation. It should include sufficient information to ensure a good understanding and effective control of the operation. The risk assessment should include physical and operational hazards and how they are managed and should include the suitability of STS equipment. Risk assessments are an important part of the pre-STS planning process and, as a minimum, should include:

- Ship compatibility, including mooring arrangements and bridge wing separation distance (see section 3.1 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition);
- Operational status of main engine, auxiliary engines, steering gear and other required equipment;
- Properties of the cargo to be transferred;
- Training, experience and qualifications of personnel (see section 1.5 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition);
- Training, experience and qualification of POAC/STS Superintendent (see section 1.1 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition);
- Preparation of ships for the proposed operations and sufficient control during operations (see section 7.3 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition): Operational planning and control; planning for emergency breakaway; information for ship's motion limits for all filling levels;

- Navigational procedures (see chapters 7 and 9 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition);
- Adequate number of personnel assigned to control and perform the transfer operation (see section 1.4 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition): adequate experience;
- Anticipated duration of transfer, as longer operations will lead to extra wear and tear on equipment and potential working hours issues/fatigue for all parties: potential for damaged moorings due to chafing and cyclic mooring;
- Communications between ships and/or responsible persons (see section 2.11 and chapter 6 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition);
- Differences in freeboard or the listing of ships when transferring cargo (see chapter 9 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition);
- Equipment, including fenders and transfer hoses (see chapter 8 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition), looking for: fender defect; inadequate fendering; STS hose defect; mooring equipment failure; inadequate transfer equipment(type/fit for purpose); defective level and/or overfill alarm. Both systems are inadequate for open water operation;
- Method of personnel transfer between ships (see chapter 5.1.1 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition): adequate lifting equipment; personnel transfer equipment; Compatibility study for personnel landing area;
- Emergency planning and procedures (see chapter 12 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition): contingency planning; incident management;
- Restrictions on hours of operations (see section 9.1 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition);
- Transfer operation: potential for transfer rate being too high; transfer planning;
- Toxic vapour management (see sections 3.1.1, 4.5 and 10.2.6 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition);
- Specific risks associated with alternative fuel powered ships;
- Specific factors arising from the security risk assessment.

It is important that the potential for hazards particular to the planned STS transfer operation are identified and managed. When the risk assessment is incorporated into a standard procedure, additional assessments should be conducted for any deviation from assumed or standard conditions. Due to the complexity of Liquefied Petroleum Gas (LPG) and LNG STS operations, it is important that the unique elements of each STS operation are recognised and that a risk assessment is performed as part of the planning of each STS operation. The risks identified will vary according to the type of STS operation, for example, the risks associated with being double banked to a ship moored alongside differ from the risks associated to side by side at anchor or side by side with both ships underway. The risk assessment should consider risk reduction measures already in place, their effectiveness and other factors that could change the probability/frequency of a risk event or its impact. Where administrative or procedural controls alone form the basis for risk reduction, these procedures should be thoroughly evaluated.

On completion of the risk assessment, potential risks should have been identified and a risk management strategy developed to ensure that all identified risks are reduced to an acceptable level, with additional mitigation measures included where necessary. Key findings from the risk assessment should be documented in the JPO and during pre-STS operation meetings. Should a ship with single-hulled bunker tanks be nominated for the STS operation, lowering the bunker tank level below the waterline should be considered.

3.3.3 Other risk assessments

Ship to Ship cargo transfer operations involving ships of a similar length(see section 3.1.2 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

Simultaneous Operations(SIMOPS)during cargo transfer (see section 4.9 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

The use of radio and satellite communication equipment (see section 4.14.1 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

The use of portable fenders/fairleads (see section 8.1.1 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

Manoeuvring alongside a ship already at anchor (see section 9.3 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

Manoeuvring with one ship alongside a terminal (see section 9.5 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

Manoeuvring with the assistance of tugs (see section 9.6 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

Winch brake settings (see section 9.7.4 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

Dynamically positioning ships involved in Ship to Ship operations (see section 9.8 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

Emergency shutdown systems (ESD) (see section 10.3.2 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition).

3.4 Safety

For all STS transfer operations each Master remains at all times responsible for the safety of his own ship, its crew, cargo and equipment and should not permit safety to be prejudiced by the actions of others. Each Master should ensure that the procedures recommended by this STS transfer operations plan are followed and, in addition, that internationally accepted safety standards are maintained (e.g. ICS/OCIMF/IAPH International Safety Guide for Oil Tankers and Terminals).

3.4.1 Prevention of fatigue

To prevent human fatigue during the STS transfer operation, the POAC and/or all the responsible officers for the lightering operation should comply with rest period requirements of relevant ILO, IMO and national regulations, and the relevant section of the ISM. Records of rest and work hour compliance should be retained.

3.4.2 Safe watch keeping

The Master should take into consideration the estimated duration of operations to ensure that safe and fatigue-free watch keeping can be maintained throughout.

For reasons of crew workload, transfer operations taking place simultaneously from either side of the STBL are generally not recommended unless fully reviewed by risk assessment.

3.4.3 Personal Protective Equipment and lifesaving appliances

PPE, suitable for the products being handled, should be worn by crew members engaged in operational tasks on both ships. Self-Contained Breathing Apparatus(SCBA)sets should be ready for use in designated locations. Powered air purifying respirator (PAPR) and personal gas detectors, appropriate for the cargoes to be handled, should be available and used. When handling hazardous products, appropriate PPE should be placed at operational locations, particularly around the manifold area.

Transfer should not commence until it is ensured that all parties on both ships are wearing correct PPE and, where required, have the appropriate neutraliser/antidotes readily available.

When undertaking STS cargo transfers, all parties should be aware of the nature of the product(s) being transferred and the actions to be taken in an emergency.

All ships should review their emergency evacuation plans, particularly where the launching of lifeboats and life rafts may be impeded by ships alongside. Mooring plans should consider the need to launch free-fall lifeboats and, if launching arrangements are compromised, alternative means of emergency evacuation should be identified.

The POAC/STS Superintendent should be aware of any additional PPE and Life Saving Appliance (LSA) requirements that are imposed by local harbour regulations or by the terminal and these should be communicated to the Masters of all ships involved.

3.4.4 Use of checklists

Checklists are an important risk management tool aimed at ensuring operations are conducted in a safe manner. They provide essential reminders of the principal risks to be managed and should be supplemented by vigilance throughout the whole operation (see appendix A).

3.4.5 Safety Data Sheets

Both ships should have copies of SDS and cargo data sheets for the products being transferred. They should be posted in communal areas of both ships, available for all crew members. In the absence of SDS and cargo data sheets, STS operations should be postponed until they are provided.

Where cargo vapours and residues are present in the receiving ship's tanks, a copy of the SDS of the previous cargo should be provided to the discharging ship. This would enable the discharging ship's personnel to take precautions if the previous cargo contained toxic vapours that could be displaced onto the deck of the discharging ship or returned to the ship's tanks through vapour balancing/vapour return. Particular attention should be given to the potential of H_2S and other toxic substances in cargo vapours and all necessary personal safety precautions should be taken.

It is important that the SDS is the one issued by the shipper of the product. Generic SDS should not be used and transfer operations should not commence before it is verified that the SDS is for the specific cargo, as issued by the shipper.

3.4.6 Gas accumulation on open decks

STS operations should be suspended if cargo vapour accumulates on the decks or manifolds of either ship. Operations should not be resumed until the vapour has dissipated and it is considered safe to do so.

Measures should be taken to avoid gas accumulation on ships' decks. These measures include heaving anchor and slow steaming, changing the ship's heading for a favourable wind direction, or vapour balancing. In all cases risks should be managed and suspension of cargo transfer may be the best course of action.

Venting from the smaller ship may result in a hazard on the elevated deck of the larger ship.

While it is normally anticipated that cargo vapours will be dissipated by environmental airflows across open decks, airflows around ships engaged in STS operations are prone to eddies that prevent normal dissipation. Surrounding structures, such as deck frames and deck houses, can impede air flows, creating hazardous areas where cargo vapours can accumulate. Risk assessments should be conducted to determine control measures when working in these areas.

3.4.7 Cargo leakage

Cargo transfer should be stopped in the event of a cargo leak on either ship and should not be resumed until the source of the leak is identified, repaired and/or the cause isolated. Where required, notifications to the local authority should be issued from the Master and/or POAC/STS Superintendent. The process should be detailed in the STS Plan and ship specific emergency response procedures.

Cargo operations should only resume with the agreement of both Masters and the POAC/STS Superintendent and local authorities once the spilled product has been cleaned up or contained, any vapour associated with the leak has dispersed and safe atmospheric conditions confirmed.

Consideration should be made of the hazardous properties of the cargo or vapour released and the potential dangers to responding personnel.

For transfers involving LNG and refrigerated LPG cargoes adequate protection of the ships' steel structures against brittle fracture should be provided in areas likely to be affected by cargo spillage. The rapid evaporation of spilled cargo can produce a flammable vapour cloud that may disperse downwind and be a risk for nearby ships.

Arrangement plan of the manifold and drip tray is shown in I.4. For transfers involving LNG and refrigerated LPG cargoes, the drip tray should be emptied prior to cargo transfer to prevent violent boiling and vapor explosion caused by cargo leakage, and then the valves on the discharge pipes of the drip tray should be closed, as shown in Figure 3.4.7.

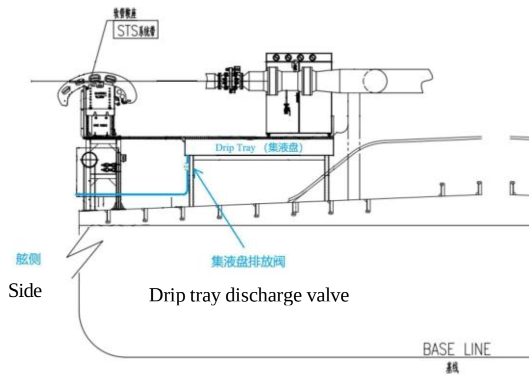


Figure 3.4.7 Diagram of Arrangement of Drip Tray Discharge Pipe and Valve

3.4.8 Helicopter operations

All helicopter operations should be carried out in compliance with ICS Guide to Helicopter/Ship Operations.

In line with ICS/OCIMF/IAPH International Safety Guide for Oil Tankers and Terminals, helicopter operations are not permitted over the tank deck unless all other operations have been suspended.

Helicopter operations should be coordinated in advance between the ships, organisers, agents and the helicopter operator.

3.4.9 Safety during cargo transfer

Safety requirements for a transfer operation are similar to those for a normal port cargo operation. Simultaneous Operations(SIMOPS), including helicopter operations, bunkering, taking stores and crew changes should be risk assessed. The POAC/STS Superintendent and the other ship involved in the STS operation should be notified of the planned SIMOP. The SIMOP should not interfere with the STS operation.

If one of the ships involved in the STS operation is carrying out SIMOPS, the other ship should be informed of the actions to be taken in the event of an emergency.

3.4.10 Smoking and naked lights

Regulations regarding smoking and the use of naked lights should be strictly enforced. Warning notices should be displayed and designated smoking rooms clearly marked.

Consideration should be given to the different sizes and configurations of ships, particularly regarding the risks present when the accommodation space of one ship is within the gas dangerous zone of the other.

3.4.11 Earths on electrical switchboards

Earth indicators showing on the main switchboard indicate a faulty circuit and such faults increase the voltages on the remaining phases, presenting an increased risk of further faults and electric shock. Earth faults should be immediately traced and isolated to avoid the risk of arcing, especially in deck areas where hazardous accumulations of gas may be present.

3.4.12 Machinery operations

The following should be considered for the management of main engines and machinery systems:

- Sufficient reserve power should be available on the switchboard to overcome sudden loss of generating equipment or increased electrical demand. Standby generators and the emergency generator should be tested and confirmed ready before STS operations;
- The main propulsion unit should either be in standby mode or available on an agreed notice of readiness. This ensures that lubrication, fuel, jacket water and other services are available when needed;
- The potential impact of power limitation on either ship manoeuvring requirements and the control measures to avoid unplanned power limitation, e.g. bypassing the limiters for immediate access to the full power of the engines. The readiness of the main propulsion machinery of both ships should be agreed between the Masters and the POAC/STS Superintendent;
- Steering gear system tests should be carried out before starting the STS operation and the tests should remain running on both ships throughout the operation;

- Any changeover of fuel, for example to low sulphur fuel oil, should be carried out in good time before starting STS operations. Any automated changeover systems should be stabilised before operations begin;
- On ships fitted with controllable pitch propellers, the main propulsion unit could be operating on low load at zero pitch for prolonged periods. Manufacturer's recommendations should be followed when preparing the plant for such operation;
- On ships fitted with boilers, operations such as soot blowing should be carried out before starting the approach manoeuvre. Incinerators should not be used during transfer operations;
- Exhaust uptakes should be regularly monitored. In the event of sparks being observed, transfer operations should be stopped immediately;
- The IGS should be ready for use, where applicable.

3.4.13 Electrical isolation

Guidance on the electrical properties of cargo hoses and insulating flanges is detailed in ICS/OCIMF/IAPH International Safety Guide for Oil Tankers and Terminals and Guidelines for the Handling, Storage, Use, Maintenance and Testing of STS Hoses.

Incendive sparks can be caused in two ways when using cargo hoses for STS operations:

- Electrostatic accumulation and discharge when cargo flows through the hoses;
- Sparks from making or breaking circulating currents caused by slight potential differences between ship hulls.

To avoid sparks there should be sufficient resistance between the ships involved in STS cargo transfer operations during hose connection/disconnection and cargo transfer. Elimination of the potential for incendive arcing between two ships performing STS operations can be achieved by either:

- Using a single insulating flange fitted at the manifold of one ship or within each hose string. All hoses in the string should be electrically continuous;
- Using STS hoses compliant with BSEN 1765:2016, grade Ω with a resistance between 25,000 and 1,000,000 Ω for the hose string.

Where an insulating flange is used, no part of the conducting hose outboard of the insulated flange should come into contact with the ship to which the insulating flange is fitted, for example from the use of non-insulated hose saddles, as this could cause a spark.

Where the transfer arrangement includes the fitting of an Emergency Release Coupling (ERC) to one ship's manifold and the hose string is electrically continuous, the insulating flange should be installed on the end of the cargo transfer hose not connected to the ERC.

If the ships cannot be positively isolated, the electrical potential between them should be reduced as much as possible. This is best achieved if they both have working impressed current cathodic protection systems and they leave them running. Likewise, if one has an impressed system and the other a sacrificial system, the impressed system should remain in operation.

However, if one ship does not have cathodic protection or its impressed system has failed, consider switching off the impressed system on the other ship well before the two ships come together.

Some local regulations may require that cathodic protection systems are turned off.

Attention should be paid to the possibility of radio frequency induction when cranes are used, particularly when handling electrically continuous hoses. The supporting steel deck, crane structure, lifting wires, shackles and hose can form an open-ended induction loop and may lead to arcing between the hose end and the steel deck or other part of the ship's structure. Main MF/HF radio transmitters should be switched off and the antennae earthed during hose handling and cargo transfer operations.

3.4.13.1 Other places where electrical arcing may occur

All STS mooring lines should be insulated, either by using the natural properties of soft mooring lines or by attaching a soft rope tail to the eye of each steel wire mooring line. If using soft rope tails, they should be long enough to extend to the outboard side of the ship receiving the mooring.

Care should be taken to avoid low resistance STS electrical contact, such as from using non-insulated metal ladders or by contact with derrick or crane wire runners and hooks. Fender cages should be maintained to avoid any risk of metal-to-metal contact.

3.4.14 The use of radio and satellite communication equipment

When sited outside the gas dangerous areas, radio transmitting equipment is not required to be intrinsically safe.

The risk assessment should consider that, when alongside another ship, radio and satellite equipment may be within the gas dangerous areas of the other ship or may be exposed to hazardous vapours during operations or in an emergency. While the transmitting power may not be sufficient to create a source of ignition, ancillary equipment such as motors for azimuth control may present a hazard.

3.4.14.1 Automatic Identification Systems

Notwithstanding local, national or Flag State regulations or SMS requirements, it is recommended that the Automatic Identification System (AIS) equipment always remains in use, including during STS operations.

The Very High Frequency (VHF) equipment used for the AIS broadcasts need not be set to low power output during STS operations. However, during STS operations consideration should be given to including a phrase to indicate that the ship is anchored or restricted in its ability to manoeuvre.

AIS broadcasts should be considered as supplementary to the obligation to broadcast navigational warnings by other means, not as a replacement.

3.4.15 Radar use

Marine radar systems operate in the Radio Frequency (RF) and microwave range. Radiation from the scanner fans out in an almost horizontal, narrow beam as the scanner rotates. It will pick up cranes, loading arm gantries and other such structures, but will not normally spread down to the ship deck.

Radar sets, operating on 3cm and 10cm wavelengths, are designed with a peak power output of 30kW. If properly sited, they do not present a radio ignition hazard due to induced currents.

Radar radiation does not penetrate the human body, but at short ranges (up to 10m) can heat skin or eyes. By not looking directly into the scanner at close range, there is no significant health risk from marine radar emissions.

Radars of smaller ships (e.g., ships with relatively low-mounted radar antennas during STS operations) should be switched off before berthing and when moored alongside.

Ships' Masters should agree before the use of the ships' radar during STS operations is allowed.

Consideration is to be given to scanner motors of radars that are not certified for hazardous zones as such zones may be present on the larger of the two STS ships.

3.4.16 Readiness of firefighting equipment

Firefighting equipment (including water spray systems for cooling, fire prevention and crew protection) should be ready for use on all ships involved in STS operations. Additional portable fire extinguishers, suitable for the product(s) being transferred, should be placed close to the manifold area.

Dry powder monitors should be pointed towards the cargo manifold in use and left ready for remote operation.

Where cargo hose connections may be made in a location that is remote from the manifold, a primed fire hose should be laid out in the vicinity together with portable dry powder equipment.

The fixed firefighting system should be compatible with the majority of cargoes the ship is allowed to carry.

Figure 3.4.16 Dry Powder Monitors and Fire Water Monitors Near the Manifold

3.4.17 Electrical storms

When an electrical storm is present or forecast in the transfer area, it is often accompanied by gusts of wind or squalls. The cargo transfer operation should be suspended and all vent risers, cargo systems and IGS secured until such time as it is safe to resume operations. Depending on severity of the storm, consideration should be given to unmooring the ships.

3.4.18 Unauthorised craft

No unauthorised craft should be allowed alongside ships involved in STS operations.

3.5 Emergencies

3.5.1 Contingency planning and emergency response procedures

As part of the ship's SMS, the risk of accident and the potential consequences require that STS organisers and ship operators develop contingency plans for dealing with emergencies. The contingency plans should be developed as part of the ship's STS Plan, where appropriate.

For STS operations, a risk assessment should be carried out as described in section 4.2.3 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition. The risk assessment should be used to identify and document any emergency scenarios not covered by the ship's emergency response plans. Risk mitigation and contingency plans should be drawn up to cover all possible emergencies and provide for a comprehensive response. In addition,contingency plans should be relevant for the location of the operation and include the resources available, both at the STS operation location and nearby backup support(shore based). Where appropriate,the contingency plan should be integrated with plans prepared by the local authority. In some locations, the local authority may require approval of the plans.

It is recommended that a drill should be held, where practicable, within 24 hours of, and in any case not more than seven(7)days before, starting STS operations. Ships' crews should be made aware of emergency signals, procedures and actions (see section 1.5 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2025), second edition). For ships regularly engaged in STS cargo transfer operations drills should be held as per their SMS. Consideration should be given to Table 3.5.4.

The JPO should document credible emergency scenarios and detail the contingency plans for the scenarios. The contingency plan should include an emergency contact list that should be posted on board all ships involved in the STS operation. Emergency procedures should cover the full scope of the operation and include scenarios that include but are not limited to:

- Ship collision during mooring/unmooring manoeuvres;
- Cargo spill;
- Toxic or flammable vapour release;
- Fire/explosion;
- Multiple mooring line failure;
- Emergency unmooring;
- Dragging anchor;
- Emergency on own ship or other ship(s)involved in the STS operation.

In an emergency, both Masters should assess the situation, act accordingly and, if applicable, take guidance from the POAC/STS Superintendent. When considering emergency response options, reference should be made to the information provided in the SDS for the products being handled. Coastal States or other authorities may have specific contingency and notification requirements.

3.5.2 Additional considerations for Liquefied Natural Gas

3.5.2.1 Emergency Release System

An ERS, consistent with dry-break philosophies and designed in accordance with BS EN 1474-3, should be provided in accordance with the following guidance:

- Each transfer line should be fitted with an Emergency Release Coupling(ERC).
- The ERC should have two valves, one upstream and one downstream of the coupling.
- The ERS should be capable of operation and release of all transfer lines in the event of a loss of power and the non-availability of ship provided services.Wire based triggering devices should be set to the correct length to ensure ERS activation before transfer equipment damage occurs.
- In all cases the Emergency Shutdown(ESD)system and the ERS should be interlocked such that ERS activation is not possible without the ESD having already been initiated. Step by step activation procedures should be posted at the ERS operating location.
- A system should be in place to ensure activation of any ERS is not initiated before the ESD trip signal has been issued on both ships.
- In the event of the ships breaking away, and to avoid failure of the transfer system, the ERS should automatically operate and release the transfer lines before the maximum

operating limits of hoses/arms are reached. Equipment should also be in place to enable manual activation of the ERS. The following should be considered in the event of ships breaking away:

— The speed at which the ships would drift apart.

— Location specific metocean conditions - wind, current, sea and swell.

— Whether the STS operation is performed underway or at anchor.

- The system should be designed such that its operation will not result in unacceptable surge pressure in the ships' cargo pipelines. Refer to Guidance for the Alleviation of Excessive Surge Pressures on ESD for Liquefied Gas Transfer Systems for further information.
- To avoid sparking, full consideration should be given to the resultant effect upon the hose/arm ends if there is an emergency release.
- Systems should be designed and procedures developed to minimise the possibility of accidental or spurious operation of the ERS.

An example of the typical hose transfer system with an ERS is shown in Figure 3.5.2.1.

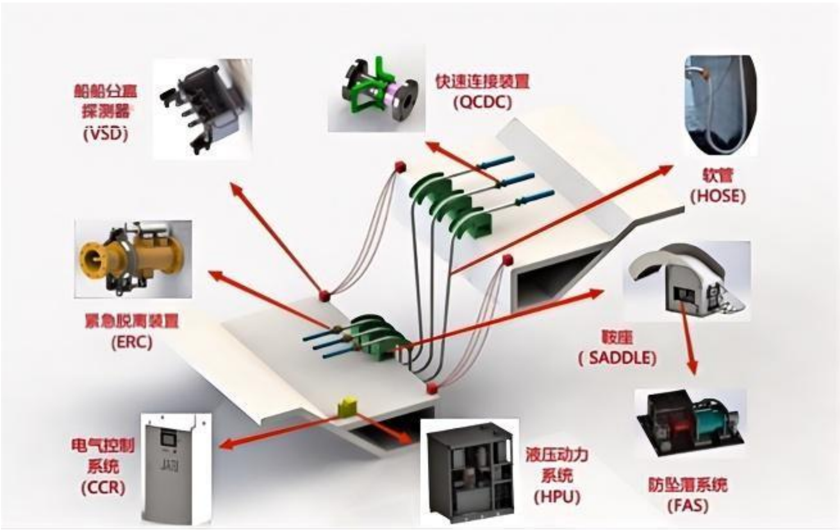


Figure 3.5.2.1 Typical Hose Transfer System With an ERS

3.5.2.2 Emergency Release System activation location

The operating station for a manual ERS release should be sited in a safe location away from the manifold area. Sequential operating instructions should be permanently attached to the equipment and all personnel involved in its operation should be trained in its correct use.

Additionally, procedures should be in place to identify the authorisation process to activate the ERS. Operating manuals should include operating instructions, testing and inspection schedules and any limitations of the ERS. Records of tests, inspections and use of the ERS should be maintained and be readily available.

Monitoring of the ERS equipment should be conducted throughout the STS cargo transfer.

3.5.2.3 Hose handling after Emergency Release Coupling release

If the length of the hose string is such that, after release of the ERC, it would impact either ship with such force that it could cause damage to the ship or impact the integrity of the hose, either ship manifold or the ERC, then a hose handling system should be provided.The system should be capable of handling and controlling the cargo transfer hoses in their charged cryogenic condition. Additionally, the hoses and hose handling system should be capable of absorbing all shock loads imposed by the simultaneous release of multiple transfer hoses. If an unrestrained release would cause the loading limits of the manifolds to be exceeded, a restraint system should be fitted to transfer the load to another part of the ship.

The system should ensure complete disconnection and, as far as practicable, ensure that the released hoses do not contact the metal structure of the ship. This would reduce the risk of sparking at the contact point, injury to personnel or mechanical damage.

3.5.2.4 Dead ship Emergency Release Coupling activation

To ensure that the mechanical integrity of the transfer system is not compromised during emergency scenarios, the ERS should be able to activate the ERC under a dead ship condition (i.e. no motive power is available from the ship systems). In addition, the ERS should be capable of releasing the transfer lines automatically before their safe working envelope is exceeded.

3.5.3 Emergency signal

The agreed signal to be used in the event of an emergency on either ship should be clearly understood by the personnel on both ships. An emergency on either ship should be indicated by sounding the ship's alarm signal and by sounding five or more short blasts on the ship's whistle to warn the other ship. The emergency signal should be communicated to all personnel on both ships and understanding confirmed. All personnel should then proceed as indicated by the contingency plan.

3.5.4 Emergency situations

In an emergency, both Masters, if applicable in consultation with the POAC/STS Superintendent, should assess the situation and respond accordingly. The following actions in Table 3.5.4 should be taken, or considered, in the event of any emergency arising. The basic actions, as listed in Table 3.5.4, should be included in individual STS contingency plan and be consistent with the ship's safety management system.

Action to be taken during emergencies **Table 3.5.4**

Action to be taken during emergencies	
1.	Implement procedures for raising the alarm, sound the emergency signal
2.	Cessation of STS operations during emergencies
3.	Implement notification procedures, inform the crew on both ships of the nature of the emergency
4.	Personnel take up positions at emergency stations
5.	Implement emergency procedures
6.	Emergency disconnection of cargo transfer equipment
7.	Send mooring gangs to stations
8.	Confirm the ships main engine is ready for immediate use
9.	Advise standby boat of the situation and any requirements
10.	Unmooring

If vessel separation is the preferred response in an emergency, the estimated time required for the operation is as follows:
ESD activation/cargo transfer shutdown: 60 seconds;
Hose disconnection: 60 seconds;
Emergency unberthing: 13 minutes;
Total estimated time for vessel separation: 15 minutes.
In addition, Masters of both vessels should decide, particularly in cases of fire, whether it is to their mutual advantage for the ships to remain alongside each other,or to unmoor.

3.5.5 Emergency duties

Emergency duties assigned to designated members of the crew are given in Table 3.5.5, which can be used as general guidance.

Example of emergency duties allocation **Table 3.5.5**

Title	Location	Duties
POAC/STS Superintendent	Bridge	Provide advice to Masters of both ships
Master	Bridge	In overall charge of ship's operations. Arranges notifications as appropriate
Chief Officer	Cargo Control Room(CCR)	Stops cargo operations.Organises hose disconnection
Cargo engineer (if manned)	On deck	Responsible for the operation of cargo pumps, compressors, inert gas systems etc., and assisting with hose disconnection
2nd Officer	Bridge	Prepares bridge for departure
2nd-3rd Officers	Manifold area	In charge of hose disconnection
Chief Engineer	Engine Control Room(ECR)	Prepares main engine for manoeuvres and auxiliary equipment required to respond to an emergency
2nd Engineer	ECR	Secures cargo plant
3rd-4th Engineer	ECR	Under Chief Engineer or 2nd Engineer's orders
Electrical Technical Officer	As required	Under Chief Engineer or 2nd Engineer's orders
Pumpman	As directed by Chief Officer	Under direction of Chief Officer. Provides support to respond to emergency
Bosun and deck ratings	Bridge/main deck as required	Under Officer of the Watch(Deck)and Chief Officer orders
Engine room ratings	Engine room	Under Officer of the Watch(Engine)orders

The allocated duties are to be assigned by the ship management team based upon the anticipated workload for the STS operations, having due regard to the provisions regarding prevention of fatigue in accordance with requirements of the relevant International Labour Organization(ILO) regulation 2.3 and Standard A2.3 of the Maritime Labour Convention, STCW and national regulations. A copy of the allocated duties table should accompany the STS operations plan posted in the bridge, CCR and ECR.

3.5.6 Emergency preparedness

The following arrangements in Table 3.5.6 should be made on both ships:

Emergency preparedness **Table 3.5.6**

Emergency preparedness	
1.	Main engines and steering gears on standby or agreed notice of readiness
2.	Cargo pumps and all relevant cargo equipment trips tested before the STS operation
3.	Sufficient crew available and systems prepared to drain and disconnect hoses at short notice
4.	Spill management equipment prepared, ready for use
5.	Mooring equipment ready for use and extra mooring lines ready at mooring stations as replacements in case of mooring line failure
6.	Firefighting equipment ready for use
7.	Establish procedures for evacuation and designate muster points in case of an onboard emergency

3.5.7 Emergency notifications

The STS operations plan should include details of the company specific contacts that require notification in the event of any shipping emergency, including notification requirements for:

- Notifiable parties referred to in the ship's current voyage orders;
- Port contacts as listed in the ship's SOPEP/SMPEP.

Responsible National Authorities as listed in Annex 2 of the SOPEP in accordance with the latest MSC-MEPC Circular.

3.5.8 Cessation of Ship to Ship operations

All operations should cease should an unsafe condition develop. Such conditions include, but are not limited to:

- Failure of cargo hoses, moorings or fender pennants;
- Deterioration of weather and/or sea conditions, including incidence of lightning;
- Concentration of gas;
- Dangerous concentrations of flammable gas on deck;
- Obvious cargo leakage;
- Cargo tank failure (failure of safety protection, valve operation and other functions);
- Large discrepancy in cargo transfer quantities observed between both ships;
- Loss of power of either ship (power outage);
- Close-quarters situation with another vessel or navigational hazard;
- Substantial alteration of course required(when carrying out STS cargo transfer operations underway);
- Any emergency on other ships involved in the operation;
- Security threats;

- Fatigue;
- Loss of communication between ships.

3.6 Security

The International Ship and Port Facility Security(ISPS) Code requires all Coastal States and ships to have security plans in place. Best practice recommends that ships have a Vessel Hardening Plan (VHP) that covers the different scenarios they may face when in high security risk areas. While ensuring a balance between safety and security, this should also include protection during STS operations.

The basis of any security risk assessment is analysis of the threat, including capability, intent and opportunity. The risk is a function of the threat, coupled with the vulnerability of the ship and the consequences of the incident. More information on security assessment is given in Appendix G.

Information on threats in each region can be accessed through regional military organisations, open-source reporting and commercial intelligence providers. Best practice guidance for vessels and operators can be accessed for free in BMP Maritime Security.

4 EQUIPMENT

4.1 Fenders

Fenders are key components in all STS operations, providing first line protection from hull damage between two ships. This is achieved in two ways; first, by absorbing the energy arising from the dynamic motion between the two ships throughout the entire STS operation and then by providing an adequate “stand-off” distance by virtue of the fender's diameter.

4.1.1 Fenders used for at sea Ship to Ship operations

There are two types of fender in an STS operation: primary and secondary. Each type is constructed and sized according to its function and the size of the ships involved.

Primary fenders float and are secured by towlines to the ship’s side. They are usually positioned one at each end of the parallel mid-body with additional fenders placed between them, ideally just forward and aft of the cargo manifold area.

Secondary fenders are smaller in size and lighter in weight and are usually heaved up or hung off at a pre-determined height from the waterline to protect the bow and stern plating from hull contact. They are usually fitted to the Manoeuvring Ship (MS) as a last line of defence should it get out of alignment during mooring or unmooring. The points where contact is likely to occur is on the ship’s side where the parallel body ends and the curve towards the bow and stern begins. The position of the secondary fender is relevant to the position of the closest primary fender, since the ship may pivot about that primary fender. The secondary fender should protect the area where hull contact may occur. The height above the waterline of the secondary fender will be determined by the ship with the lowest freeboard.

Before the final approach, the height of the secondary fenders should be checked from the deck of the other ship by the assistant to the POAC/STS Superintendent or by an officer at the mooring stations.

On smaller ships, or where there is limited availability of bitts and/or fairleads, primary fender towlines and secondary fender securing pennants might overlap, posing a risk of chafing or entanglement(see figure 4.1.1(1)). Mitigation measures should be implemented and personnel made aware of the risk of the secondary fender jumping or “boarding” onto the main deck if the primary fender towlines come under sudden tension.

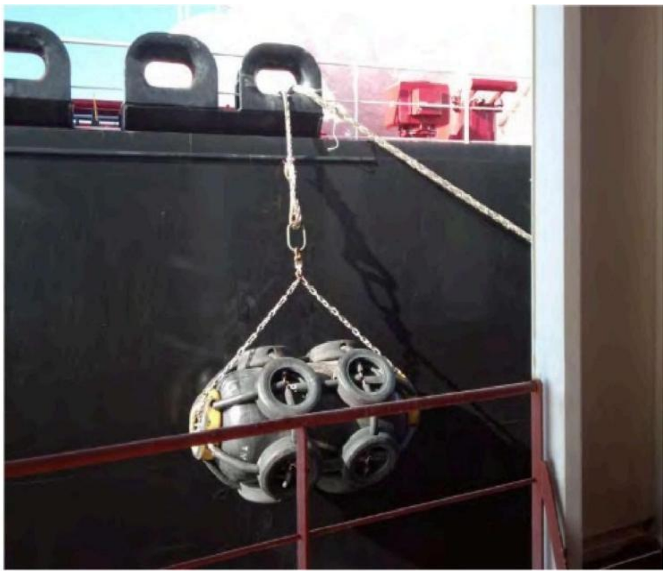


Figure 4.1.1(1) Secondary fender rigged through same fairlead used for primary fender towlines

Where ships are not equipped with suitable fairleads or securing points for the secondary fenders close to the parallel mid-body ends, a portable chock/fairlead may be fitted in the required position. Portable chocks/fairleads should be secured to the fish plate to prevent potential incidents, see figure 4.1.1(2). Some portable chocks/fairleads may be Class approved or certified load tested, but installation methods are not regulated. When conducting risk assessment, consideration should be given to the probability that the Minimum Breaking Load(MBL) of the mooring lines may be higher than the installation strength of the chock. The areas around fender mooring arrangements should be identified as "snap back" zones.

It will most likely be necessary to adjust the height and longitudinal position of the secondary fenders before unmooring as the potential points of contact will have changed due to changes in the freeboards of the two ships.

Figure 4.1.1(2) Portable chock used to deploy secondary fender pennant

Pneumatic fenders manufactured, tested and maintained in accordance with ISO 17357-2:2014 Part 1 or other relevant ISO Standards, are most widely used as primary fenders. It is recommended that the fairleads selected for the fender towlines should be used only for that role and not for mooring. This is to avoid placing personnel close to lines under tension and to avoid multiple line chafing issues. Ideally, the vertical angle from fairlead to the primary fenders should be minimal to prevent shock loads on the fender tow assembly.

ISO 17357-2:2014 Part 1 specifies the material, performance and dimensions of high pressure floating pneumatic fenders used for the berth and mooring of a ship to another ship or berthing structure. It also specifies the test and inspection procedures for floating pneumatic fenders.

There are two initial pressure ratings for high pressure floating pneumatic fenders: 50kPa and 80kPa. However, there is a large range of fender sizes. While construction methods vary, fenders should provide a Guaranteed Energy Absorption (GEA) and minimum reaction force for a specific size and pressure rating.

Standard fender sizes and their respective GEA and reaction force values **Table 4.1.1**

Fender Size (Diameter × Length) (mm×mm)	Guaranteed Energy Absorption (GEA) (kNm) Initial Pressure 50kPa	Guaranteed Energy Absorption (GEA) (kNm) Initial Pressure 80kPa
500×1000	6	8
600×1000	8	11
700×1500	17	24
1000×1500	32	45
1000×2000	45	63
1200×2000	63	88
1350×2500	102	142
1500×3000	153	214
1700×3000	191	267
2000×3500	308	430
2500×4000	663	925
2500×5500	943	1317
3300×4500	1175	1640
3300×6500	1814	2532
3300×10600	3067	4281

Fender Size (Diameter × Length) (mm×mm)	Guaranteed Energy Absorption (GEA) (kNm) Initial Pressure 50kPa	Guaranteed Energy Absorption (GEA) (kNm) Initial Pressure 80kPa
4500×9000	4752	6633
2500×12000	6473	9037

Foam filled primary fenders provide comparable performance to pneumatic fenders and are preferred in certain cases due to their suitability for low temperatures and lower maintenance requirements, although manufacturers commonly specify a shorter lifespan than for a pressurised equivalent.

Secondary fenders may be either pneumatic type or foam filled. If foam filled fenders are used, there are no comparable standards addressing their manufacture and testing. However, the materials, verification and inspection for foam filled fenders should be in accordance with manufacturers' recommendations.

Except in cases where the STS operation is carried out using a dedicated lightering ship, it is usually practice that fendering operations will be carried out with the assistance of an STS service provider. Such companies usually have LSVs available and these assist in positioning fenders on the relevant ship.

In addition to the main/primary towing wire, all fender lowing assemblies should have a backup towing pennant.The assembly may incorporate materials such as synthetic lines, wires and/or chains, see Figure 4.1.1(3). In all cases care should be given to prevent chafing and to ensure the safety of the personnel handling the assemblies.

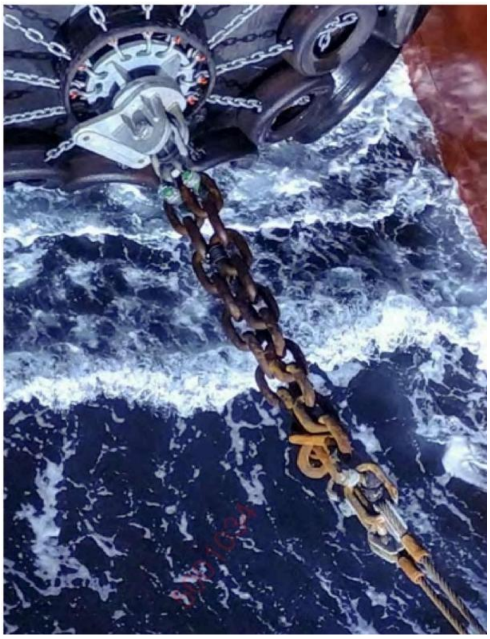


Figure 4.1.1(3) Primary fender towing assembly (consisting of main towing chain/wire and backup system)

Primary fenders provide the best protection if secured to the MS, however it may become apparent during the risk assessment that factors (such as environmental conditions exposing the towed fender assembly during the approach or multiple STS operations) make it advisable to make fenders fasten to the Constant Heading Ship (CHS).

Whichever ship the fenders are rigged on, limits should be imposed on the ship's speed to prevent over-stressing of the fender system.

In ship compatibility analysis, particular attention should be paid to ships with a relatively short length of parallel mid-body. In such cases, the proper placement of the fender string is critical to ensure adequate hull protection. As the parallel mid-body of larger LNG ships tends to be much shorter than that of a conventional oil tanker of similar LOA, the correct placement of the fender string is critical to ensure adequate hull protection for both ships. This may require adjusting the length of the fender connection wires to a specific dimension for the particular operation.

The fender pennants may be secured to a winch (if applicable) or a mooring bitt. If the fender pennant is shackled onto a winch, the winch brake should be correctly set to prevent the fender string from moving out of position. When fender pennants are secured on a split drum mooring winch, the proper number of turns should be taken on the tension drum to ensure the brake is effective.

Bitts recessed in the shell plating should not be used for securing fenders due to access and SWL restrictions. Fenders should be kept clear of any recessed bitts (to prevent snagging) and from pilot doors, where fitted, on either ship's hull.

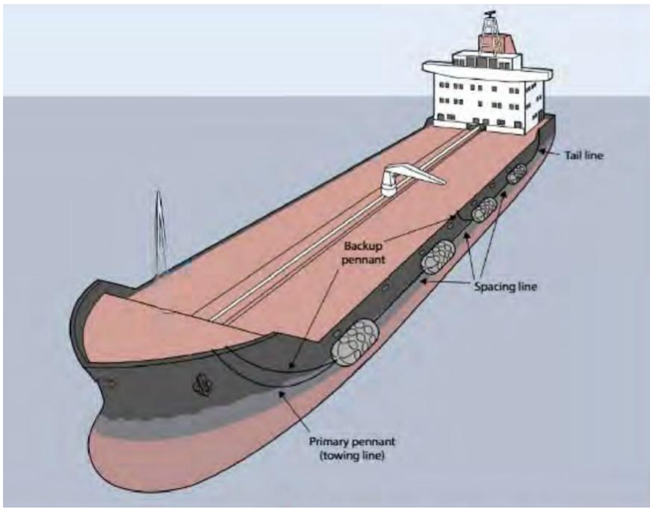


Figure 4.1.1(4) Typical arrangement of fender strings

The POAC/STS Superintendent should have clearly advised the position and method of securing the fenders to she ships in advance of the operation. Fender pennants should be led through fairleads to prevent chafing. Care should be taken to ensure that there are no obstructions, such as fish plates, which could result in chafing the pennants. The condition of the pennants should be monitored regularly during the STS operation.

When fenders are fitted to the MS, primary fenders should be positioned one at each end of the parallel mid-body, with additional similar sized fenders fitted in between (see figure 4.1.1(4)). The fender string may be made up to a prearranged length. In operations where four fenders are used,it has been found beneficial to position them in two groups of two (see figure 4.1.1(5)). With each group positioned well forward or well aft on the parallel mid-body, better protection is provided. Fender pennants should be monitored frequently and tended as necessary to ensure that they do not become too slack or too taut and that the fenders remain in position.

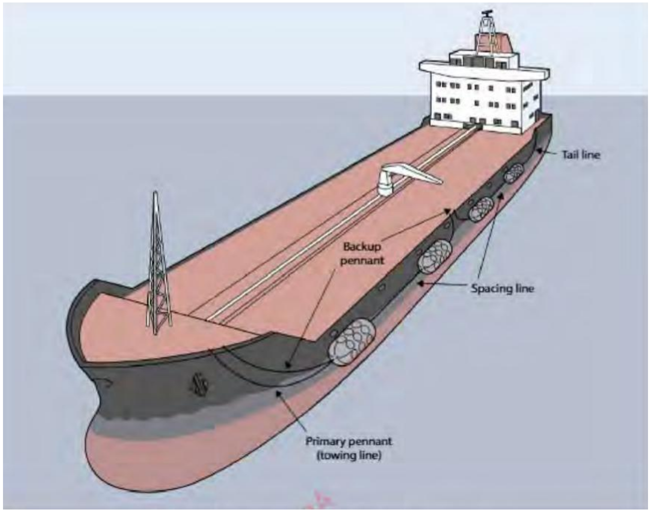


Figure 4.1.1(5) Typical arrangement of fenders rigged in pairs

The length of fender string should be such that fenders will be able to distribute the maximum anticipated impact load within the parallel mid-body of both ships.

4.1.2 Fender size selection procedure for Ship to Ship operations at sea

Selecting the correct size and number of primary fenders for STS operation is dependent on many factors including:

- Size of the ships involved.
- Exposure of the STS location to environmental conditions, including swell and wave height.
- Whether the operation area is in port or at sea.
- Whether the operation is underway or at anchor.
- Experience of the POAC/STS Superintendent involved.
- Requirements of local Administration and/or customer expectations.
- Ship crane capacity should the ship deploy and need to recover the fenders.
- STS operation underway or at anchor.
- Ships' freeboard.
- Minimum stand-off distance to prevent contact of the two ships during rolling, pitching, yawing and excursion during the transfer.
- Length of crane boom used for hose connection and personnel transfer.

- Method of fender rigging.
- Quantity of consecutive STS operations scheduled.
- Accessibility of fenders at the designated STS location.

There are numerous tools and tables developed by different industry bodies and fender manufacturers to assist with the calculation of the anticipated energy involved in bringing two ships together.

Refer to appendix C for further guidance on calculating the correctly sized fender.

4.1.3 Number of primary fenders

The number of primary fenders should be determined by an analysis of the start and end parallel mid-body lengths of both ships. It is recommended that fender manufacturers, fender rental companies or STS service providers experienced with STS operations are consulted before confirming the selected fender size and required number of fenders.

4.1.4 Precautions when using fenders

To reduce abrasion damage to the outer rubber of the fender and to prevent steel-to-steel contact between the fender and the ship's hull, fenders may be fitted with hard wearing tyres (such as aircraft tyres) and fender components may be fitted with rubber sleeves.

Consideration should be given to fixing retro-reflective tape on the fenders to improve their visibility during hours of darkness.

Fenders should be regularly inspected for damage or deterioration, as recommended by the manufacturer. Pneumatic fender pressure should be regularly checked and safety relief valves should be maintained in accordance with manufacturer's recommendations. According to the IMO Manual on Oil Pollution, "Industry best practice is that the safety valve on pneumatic fenders is inspected at intervals not exceeding two years and a certificate provided to demonstrate this." A record of test results should be available, including the date of manufacture.

The longevity of fenders will be determined by factors including frequency of use, method of storage and standards of maintenance. Fenders should not be used beyond the manufacturer's recommended service life. If the fenders are provided by a STS service provider, the Master, shipping company or STS organizer should ascertain the age of the fenders to be used. It is recommended that all fender providers maintain detailed and accurate records regarding the history of the fenders. These records should include testing, date of manufacture, commissioning date, maintenance and casualty information.

When selecting fenders for specific operations, reference should be made to the individual fender manufacturers' specifications and these should be addressed in terms of combined berthing displacement, Relative Approach Velocity and sea and swell conditions. It is the responsibility of the STS organizers to determine the fender requirements and to agree these with all other parties involved.

In the case of reverse lightering where the MS is laden and potentially at maximum displacement, fender selection is crucial.The additional displacement and slower response to engine and rudder orders may result in higher berthing forces. Consideration should be taken to utilizing fenders with higher energy absorption for the berthing phase than those calculated as detailed in appendix C.

4.1.5 Fenders used for in port transfers

It is important that ships engaged in STS operations in sheltered waters or in port use sufficient fenders, considering approach velocity and energy absorption requirements for the prevailing conditions. In all cases a risk analysis should be completed and the fender manufacturer's fender selection criteria should be followed.

In certain shipping routes in many regions of the world, fenders are provided in accordance with local customs and practice. It is recommended that Masters reject any ship should they believe that the fendering arrangements are inadequate or post a risk of metal-to-metal contact.

Figure 4.1.5 Foam fenders in use for an in port transfer

Masters should understand the number and size of fenders required. For smaller ships and barges, many different forms of fenders are used.

Primary fenders should be in place and secured before manoeuvring. Secondary fenders to protect the bow, stern and accommodation should be available for the crew to prevent contact of the ships.

4.1.6 Low pressure fenders

Low Pressure (LP) fenders are not routinely used for STS operations at sea. However, owing to their ease of transportation, they can offer an alternative for specific STS operations, such as in the event of an emergency.

ISO 17357-2:2014, Part 2 specifies the construction, testing, and maintenance requirements for low pressure fenders. Fender size should be selected in accordance with the manufacturer's recommendations for the intended use. Factors for consideration include ship size, weather conditions and sea state.

4.1.7 Foam filled fenders

Foam filled fenders are not commonly used as primary fenders in exposed waters, but they may be suitable for use as primary fenders in port or within sheltered waters.

4.2 Hoses

Hoses used in STS operations should be specifically designed and constructed for the product being carried and the purpose for which they are being used. Upon supply, they should be checked for suitability for the intended use.
Reference should be made to Guidelines for the Handling, Storage, Use, Maintenance and Testing of STS Hoses and ISGOTT.

4.2.1 Hose standards

Hoses used in STS operations should be designed and constructed for the product being handled and the purpose for which they are being used. They should be checked as being suitable for the intended use .
This Guide does not prevent operators from evaluating and using newly developed designs, materials, techniques or technologies provided a design review, risk assessment and Management of Change (MoC) has been completed.
There is no international standard that specifically addresses hoses used in STS operations. Existing dock hose standards[①] and offshore hose guidelines have been used when assessing the suitability of hoses for such service.
Hoses are used for some STS operations that do not conform to an international standard. Although they have provided incident free service over many years and aspects such as their ease of handling and kink tolerance have proven operationally advantageous, no technical justification exists to support their use.These hoses should be subject to independent evaluation supported with an appropriate hazard review to ensure they are safe for the specific operation until an appropriate international standard is established.

① These standards include ISO 10380 (Pipework — Corrugated metal hoses and hose assemblies), ISO 2928 (Rubber hoses and hose assemblies for liquefied petroleum gas (LPG) in the liquid or gaseous phase and natural gas up to 2,5 MPa (25 bar) — Specification) and EN 13766 (Thermoplastic multi-layer (non-vulcanized) hoses and hose assemblies for the transfer of liquid petroleum gas and liquefied natural gas. Specification) for LPG; BS EN 1474- 3 (Design and testing of marine transfer systems) for LNG; and BS EN ISO 8031 (Rubber and plastics hoses and hose assemblies — Determination of electrical resistance and conductivity) for rubber and plastic hoses and hose assemblies.

The recommended electrical property of the hoses used is detailed in the Guidelines for the Handling, Storage, Use, Maintenance and Testing of STS Hoses.

A visual inspection of each of the hose assemblies should be carried out, before they are connected to the manifolds, to determine if any damage has been caused through handling. If damage to a hose or flange considered to be critical to the STS operation is found, the hose should be withdrawn from service.

Additional guidance for Liquefied Petroleum Gas (LPG) cargoes

Hoses used in LPG STS cargo transfer operations should be designed and constructed for the product being handled and the purpose for which they are being used.

Where cargo hoses are used, they may be supplied by an STS service provider or by one of the ships involved in the cargo transfer. In either event, continuous control and monitoring of cargo hoses is essential.

Hoses used should comply with IGC Code requirements and, in addition, comply with the latest standard, listed below:

- Composite hoses-BS EN 13766:2018+A1:2020.
- Metallic hoses-ISO 10380:2012.
- Rubber hoses-ISO 2928:2021 and BS EN 1762:2018.

The characteristics,testing,inspection and storage requirements of the hoses should be known and will include hose standards and inspection and testing requirements:

- Design characteristics and the use of hoses with leak before failure capability.
- In-service testing procedures developed in line with manufacturer's recommendations, but in any event at intervals not exceeding 12 months, or as necessary to prove the integrity of the hose before use.

Records of testing and inspection should be maintained and provided as part of information exchange.

For composite hoses, a record should be kept detailing:

- Cargo transferred.
- Pressure during transfer.
- Temperature during transfer.

Hoses should be stored in accordance with manufacturer's recommendations and in a manner to minimise the possibility of mechanical damage or the entrapment of moisture.

Certification for testing as per manufacturer's instructions should be available.

Flow velocities

In establishing the maximum flow rate during STS cargo transfer operations, consideration should be given to:

- Limitations set by the hose manufacturer.
- Limitations of both carriers' cargo systems.

Refer to ISGOTT of ICS/OCIMF/IAPH for recommendations on maximum flow velocities for different hose types.

Additional guidance for Liquefied Natural Gas (LNG) cargoes

Cargo hoses may be supplied by the STS service provider, or by one of the ships involved in the cargo transfer. In either event, continuous control and monitoring of cargo hoses is essential.

LNG STS transfer hoses should be designed and tested in accordance with the latest version of BS EN 1474-3.The following should be considered:

- The characteristics,testing,inspection and storage requirements of the hoses should be known and include design characteristics and the use of hoses with leak before failure capability.
- The need for additional physical support to be provided for LNG hoses.
- In-service testing procedures developed in line with manufacturer's recommendations,but in any event at intervals not exceeding 12 months or as necessary to prove the integrity of the hose before use.Records of testing and inspection should be maintained.
- Storage of hoses as per manufacturer's recommendations and in a manner to minimise the possibility of mechanical damage or the entrapment of moisture.
- A certificate from the certifying authority should be available for each hose.

4.2.2 Hose types

Hoses used may be manufactured from rubber, composite material or cryogenic material, designed for specific use in STS operations.
Rubber hoses are the most common for use in the crude oil and heavy fuel transfers where transfer rates may exceed maximum flow rates for composite hoses.
Composite hoses are generally found in chemical and clean product STS operations. These hoses require more care in handling and can be more easily damaged than rubber hoses.
Cryogenic hoses are used in LPG and LNG STS operations.

4.2.3 Hose length

Hose lengths should be determined on a case-by-case basis, considering any special characteristics of the ships or features of the STS operation. The following aspects need to be considered when determining the hose length to be used:

- Minimum allowable bending radius of the hose;
- Horizontal distance between the ships;
- Manifold offset(difference in fore and aft alignment of the two ships);
- Horizontal distance between the manifold and the ship's side;
- Vertical and horizontal ship movement;
- Any other special characteristics related to the ships;
- Relative change in manifold heights between the ships during the STS cargo transfer;
- Minimisation of number of hoses used in the hose string;
- Manifold height above waterline to be considered in event of ERC activation;
- Obstructions caused by fenders;
- Ability to drain the hoses with the available ship's equipment (crane length vs hose length);
- Hose handling requirements and any limitations of the ship's equipment.

4.2.4 Pressure ratings and flow velocities

Hoses should have pressure ratings appropriate for their intended service.

The maximum permissible flow velocity through a hose is limited by its construction. The hose manufacturer's recommendation and certification should provide recommended flow rates / velocities and these should not be exceeded..

4.2.5 Hose handling

Care should be taken when handling and supporting hose strings to avoid kinking or over-stressing that may cause damage or reduce service life.

The hose length for each STS operation should be considered individually. It is recommended that the total length of the hose string be twice the height difference between the manifolds of the two ships to accommodate variations during the operation.

To prevent damage when handling or supporting hoses, the hose Minimum Bending Radius (MBR) should not be exceeded. For guidance, a simple formula for calculating the MBR of a rubber hose is:

MBR= nominal bore of hose × 6

Hoses more than 300 mm in diameter are more difficult to handle and care will be needed to avoid damage from kinking unless the hose assembly is specifically designed to overcome this problem.

The maximum hose size may be governed by the capabilities of the onboard lifting equipment and manifold construction.

When using hose strings comprising of more than one length of hose,the tightness of connecting flange bolts should be checked before each transfer operation, as applicable. Where the hose strings are assembled on board the ships, a pressure test should be conducted to ensure all flanges are leak free.

The cargo transfer equipment should be supported by suitable means to prevent excessive loads on manifold fittings, in accordance with manifold guidelines published by OCIMF and SIGTTO.

Suitable hose supports should be employed to ensure the hose bending radius is maintained within manufacturer's guidelines and to assist in supporting the hose throughout the transfer operation. These supports may form an essential part of the load restraint system, preventing excessive axial and torsional loads on the cargo hose end fittings. In STS operations where composite hoses are utilized, hose saddles will provide proper support. Their design load and security should be considered along with their ability to prevent chafing of the hoses and their ability to avoid damage to handrails and other fittings in the event of a separation of an ERC, where fitted. A flat landing surface free of obstructions (e.g.pad eyes) should be provided for the saddles to be placed at the manifold platform. The use of wooden pallets or other make shift arrangements for placing the saddle are not recommended. Their design should ensure electrical isolation is maintained between the hose and the ship's structure.

4.2.6 Hose connection

Flanges should be in good condition and connections should be liquid or gas tight. The gaskets used at the ship's manifolds and between each hose should be made from a material suitable for use with the cargo to be transferred.

Both ships are expected to provide the necessary personnel lo connect the hoses. As this is an operation not frequently carried out by ships' crews, it should be properly supervised and the integrity of the connection confirmed.

Guidance on the connection of hoses for STS operations may be carried out with reference to the relevant requirements in Appendix D.

Before starting transfer of certain products, the integrity of hose assemblies and manifold connections should be verified by a pressure/leak test.Local authorities may also require pressure testing.

Quick Connect/Disconnect Couplings such as cam-lock couplings may be used to connect transfer hoses to the ship's manifold.The coupling provides a quick and effective method of making the connection.The two flanges are brought together and are positioned within the cam blocks around the coupling.The cams are then rotated to secure the coupling. An internal 'O' ring provides a seal within the coupling.The lime taken to set and lock as well as unlock each cam is relatively short with proper training.

Manufacturer’s guidance on operating and maintenance procedures should be followed.

4.2.7 Hose inspection and testing

Hoses should be visually inspected before, during and after the STS operation, for visible damage or deformation. Where practicable, hoses should be internally inspected immediately after use, as damage such as dislodged inner liner and helix may not be visible during STS operations.

If hoses are supplied by an STS service provider, confirmation that they are fit for the intended service and valid test certificates should be provided.

Hoses should be subject to regular inspection for damage or deterioration. A record of inspection and testing should be available. Testing of hoses should be in accordance with the requirements of the standard to which the hose was manufactured, local regulatory requirements and manufacturer's recommendations. Periodic tests, undertaken at intervals not exceeding 12 months, include hydrostatic pressure and vacuum tests, measurement of temporary and permanent elongation and electrical continuity tests.

In consultation with the hose manufacturer, the retirement criteria for the hoses should be defined to determine when they should be removed from service.

4.2.8 Hose marking

Each transfer hose should be permanently marked with the information required by the appropriate international standard and other applicable regulations (such as the IBC Code), including but not limited to:

- The manufacturer’s name or trademark;
- Identification of the standard specification for manufacture;
- Maximum allowable working pressure;
- Maximum and minimum service temperatures;
- Month and year of manufacture and manufacturer’s serial number;
- Indication that the hose is electrically continuous,electrically discontinuous or semi-continuous;
- The type of service for which it is intended;
- Hose test dates, including the last and/or next test date.

4.3 Reducers

It should be confirmed that reducers and gaskets, with dimensions compatible with the ship's actual piping manifolds and cargo hoses, are available on board.

4.4 Mooring equipment

It is important that ships involved in STS operations are equipped with good quality mooring lines, efficient winches, well placed and sufficiently strong closed fairleads, bollards and associate mooring equipment. Ship operators considering designs for modern ships that will likely conduct STS operations should consult the latest edition OCIMF Mooring Equipment Guidelines(MEG).

The correct functioning of winch brakes should be ensured through testing as per the ship's planned maintenance system.It is recommended that fairleads and bollards are sized, marked arid certified in accordance with the guidance provided in MEG.

Only fairleads of the enclosed type should be used to ensure effective control of mooring lines as the freeboards of the ships change. Fairleads should be large enough to allow themooring line (plus any rope tail and shackle) to pass through comfortably.Open fairleads,even those fitted with stopper bars, are not recommended for STS operations.

A ship's standard complement of mooring lines is generally suitable for STS operations, but ships equipped with steel wire or high modulus synthetic fibre mooring lines should fit soft rope tails to provide elasticity.

Rope tails are recommended to have a TDBF of between 125 and 130% of the ship design MBL. Different tail lengths may be used while considering ship excursions and avoiding chafe points at fairleads.The connection between a wire rope and the rope tail should be made with an approved fitting, e.g. Mandal,Tonsberg or Boss shackle.With high modulus synthetic fibre ropes, the tail may be attached using correctly sized shackles or joining the two components using a cow hitch. Manufacturers' recommendations should be checked to ensure requirements for minimum radius bends are observed.

Ships frequently involved in lightering may be equipped with special mooring line arrangements where the synthetic fibre tail is of a custom length and may be fitted with wire pennants where the synthetic part is outside the fairleads to reduce chafing.It is recommended that wire pennants are not passed through fairleads that are normally used for synthetic (e.g. high modulus) ropes as they will cause grooving of the fairlead/chock, which will subsequently damage the synthetic rope.Where this is not possible, additional protection may be required to prevent grooving or abrasion damage to the surface of the fairlead.

Heaving lines and strong rope messengers should be available at the mooring stations on both ships.

For at sea and large ship STS operations, follow the recommendations made in this chapter.

In most STS operations the larger ship is the Constant Heading Ship (CHS). This ship maintains a constant heading and speed or remains at anchor while the smaller Manoeuvring Ship (MS) approaches with its port side to the starboard side of the CHS. It is common for ships to be fitted with STS fairleads and bitts on one side only, but this does not take into consideration those operations where approach is made on the opposite side.

It is recommended that fairleads and bitts are arranged symmetrically so that ships are not restricted to mooring operations on one side only (MEG). The recommended minimum number of closed fairleads on the larger ship for STS operations is three aft and four forward. Typically, a mooring pattern for exposed locations would consist of at least six headlines, two forward and two back springs and four stern lines.Where specialised mooring equipment is fitted (e.g. on dedicated

STS ships) the number of headlines could be reduced to four where this has proven to be reliable for the local operating environment.

The aft closed fairleads should be located as far aft as is practical and the forward closed fairleads should be located as close as is practical to the centreline and clear of any protruding anchor housings. In determining the location of closed fairleads, consideration should be given to achieving a mooring arrangement that allows mooring lines of the same function (headlines, stern lines, breast lines or springs) to run as parallel as possible to each other to share the mooring load most effectively. It is desirable that each designated STS suitable closed fairlead on the larger ship be accompanied by bitts capable of taking at least two mooring lines and rated to at least the same SWL as the fairlead. To avoid exceeding the SWL of the bitts,it is important to understand that mooring forces will double when two lines are placed on the same set of bitts, i.e. if two mooring lines rated to 100T LDBF are placed on a set of bitts, the resulting load on the bitts may reach 200T. Each set of bitts should be sited or arranged for safe use of messengers and winches.

Additional guidance for optimum mooring considerations may be found in Chapter 9 of the Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2nd Edition (2025), as well as Mooring Load Analysis during Ship to Ship Transfer Operations.

In addition, it is recommended that provision is made for securing fender lines, taking relative proximity to mooring lines into consideration.

4.4.1 Mooring equipment for liquefied gas carriers of less than 16,000 deadweight tonnes

For liquefied gas carriers of less than 16,000 deadweight tonnes that are planned to engage in STS transfer operations, the mooring equipment should, as far as practicable, comply with all the aforementioned requirements. In cases where deck space is restricted or a layout according to the above requirements is not feasible, it is recommended, based on industry best practice, to at least meet the following minimum configuration:

Number of mooring lines:

4 headlines, 2 forward spring lines, 2 aft spring lines, and 4 stern lines, subtotalling 12 lines. Additionally, 2 spare mooring lines should be provided, resulting in a total of 14 lines.

To meet the requirement of 6 headlines for offshore STS transfer operations, 2 headlines can be supplied by the other ship. Therefore, 2 additional closed fairleads and bitts must be fitted forward.

Polypropylene mooring lines are not recommended for use.

Fairleads:

The total number of fairleads on a single side should not be less than 18 (14 for STS mooring line fairleads and 4 for fender securing line fairleads).

All fairleads on the ship should, as far as practicable, be of the closed type. In any case, no fewer than 4 closed fairleads should be provided forward and 3 aft.

Bitts:
18 units.

Winches:
Double drum winches should be provided as far as practicable. The use of single drum winches is also permitted if it has been verified that their installation is not feasible due to restricted deck space.

4.5 Deck lighting

During STS operations at night, normal in port deck lighting should be adequate. It should be ensured that manifold areas, work areas and personnel access points are adequately lit. The lighting should not interfere with the keeping of an effective lookout or impair the recognition of the ships' navigation lights and signals. It should also be understood that deck lighting may need lo be extinguished (and STS operations shut down) if a close-quarters situation develops.
Portable spotlights, which should be suitable for use in hazardous areas and bridge wing searchlights, are useful for night mooring and unmooring operations.

4.6 Ancillary equipment

All equipment relating to the handling, securing and/or support of cargo transfer hoses, primary and secondary fenders and STS support craft should be inspected before starting the STS operation. Established retirement criteria should be considered.
Eyesplices are susceptible to wear during STS operations. Therefore, the wear resistance of the material used for the configured eyesplices should be considered, and the provision of spare eyesplices should be taken into account.

4.7 Equipment noise levels

Excess noise levels in the vicinity of equipment can influence the safety of operational communications and affect off duty personnel during rest periods, contributing to fatigue. It is recommended that noise levels are assessed and that appropriate measures are taken to minimise disruption. This may include the need to designate alternative sleeping arrangements for any affected crew members.

5 COMMUNICATIONS

All communications between all ships involved in STS operations should be closed loop communications (i.e., call and response). Methods of communication, including backup systems and emergency communication procedures, should be agreed and tested before STS operations begin. The means of communication should be detailed in the JPO and on Checklist 1 of Appendix A.

The ships should establish initial communication as early as is practical, to plan operations and to confirm the transfer area.

5.1 Language

A common language for communication should be agreed before operations commence to ensure that all ships can communicate to maintain a safe standard of operation throughout. The agreed language should be recorded on checklist 1. Reference should be made to the IMO Standard Marine Communication Phrases.

Should a language problem become evident, operations should be suspended until a competent person, fluent in the common language and the language of the ship on which the problem exists, is in attendance.

5.2 Pre-arrival communications

The STS organizer should provide the pre-arrival information to the nominated ships. The STS organiser may be the operator of the ships if in-house operations are being conducted, or an external STS provider may be the designated organiser. Best practice is for organisers to send STS instructions to the ships in advance of the planned operation. All relevant parties concerned planning to be involved in the STS transfer operation should exchange the information specified in Table 5.2(1).

Exchange of information between parties involved in the STS transfer operation

Table 5.2(1)

Exchange of information between parties involved in the STS transfer operation	
1.	Ship's name and call sign.
2.	Estimated time of arrival, updated at intervals specified in the pre-transfer commercial agreement.
3.	Location/position of the transfer operation and water depth.
4.	Name and contact details of the POAC/STS Superintendent and confirmation that they are qualified in accordance with the guidance contained in section 1.1 of the Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2nd Edition, 2025.
5.	Confirmation of the integrity of all systems, e.g., navigational, machinery, steering gear, cargo systems, inert gas system, fire-fighting, mooring equipment and cranes.
6.	Confirmation that the latest edition of the Ship to Ship Transfer Guide and other relevant industry guidelines are on board (refer to 4.1 of the Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2nd Edition, 2025), and that ship's personnel understand the procedures within them.
7.	Cargo details, including a copy of the Safety Data Sheet (refer to 4.5 of the Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2nd Edition, 2025).
8.	Confirmation of arrival/departure draughts, freeboard and height of manifold above the waterline, including anticipated changes during the transfer.
9.	Confirmation of the ship complies with applicable local, national, and international requirements, including those relating to hours of work/rest.
10.	Details of the planned STS operation and the intended sequence for ships alongside the discharging ship.
11.	Details of equipment required, including fendering, lifting equipment, hoses, and connections.
12.	Applicable local regulations.

The STS organizer should request an electronic copy of the ship's approved STS operations plan, if available. The information that the STS organizer should provide for the ships involved in the STS operation is listed in Table 5.2(2).

Information to be provided by the Ship to Ship organisers

Table 5.2(2)

Information to be provided by the Ship to Ship organisers	
1.	Full title and contact number of the STS organizer.
2.	Description of the planned STS operation, including the location of the transfer area and the metocean conditions.
3.	Details of the equipment, including confirmation of hose and fender test dates, logistical support and personnel to be provided.
4.	Requirements for the preparation of moorings, manifolds and lifting gear.
5.	Local and national STS regulations, where applicable.

The STS Organizer should also send electronic copies of the following to the ships:

- Copies of the risk assessment identifying the mitigation measures to ensure safety conduct of the STS operation at the planned transfer area.
- A Copy of the JPO and the mooring plan.

5.3 Navigational warnings

Before starting STS operations at sea, and at intervals according to local requirements (or more frequently if the situation warrants), the POAC/STS Superintendent, or a designate, should broadcast the navigational warnings to all ships advising as detailed in Table 5.3.

Navigational warnings during STS transfer operations

Table 5.3

Navigational warnings	
1.	Names and nationalities of the ships involved in the STS operation.
2.	Geographic position of operations, including the course and speed for underway STS operations.
3.	Type of operation taking place (loading or discharging and cargo type).
4.	Time of starting operations and expected duration.
5.	All ships to maintain a wide berth.

On completion of the transfer operation, an advisory message should be broadcast advising all parties that ships have unmoored and the navigational hazard no longer exists.

For operations conducted in port, local requirements may address the need for navigational warnings, their content and responsibilities for their broadcast. The requirements may also include associated provisions for traffic control.

5.4 Communications during maneuvering, mooring, and unmooring

As the ships come into the STS transfer area, contact should be established on the appropriate VHF channel before switching to an agreed working channel. Approach should not commence until communication has been established between the two ships. Before starting the approach, both ships should confirm that checklist 2 (see appendix A) is completed.

When conducting operations in port, there may be a need to communicate with additional parties such as the port authority, a terminal, pilots, tugs and line handlers.

5.5 Communications during cargo transfer operations

During cargo operations, personnel should have a common means of communication, including an agreed backup system. It is recommended that spare radios and batteries are available.

When undertaking operations in port,frequencies should be assigned by the POAC/STS Superintendent, having due regard for the safety and working channels of the port.

Communications between ships should be tested at pre-agreed intervals.

When conducting STS transfer operations at sea, bridge watches should be maintained in accordance with recommendations contained in ICS Bridge Procedures Guide.

Bridge watchkeepers should maintain communication with the following:

- The POAC/STS Superintendent;
- Deck officers on all ships;
- Harbour authorities to provide any required notifications of ship movements and operations taking place.
- Lightering support craft and other ships, such as tugs and port safety ships.

5.6 Procedures in case of communication failure

If the primary communication system fails at any time during the STS operation, the agreed backup system should be used.

If communication failure occurs during an approach manoeuvre, the manoeuvre should be aborted if safe to do so. Subsequent actions taken by each ship should be indicated by the appropriate sound signals, as prescribed in regulation 34 of IMO COLREGS.

In the event of communication failure during cargo operations, the emergency signal (refer to 7.3, 12.1 and 12.3 of the Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2nd Edition, 2025) should be sounded, and all operations should be suspended. Operations should not be resumed until communications have been re-established.

6 PREPARATION

6.1 Conditions and requirements

6.1.1 Ship to ship compatibility

When planning STS transfer operations, the organizer should ensure that the ships are mutually compatible in terms of design and equipment to comply with the various recommendations in this plan and to ensure that mooring operations, hose operations, and communications can be carried out safely and effectively. A compatibility assessment should confirm the suitability of the ships for the planned operation and to identify any aspects that require special management. It is essential to provide information regarding the main dimensions, freeboard, manifold locations, mooring points, and fenders of the relevant ships to the masters of both ships, and to communicate this information to the POAC/STS superintendent.

Necessary mitigation measures should be considered to reduce the risk of contact with the bridge wings. If a risk of contact exists, it is recommended that ships whose bridge wings extend beyond the maximum ship breadth should not participate in the transfer operation. This is particularly applicable when the bridge wings of one ship are lower than the deck edge of the other ship, or when the bridge wings of one ship are likely to interfere with structures (such as lifeboats, etc.) on the main deck of the other ship.

Information should be exchanged before berthing, as detailed in Table 6.1.1.

Ship compatibility information

Table 6.1.1

General	
1.	Current and previous ship names.
2.	IMO number.
3.	Current Ship Particulars Questionnaire (VPQ) data has been exchanged per the STS operations plan.
4.	Where applicable, a copy of the Joint Plan of Operation (JPO) has been exchanged.
5.	General arrangement plan or mooring diagram exchanged.
6.	Planned arrival and departure conditions.
7.	Displacement, draught, freeboard, parallel body length, fendering requirements.
8.	A Class approved STS plan is available, if required.
Cargo	
1.	Cargo handling equipment, types of cargo pumps and sizes.
2.	Designed maximum permitted pumping/receiving rates for all ships involved.

3.	Confirm the ship is equipped to conduct vapour balancing.
4.	Inert Gas System (IGS) /N_2 plant operational and all tanks are inerted and requirements for cargo intended to be transferred have been met.
5.	Type/quantity/temperature/density of cargo.
6.	Country of origin.
Mooring	
1.	The location and number of enclosed fairleads and mooring bitts fitted on the ship is in accordance with OCIMF Mooring Equipment Guidelines.
2.	Is the ship fitted with any open roller chocks/fairleads? If so, where and how many?
3.	Location and number of mooring wires on drums.
4.	Location and number of mooring ropes on drums.
5.	Type of mooring lines including material, size, elongation, Line Design Break Force (LDBF) and time in service.
6.	Type of mooring tails, including material, size, elongation, Tail Design Break Force (TDBF) and time in service.
7.	The ship can deploy all lines on winch drums (split drums).
8.	Date of last winch brake test.
9.	Date oldest winch wires/ropes were installed.
10.	Date oldest mooring tails were installed.
11.	Number of messengers on board.
12.	Size, length and material of messengers.
13.	Identification of known mooring issues associated with ships of similar length.
14.	Both sides of the ship are clear of any overhanging projections, including bridge wings.
15.	Any nighttime berthing restrictions.
Equipment and Personnel Transfer	
1.	The ship's manifold arrangement and lifting gear is in accordance with SIGTTO recommendations for the ship type/size.
2.	Lifting equipment is in good working order and an inspection of the crane, wire, sheaves, and block will be completed prior to arrival at the STS location.
3.	The number of manifold connections available and cargo hose details including number, size and allowable rate.

4.	Maximum and minimum height of the cargo manifold from the waterline during the cargo transfer.
5.	Hose handling crane Safe Working Load (SWL) and maximum outreach.
6.	Date crane wire last renewed.
7.	Personnel transfer arrangements identified.
8.	Is the crane certified for personnel transfer?
9.	Is personnel transfer by crane allowed?
Navigation	
1.	Confirm the ship can maintain five knots for a minimum of two hours for underway berthing.
2.	Critical Revolutions Per Minute (RPM) range.
3.	Is a controllable pitch propeller fitted?
4.	Are bow thrusters fitted?
5.	Do the bridge wings extend past the extreme breadth of ship's hull? If yes, state the distance.
Manning	
1.	Sufficient personnel available to ensure safe operations while minimising the potential for fatigue for the entire STS operation including: - Rigging STS gear. - Mooring. - Officer of the Watch (OOW) on the bridge at all times. - Officer of the Watch (OOW) in the engine room at all times. - Hose connection. - Cargo transfer. - Hose disconnection. - Unmooring.
2.	Number of Deck Officers in addition to the Master.
3.	Confirm key personnel can communicate in English.
4.	Number of ratings available for mooring.
5.	Sufficient accommodation available on board for STS personnel.
Cargo Operations	
1.	Cargo transfer and ballast plans, including anticipated duration.
2.	Vapour management capacity of each ship and, where vapour return/balancing is used, the compatibility and capacity of ship systems.

3.	Cargo compatibility, including temperatures, pressures, and densities for both ships.
4.	Safety Data Sheet (SDS) information has been exchanged for the cargo being transferred and, where applicable, the previous cargo of the receiving ship (where applicable).
5.	The potential for toxic vapour release and identification of hazardous zones.
Additional Information	
1.	Date of last USCG Certificate of Compliance (if applicable).
2.	Confirmation the ship can comply with guidance in the ICS Guide to Helicopter/Ship Operations.
3.	Internet available for the POAC/STS Superintendent.
4.	Liquid and vapour manifold arrangements.
5.	Relief valve settings confirmed.
6.	STS Transfer Compatibility Questionnaire data has been exchanged (if applicable).

Consideration should be given to mitigation measures required to reduce the risk of bridge wing contact. It is recommended that ships that have bridge wings extending beyond the beam are not used if there is risk of contact,especially when the bridge wing of one ship is lower than the deck edge of the other, or when the bridge wing of one ship may interfere with structures such as lifeboats on the main deck of the other.

Appendix E provides an example of a compatibility questionnaire. Although the questionnaire is intended for use when planning STS operations between Liquefied Natural Gas (LNG) ships, much of the information contained is relevant when planning transfers involving other cargoes.

For STS transfer operations involving ships of a similar length (where the difference in overall length is less than 10%), a risk assessment should be undertaken to identify mitigation measures for the operation to reduce the risk to an acceptable level. The specific measures are as follows:

- Identify the optimal mooring arrangement, considering bow and stern lines will be in a breast line configuration. It may be necessary to deploy additional lines in a fore and aft direction to compensate;
- Identification of optimum securing arrangements for fenders to ensure that mooring arrangements are not compromised due to a lack of useable chocks/fairleads;
- The adjustment of the fore and aft positions of the ships so that the bridge wings are offset. It should be ensured that all primary fenders will rest on the parallel body of the ships throughout the transfer operation.
- Sufficient hose lengths to accommodate manifold offset. Consider loads exerted on cargo hoses due to manifold offset during STS operations involving ships of a similar length.

- For STS operations conducted at anchor with one of the ships offset, consideration should be given to the need for extra headlines to counter the additional forces on the ship with the exposed bow.
- Provision of larger diameter fenders to increase ship separation distance.
- The reduction of limiting environmental parameters, once the lead and effectiveness of the mooring line configuration is established.

Dumb barges may be used for STS operations. The barging company is responsible for the barges they operate. When the barge is under tow or being pushed, the tug Master is the responsible person. For mooring, unmooring and during transit, the tug crew is responsible for the handling of the barge. When alongside a berth or discharging ship, the barge comes under the facility's security plan. During cargo operations, an operator either belonging to the tug or appointed by the barge company takes charge of the barge and is responsible for ensuring safe cargo operations. Dumb barges have independent power units that drive the cargo transfer pumps.

Most modern barges are fitted with float-type high level gauges with an audible alarm. Alarms are usually powered by a portable battery pack that is brought on board by the barge operator. Depending on the products to be carried, some barges are fitted with hermetic coupling sounding pipes for taking closed soundings. Regular soundings are taken by either a fixed stick system or visually through a sight glass.

It should be noted that dumb barges might not have fixed firefighting capability. In these cases, portable fire extinguishers should be placed on board during cargo operations. The POAC/STS Superintendent should be aware of when barges are alongside the discharging ship and of any other ships involved in the STS operations. It should be ensured that adequate firefighting capability is available to cover the operations of the dumb barges.

It should also be noted that mooring to barges can present challenges due to:

- The limited number of mooring wires/ropes available;
- The limited number of winches;
- The limited number of chocks (some of which may not be closed);
- The difficulty in establishing effective mooring leads.

In many regions inland STS operations are undertaken using dumb barges. The equipment and operational practices used by dumb barges may differ significantly from those recommended in this Guide.

6.1.2 Approval from authorities

The STS organiser should check local and national regulations to determine approval requirements. This may require the organiser and authority to agree the transfer area to be used and to consider other requirements. Emergency response arrangements should also be agreed.

When an STS operation is about to begin in territorial waters,the STS organiser should assess whether they are required to notify authorities and/or government agencies. If required, notifications may be made either directly by the STS organiser or, once requirements are known, by formally delegating the task to the STS Superintendent.

6.1.3 STS transfer operation area

Transfer areas may be defined in legislation by authorities. The size of transfer areas used varies considerably and the space available will affect the type of manoeuvre that can be used for the STS operation.

Where it is intended that both ships are to be underway, a large transfer area will be needed to accommodate manoeuvres. A ship approaching another ship at anchor or alongside will need a smaller area.

For all STS operations, a safe and secure area around the ships should be agreed and monitored.

Contingency plans should be developed to address potential breaches of the safe area. Some authorities require a safety patrol ship to be on station throughout the STS operation.Within port limits or in approved offshore locations, support in the form of pilots and tugs may be available or be required by local legislation.

When assessing the suitability of an STS transfer location, reference should be made to the guidance and example checklists contained within OCIMF Ship to Ship Service Provider Management and Self Assessment.

When the transfer is to take place alongside a terminal, restrictions on the transfer area should consider the proximity of passing ships and traffic density in the vicinity.Local regulations may not permit more than one ship alongside at any time and may require terminal facilities to be licensed for STS operations involving double banking.An engineering study to confirm the berth is structurally sound for multiple ships to be moored should be completed.

6.1.4 Environmental conditions

Weather conditions may impose restrictions on the STS operation. Some local authorities have regulations regarding limiting weather conditions. Restrictions should be considered for each specific transfer location, by the ships involved. Reference should be made to the OCIMF Mooring Load Analysis during Ship to Ship Transfer Operations.

Information that will determine operational management action should include, but not be limited to:

- Visibility;
- Wind speed and direction;
- Wave and swell height, period, and direction;
- Weather forecasts.

It is recommended that service providers and ship operators use specialised weather forecasting services, where available, to provide the latest information on present and forecast conditions for the STS location. This information should include details of the wind, wave and swell analysis of the location. The information should be distributed to all parties involved in the operation as it may have operational and commercial implications.

It is not possible to document generic limiting weather conditions under which STS operations can be conducted. These depend on the effect of the sea and swell on the fenders or mooring lines and the rolling movements induced in the participating ships, considering their relative freeboard and displacement. Other factors for operations at sea include the sizes of the ships and their manoeuvring capabilities, the speed of the approaching weather, free surface effect, sloshing limitations, manning and LSV capabilities. Weather limitations should be established for a particular location, based on local information, historical data and detailed studies.

STS operations in locations subject to long period waves should be treated with caution. Mooring loads will increase with wave period or as the period of wave encounter increases.

If STS operations are to take place at anchor the combined effect of current and weather conditions on the yawing movements of the anchored ship and tension on the anchor cable should be considered.

Throughout any berthing operation visibility should be sufficient to permit safe manoeuvring, considering safe navigation and collision avoidance requirements. The maneuveres should only start when relevant personnel are satisfied that conditions are suitable for mooring and cargo transfer.

The Master of any ship involved in the operation retains the right to suspend operations and unmoor should they have concerns regarding the safety of remaining alongside in the prevailing weather and sea state conditions.

For STS operations in port, it should be recognized that weather factors can influence available depth of water and tidal heights and can also affect currents in rivers and estuaries and sea states in exposed waters. Under keel clearances should be monitored and due account taken of any draught restrictions set by the local Administration for the given conditions.

6.1.4.1 Cold weather precautions

When conducting STS transfer operations under cold weather conditions, consideration should be given to ensuring the safety of personnel and the availability of essential ship systems. Reference should be made to applicable national or international requirements or recommendations contained in IMO and industry publications.

Particular attention should be given to, but not be limited to, the following:

- The safety of personnel;
- Availability of essential ship systems;
- Provision of cold weather clothing;

- The potential for slips and falls on icy surfaces;
- The suitability of fenders and cargo transfer equipment;
- Suitability of the mooring system (winches and lines);
- The readiness of safety and firefighting systems;
- The effective operation of water curtains;
- The functioning of pneumatic, steam and hydraulic systems;
- Operation of Quick Release Couplings;
- The operability of inert gas pipes, ballast tank vents, ballast water treatment system and cargo/ballast system valves;
- Ensuring that safety showers and eye wash facilities are in an operational condition;
- Ship stability due to ice accumulation on deck.

Figure 6.1.4.1 STS transfer operations under ice conditions

Emergency response plans, including spill response plans, may need to be revised to consider the extreme cold weather conditions and/or the presence of ice.

Cargo vapours may be heavier than air in lower temperatures. This can create a low-lying flammable or hazardous zone that can spread from the side of the hull onto a lower ship alongside.

6.1.4.2 Ship to Ship operations in ice conditions

STS operations may take place in areas of sea ice, where ice conditions may vary from open sea to solid pack ice. Before undertaking STS operations in areas that may be affected by ice, several factors should be considered:

- The experience that ship's personnel and service providers have of operating in ice;

- The shelter that operating in ice areas offers. Swell and sea conditions may be reduced or eliminated within the ice edge;
- Accessibility to the designated STS position for the ships involved;
- The suitability and ice classification of the ships' hulls to allow operations in ice conditions;
- The need for ice breaking support;
- Fender considerations will depend on the conditions, but the possibility of the ice itself acting as a fendering agent between the ships should be considered;
- The possibility of structural damage caused by ships compressing the ice between the hulls or from a higher ice classed ship causing damage to a lower ice classed ship's hull.
- Contingency plans should address the requirement for safely breaking away in the event of an emergency;
- Spill contingency plans should account for the possibility of product being contained either on the ice or within the open water surrounded by broken ice. Spill response equipment should be capable of operating in the temperatures to be encountered;
- If engines are to be run to keep the propellers and rudders clear of ice, it will need agreement between the ships.

If it is considered that the actual or potential ice build-up during the operation could have an adverse impact on the safety and the security of the fender moorings or ship mooring arrangements, the STS operation should be aborted.

6.1.4.3 Cargo sloshing considerations

The rolling and pitching of ships involved in STS operations will result in sloshing of cargo in slack tanks. The following should be considered:

- Minimize risks of damage to cargo tank structures and fittings by adherence to safe operational and environmental limits;
- The development of electrostatically charged mists when a static accumulator cargo or a cargo/ water mixture is in the tanks;
- The correct operation of PN valves and the possible lifting of the valves, as the movement of the liquid will create pressure fluctuation in the vapour space of the cargo tanks;
- The premature activation of high-level alarms and any linked shutdown facilities;
- Optimising each ship's loading/discharge plans to minimize exposure to free surfaces, especially for STS operations at sea;
- Cargo consolidation and internal transfer in the event of premature ship separation with tank levels outside of safe sloshing limits.

Consideration should be given to suspending operations to consolidate cargo and minimise the impact of sloshing loads.

6.1.5 Quality assurance of STS service providers

When an STS service provider is employed,the quality of the services and equipment provided are paramount if operations are to be conducted safely,reliably and efficiently.Ship to Ship Service Provider Management and Self Assessment should be used by service providers to verify that their SMS is comprehensive and sufficiently robust to minimise safety and environmental risks in the execution of their operations and to measure and continuously improve their management systems. STS service providers should be subject to verification of their self-assessment by users of their services.

There are currently no international regulatory standards for STS service providers. While International Organization for Standardization (ISO) accreditation, if available, will provide an assurance that an STS service provider has the necessary resources to meet the standards for which they have accreditation, this should not be the only determinant of quality.

Performance records and previous industry experience are important when assessing an STS service provider's ability to meet customer and regulatory requirements.

6.2 Operational preparations

When STS operations are to be carried out at sea, passage plans should include reference to relevant navigational charts and publications.The passage plan should include the planned courses and speeds for the approach to the mooring operation, the required sea room, the planned anchor position, anticipated drifting areas, potential navigational hazards, environmental operating parameters, security considerations and an awareness of any territorial boundaries or prohibited zones.

6.2.1 Joint Plan of Operations (JPO)

Before starting STS operations, a JPO should be produced and provided to all parties by the STS organiser.

In all cases the POAC, STS Superintendent or STS organiser should obtain agreement between all parties, including the Masters of all ships involved in the STS operation, on the STS JPO.

The JPO will include information from several sources. For a regularly used location, a generic template may be used. Information should include:

- Details of the rendezvous location and the designated STS transfer area;
- Copies of all risk assessments;
- Names and contact details of POAC/STS Superintendents and any backups or assistants.
- Description of how the STS operation will be conducted,the role of each ship and the type of STS operations. For example: whether maneuvering and mooring will be performed with one or both ships underway or with one at anchor; whether cargo transfer will be conducted at

anchor or underway; whether the unmooring will be performed with one ship at anchor or both underway; and the availability of tug assistance;

- Details regarding any local or governmental regulatory requirements and notification requirements;
- Communications protocols, including the agreed common working language and, where applicable, the broadcast of navigational warnings;
- Security requirements, including the security level in force at the STS location;
- Personnel transfer plan;
- Details of any LSV or service craft;
- Environmental operating parameters for each stage of the STS operation. These should include the environmental and operational limits requiring the suspension or cessation of the STS operation and disconnection and unmooring of the ships;
- Fender rigging and configuration arrangements, including the procedure for adjusting fenders during cargo transfer or before unmooring. Details of the last fender pressure test dates should be given;
- Mooring plan and arrangement, and the sequence for running mooring lines, including the use of any specialist mooring equipment (e.g., toggle pins, pennants, grommets with wire, and high modulus Poly-Ethylene (HMPE) tails);
- Details of any additional STS equipment used, such as quick-release hooks, saddles with fall arresters, and VSD if any;
- Compatibility study, if applicable;
- Details of cargo transfer and associated equipment, including the number, type, electrical continuity, and dimension of cargo/vapor hoses, including last pressure test dates;
- The method of cargo tank pressure control for both ships;
- Considerations for Simultaneous Operations (SIMOPS) considerations before undertaking additional activities(including helicopter operations, bunkering, provisioning, and crew changes);
- Maximum and minimum draught and freeboard anticipated during operations,including details of the stage of operations they relate to;
- Confirmation that the emergency and spill response procedures are available to all parties;
- Plans for cargo hose connection, draining, purging, and disconnection for both parties;
- The unmooring sequence;
- ESD arrangement and testing;
- Boil Off Gas (BOG) management;
- Sloshing limits;
- Agreement on Custody Transfer Measurement Systems (CTMS).

For double banking operations, the suitability of the berth and strength of mooring points should be confirmed.

In addition, the JPO should include details of the cargo transfer plans or refer to their content.

6.2.2 Preparation of ships

The Master of the ship involved in the transfer operation should complete the preparatory work listed in Table 6.2.2 as early as possible.

Preparatory work before maneuvering

Table 6.2.2

Preparatory work before maneuvering	
1.	Review the operation specific risk assessment in conjunction with the applicable JPO to ensure that all identified preventive and mitigation measures are implemented.
2.	Ensure familiarity with the procedures contained in this Guide, supplemented by any instructions issued by the ship operators or STS organizers.
3.	Confirm that the ship will be able to comply with the checklist requirements in Appendix A.
4.	Provide crew training and briefing on procedures and hazards, with reference to mooring/unmooring and hose connection/disconnection.
5.	Confirm that the steering gear, navigation and communications equipment is tested and operational.
6.	Test main engine and,where applicable,ensure thrusters are fully operational.
7.	Test cargo and safety equipment.
8.	Confirm that each ship is upright and at a suitable trim with the propeller fully immersed. If one ship has a list, the possibility of safe stand-off distances being compromised should be considered.
9.	Prepare mooring equipment (including messengers) according to the agreed mooring plan.
10.	Ensure that fenders and transfer hoses are correctly positioned, connected, and secured in accordance with the JPO.
11.	For specialised lightering ships, confirm that fender davits are in the stowed position.
12.	Prepare the cargo manifold and hose-handling gear.
13.	Obtain weather forecast for the transfer period.
14.	Confirm the actions to be taken if the agreed emergency signal is sounded.
15.	Confirm the security level at which the ship is operating, in accordance with the provisions of the ISPS Code and the requirements being undertaken on board to ensure compliance.

16	Remove any anti-piracy barriers on the working side of the ship that may cause personnel injury or cause the fouling or entanglement of mooring lines.

6.2.3 Lightering Support Vessels (LSV)

LSVs are often employed to transport equipment and personnel to the STS location and assist in preparing ships for the operation.They remain on standby throughout the operation in case of emergencies.

Some LSVs are equipped with firefighting and spill emergency response equipment, and, if required, can assist with security of the STS operation.

In addition to providing operational support for activities such as the installation of fenders, hoses, and specialized mooring equipment, personnel on the LSV are responsible for the following tasks:

- Maintaining radio watch on the agreed VHF channel and/or internal communication frequencies.
- Communicating with the ship Masters regarding approach manoeuvres.
- Remaining on standby at the agreed location while ships are manoeuvring and during STS operations.
- Maintaining a good visual and radar lookout for approaching vessels.
- Contacting vessels that intrude into the designated security zone.

The LSV should have the ability to safely launch and recover the primary and secondary fenders and cargo hoses to/from the operational area of the LSV deck. Depending on the distance to/from the operating base and available deck space, the LSV may either stow the primary fenders on deck or tow them.

When towing fenders, there should be sufficient lashing points to handle both the main and backup towlines.

If the fender is stowed on deck, there should be:

- Adequate lashing points to prevent fenders from moving.
- Sufficient space to allow personnel to move safely around the deck.
- An open back deck or stern roller to facilitate safe fender deployment and recovery.
- Suitable tugger/deck winch to assist with fender recovery.

There should be sufficient space on deck to allow cargo transfer hoses to be stowed without compromising their Minimum Bending Radius(MBR), if applicable.

Other functions of the LSV may include:

- Providing transportation for STS personnel.
- Stowage and deployment of spill response equipment.
- Ability to assist with emergency response,such as man overboard recovery.
- Provide a safe landing area for a PTB if required.
- Allow safe embarkation and disembarkation by a pilot ladder.

There should be sufficient crew to safely carry out the location specific LSV activities.

6.2.4 Navigational signals

During STS operations, lights,signal shapes and sound signals should be used as required by the COLREGS and any local regulations. Lights, shapes and sound signalling equipment should be tested before the STS operation.

7 MANOEUVRING AND MOORING

Manoeuvring, mooring and unmooring operations should consider local regulations and the output from the STS operations risk assessments. Consideration should be given to any restrictions that may be posed by factors including restricted visibility, environmental operating parameters and limits and adequacy of ship lighting for operations during the hours of darkness. Other risks include visibility and whether the operation,including mooring and unmooring, is undertaken during hours of darkness or daylight.

At some locations, particularly within port limits, manoeuvres may be subject to local requirements and involve the use of pilots and tugs. In such circumstances, the pilot should offer advice on all aspects of navigation and piloting, but the Master remains responsible for and in command of his/her vessel.

STS operations take place under different environmental conditions, which can increase the risks associated with the STS operation. The impact of environmental conditions upon mooring line integrity should be documented in a risk assessment, which includes direction of swell and weather conditions along with all identified risks associated with the manoeuvring and mooring/unmooring of ships involved in the STS operation.

During hours of darkness, it should be ensured that night vision is not hindered by bright deck lights or other background lighting. It may be necessary to temporarily switch-off or angle away the deck lighting of the CHS.

OCIMF Mooring Load Analysis during Ship to Ship Transfer Operations will assist in assessing the risks associated with mooring two ships together in open water and the impact of environmental conditions on the integrity of the mooring of the two ships. The recommendations given therein may be referred to.

Ships nominated for STS operations are to confirm they are fitted with correct mooring equipment (refer to OCIMF MEG). To ensure a safe STS operation, an early assessment of the requirements for the planned operation should be conducted to meet both operational and charter contract requirements.

7.1 Manoeuvring alongside at sea with two ships under power

When mooring two ships, it is usually the larger ship that maintains a constant heading (CHS) at a steady speed (approximately 5.5 knots). Where the two ships are of similar length, it is usually the ship with greater displacement that maintains constant heading and speed. Local conditions and knowledge will dictate the appropriate heading and method of mooring, and the manoeuvring characteristics of both ships should be considered.

A common method of berthing is for the MS to approach the CHS from the quarter on the side of berthing. On closer approach the MS is to parallel the course of the CHS at a safe distance appropriate to the prevailing conditions, then position itself relative to the CHS with the manifolds on both ships being almost abreast of each other. The MS reduces the distance by rudder and engine movements, keeping the manifolds on both ships abreast of each other until parallel contact is made with the fenders, at which point both ships are proceeding at the same speed through the water. For reliable approach manoeuvring steps, see Figure 7.1.

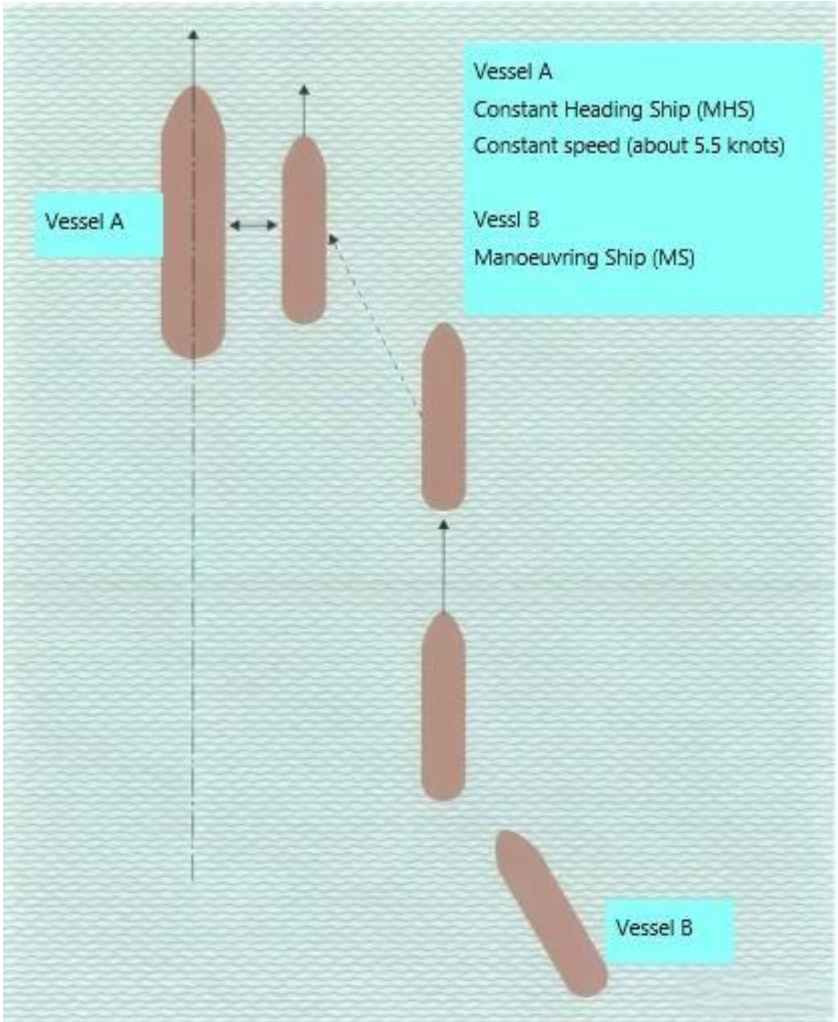


Figure 7.1 Example of a possible final approach manoeuvre at sea

7.1.1 Recommendations for controlling the two ships

Before commencing approach, the following should be confirmed:

- Navigation and communications equipment is in working order;
- A proficient person at the helm for the duration of the approach and mooring operation;
- Engine movements and steering gear can be remotely controlled from the bridge;
- Courses and speeds requested by the MS are to be followed by the CHS. A common system for assessing speed should be agreed, such as speed over the ground. Headings should be as per gyro compass and known gyro errors shared between both ships;

  The RPM of the main engine(s)of the CHS is usually put on a continuous setting (for example, Dead Slow Ahead) to provide a speed through the water, as requested by the

POAC/STS Superintendent or Master of the MS. No changes to the RPM should be made without advising the POAC/STS Superintendent or Master of the MS;

- Ships that are nominated to conduct underway STS operations are to be capable of maintaining continuous speeds of approximately 5.5 knots. In situations where the MS has a relatively high minimum speed, the POAC/STS Superintendent or Master may consider increasing the RPM of the CHS sufficiently to enable the MS to complete the berthing operation without the need to temporarily stop its engine to reduce speed though the water. Any limitations posed by loads on fender rigging should be considered. If the POAC/STS Superintendent or the Master are uncomfortable with the minimum speed, they should abort the operation;
- When manoeuvring at close quarters, the effect of ship interaction should be anticipated. The effects of interaction increase as the square of the ship's speed through the water. To ensure optimum helm response to counter the effects of interaction and to maintain effective heading control, the MS should keep engines turning ahead or, if fitted with a controllable pitch propeller, maintain positive propeller pitch throughout
- On motor ships, the number of available air starts should be confirmed;
- At night,the deck should be adequately lit and, if possible, the ship's side and fenders illuminated;
- The side for mooring shoud be clear of all obstructions;
- The appropriate navigation lights and shapes for STS operations should be displayed.
- Communications should be tested before starting the approach and agreement reached on a backup method in the event of a communication failure;
- There should be effective radio communications between the personnel on duty of each ship. This is to be maintained on a separate frequency to those being used for internal radio communications on each ship;
- There is to be effective communications between the bridge teams of both ships.

7.1.2 Advice for manoeuvring alongside

The following should be considered when manoeuvring alongside:

- Masters of both ships and the POAC/STS Superintendent, if present, should agree on the criteria for aborting the STS operation. If any party has concerns about the safety of the manoeuvre, or the ability to monitor its safe conduct, particularly during the hours of darkness, they should exercise their SWA to abort or postpone the berthing operation until such concerns are resolved;
- Both ships are responsible for maintaining a proper lookout throughout the STS operation;
- During manoeuvring, the handling characteristics of the two ships,local conditions and POAC/STS Superintendent or Master experience will determine an optimum approach. Common approaches include:

  -Keeping the wind and sea on the port bow of the CHS;

-Keeping the wind and swell on the port or starboard quarter of the CHS to reduce loads on the fender rigging and to reduce the relative wind across the deck.

The angle of approach adopted by the MS depends on the perpendicular distance off the CHS. Other factors include the size of and manoeuvring characteristics of both ships and environmental conditions. As the perpendicular distance between the ships gradually decreases, the angle should be reduced so that the ships are almost parallel just before landing on the fenders.

7.1.3 Manoeuvring two moored ships to the anchor position

On completion of mooring the CHS will usually power all future manoeuvres and, if a transfer at anchor is planned, will proceed to the agreed anchoring position. During this time, the MS will have its engines stopped and rudder amidships and the CHS should avoid excessive engine movements, particularly excessive astern movements when anchoring. To avoid excessive tension in the mooring lines, speed should be reduced gradually to zero and any change of heading, if required, should be with a minimal rate of turn. The CHS should use the anchor on the side opposite to that on which the other ship is moored.

An assessment should be made during the planning phase to ascertain suitability of holding ground and anchor holding capacity with respect to combined ship displacement and expected environmental conditions.

Once at anchor, each ship is responsible for their own watchkeeping arrangements as required by IMO STCW.

7.1.4 Underway cargo transfer

Local conditions, such as those where water depths are too great for anchoring, sometimes require STS operations to be carried out with the two ship system either making way or drifting,using engines intermittently as required.

Provided adequate sea room is available and traffic conditions,weather, sea conditions and forecasts are suitable, then transfers of this type can be safely made. Where applicable, the two ships should be kept within the limits of a designated lightering area.

The main advantage of this method over anchoring is the ability to maintain a particular heading, which can help to minimise rolling, reduce exposure of the fenders and equipment to the seas and assist with safe cargo vapour dispersion across the deck.

The CHS, generally being the ship with the greater displacement,maintains a steady course at slow speed, while the MS becomes the towed ship, with engines on standby. To minimise towing loads on the moorings, the CHS should alter their engine revolutions sparingly, adjusting speed gradually. The course and speed should be agreed by the two Masters and the POAC/STS Superintendent and should result in minimum relative movement between the two ships and minimum turbulence in the gap between the hulls.

Figure 7.1.4 Two LNG Carriers transferring cargo while underway

Alternatively, for ships having a low speed manoeuvring capability, such as dedicated lightering ships fitted with a variable pitch propeller or diesel electric propulsion, the MS may be the towing ship. In such cases, mooring arrangements may be modified, such as the provision of additional aft springs. While the ships are moored together, both are to maintain a safe navigational watch.

For STS operations where the ships continue to maintain headway after mooring, it may be necessary to make a large alteration onto the reciprocal course before unmooring. This is common where STS transfer operations must be conducted within a defined or authorised sector.

Masters and POAC/STS Superintendents are to be aware that this large course alteration, which at some point exposes the ships to 'beam seas' is high risk due to the possibility of excessive forces exerted on the mooring lines. It is not uncommon, if not properly managed, to experience multiple line failures. This process should be risk assessed by the POAC/STS Superintendent and both ship Masters before the STS operation and discussed during the toolbox meeting.

The following should be considered during the planning phase:

- Relative size and characteristics of ships involved. This includes the effect that the difference in freeboards has on the lead of the mooring lines and the impact that free surface effect has on the rolling characteristics of each ship.
- Defined weather limits;
- The mooring pattern. Tension in mooring lines are to be balanced before any tum and additional lines are to be deployed if required;
- Manoeuvring area needed for the turn;
- If there is sufficient crew available to adjust mooring lines, if required and when safe to do so;
- Possibility to suspend cargo transfer and, if necessary, disconnect the cargo hoses before the turn;
- Avoidance of turns in areas close to separation zones and in the vicinity of local shipping traffic;
- Broadcasting the course alteration on appropriate VHF channel;
- Pre-agreeing the rate of turn, including how it should be managed.

7.2 Manoeuvring alongside a ship already at anchor

STS operations involving one ship already at anchor are common.For such operations, one ship anchors in a pre-determined position using the anchor on the side opposite to that on which the other ship will moor. In addition to the factors to be considered when deciding on the length of anchor cable (water depth, holding ground, winds, currents and under keel clearance), the Master of the anchoring ship is also to be aware that a single anchor will need to hold both ships during the STS operation.

A berthing operation is only to be carried out after the anchoring ship is brought up to their anchor and is lying on a steady heading. Berthing is not to be attempted when the tidal stream is due to change.

A risk assessment should be undertaken by the STS organiser to evaluate the need for tug assistance for the anchored ship or the MS. A careful watch should be kept on the heading of the anchored ship and the anchored ship should advise the MS immediately if there is any tendency to yaw, as it can make it difficult for the MS to berth alongside. Where there is a tendency to yaw, a tug should be employed to hold the anchored ship on a steady heading. If no tug is available, the STS operation should be postponed until yawing has stopped.

It is recommended that the services of an experienced POAC/STS Superintendent or local pilot are utilised for this type of operation. For operations undertaken in port, local regulations are to be observed, and these may include the use of pilots, tugs and line handlers.

7.3 Manoeuvring for in port operations

Many STS operations are undertaken within port limits. These operations may involve berthing alongside the discharging ship, which may be at anchor in sheltered waters or alongside a terminal. Permission of the harbour authorities and where required the terminal should be obtained before starting manoeuvres to berth alongside another ship. The POAC/STS Superintendent should be informed of the ETA of the ships and be notified when manoeuvres are about to commence.

The MS should advise the Master of the moored ship of the intended approach and operations are not to be commenced until the procedure has been jointly agreed.

Within port limits, the services of the POAC/STS Superintendent are often required primarily to manage the logistics, rigging of fenders and cargo hoses. However, in most cases it will be a port authority requirement that a local berthing pilot will provide ship handling advice and that approved tugs are used.

7.4 Manoeuvring with one ship alongside a terminal

During transfer operation, one or more ships may moor alongside a ship that is already moored to a jetty. This is also known as double banking operation.

For berths that are not traditionally used for double banking operations, it is recommended that an engineering study and risk assessment is undertaken and a procedure and safety plan produced before conducting operations.

Before double banking operations are commenced, all parties are to reach agreement on:

- Safe arrival and departure procedures.
- Integrity of the berth, including fender panels and mooring fittings, reflecting the potential loads involved.
- Personnel access, including emergency escape provisions for personnel on all ships.
- Management of operational safety.
- Roles and responsibilities of involved parties.
- Contingency planning, firefighting and emergency unberthing.

The Master of the ship moored to the terminal should be aware of the total displacement of their ship and the ships berthing alongside. The mooring arrangements are to be adequate for the anticipated loads.

Consideration are to be given to the availability and need for line handling support. The ship alongside the terminal may provide crew to receive and secure the lines, but this is not to detract from the safety of ongoing cargo operations. Port regulations may require that licensed line handlers are used and these are to be arranged before starting the STS operation.

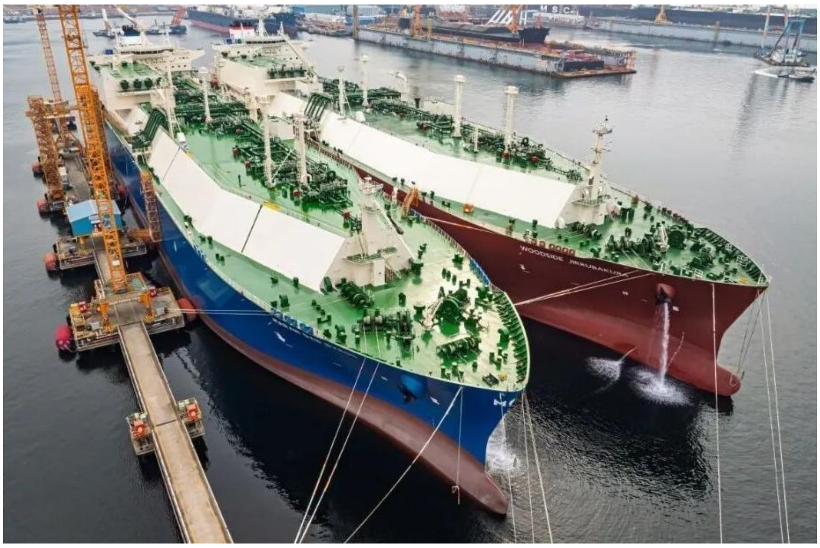


Figure 7.4 STS double banking

7.5 Manoeuvring with the assistance of tugs

For STS operations where one ship is already at anchor or alongside a terminal berth, tug assistance may be required to safely handle the MS for the mooring and unmooring stages.

For double banking/in-terminal operations, it is likely that the port authority will have conducted a risk assessment and produced towage guidelines that state the minimum number, type and size of tugs to use for handling the MS.

Towage guidelines include:

- The geography of the port and available manoeuvring area.
- Difficulties associated with specific berths, including the impact of having a ship already moored alongside.
- Size, displacement, draught and freeboard of the MS.
- Characteristics and capability of the MS(e.g.extra high lift rudder and thruster availability).
- Weather and tidal factors and limits,including wave heights and time periods.
- Complexity of the manoeuvre being undertaken (e.g.turning or unberthing).

7.5.1 Bollard Pull of tugs

It is recommended that there should be sufficient tug capability to control the MS in the maximum laden condition, assuming that the ship's engines are not available.

To determine the magnitude of the environmental forces involved when using tugs for manoeuvring, refer to the latest edition of OCIMF MEG.

Although an effective Bollard Pull(BP)can be increased by using larger tugs, loads on mooring equipment on the MS are not to exceed the safe towing limit. An appraisal of the ship's bitts and fairleads should be made to determine suitable towing positions and designated tug push points.

7.5.2 Communication

Where the pilot or POAC/STS Superintendent has not worked with the assigned tugs before, a pre-STS operations meeting should be held to discuss all operational issues, including mooring and unmooring procedures, communication protocol and contingency planning. These details are to be included in the JPO meeting with the Masters and the Master/Pilot exchange meeting on the MS.

7.6 Mooring operations

7.6.1 Mooring plans

As part of the JPO, a detailed mooring plan should be prepared by the POAC/STS Superintendent or STS organiser and reviewed by all parties involved. The plan should include scaled diagrams of both ships placed side by side and all mooring lines superimposed from mooring winch to mooring bitt.

Mooring plans for STS operations will depend upon the size of each ship and the difference between their sizes, the expected difference in freeboards and displacement,the anticipated sea and weather conditions, the degree of shelter offered by the location and the efficiency of the mooring arrangement. The mooring plan is to assist all parties during the preparation of mooring equipment and improve efficiency during the mooring operation. See Table 7.6.1 for contents of the mooring plan.

Contents of the mooring plan **Table 7.6.1**

Contents of the mooring plan	
1.	Description of manifold alignment using scaled diagrams of both ships
2.	Location of fairleads and bitts corresponding to the actual position on all ships
3.	Description of mooring lines, including line material, joining shackles, mooring tails and stretchers are to be clearly identified, run in pairs and are to be of similar size and material
4.	Mixed mooring compositions (e.g.steel wire and polypropylene) where they cannot be avoided, clearly identified and with weather/sea state parameters revised
5.	A mooring layout that should avoid crossing of lines
6.	The SWL of mooring fittings is not to be exceeded, noting that the effects of multiple mooring lines on a single fitting are cumulative. Refer to OCIMF MEG
7.	Number and position of primary and secondary fenders, including fairleads and bitts used to make them fast
8.	Secondary fenders, including size and position (both vertical and horizontal)
9.	A list of the sequence for running the mooring lines

Most STS service providers use a standard mooring plan,suitable for a specific location. Plans are to be reviewed and updated for the ships involved in the STS operation. It is important to ensure that moorings allow for ship movement and freeboard changes to avoid over-stressing the mooring lines during the STS operation. Moorings are not to be so long that they allow unacceptable movement between the ships.

STS operations create situations where two ships are moored close alongside each other with large differences in freeboard. The larger the angle of the mooring lines, the less effective they will be in resisting horizontal loads. Therefore, the maximum anticipated freeboard difference should be considered when planning the mooring layout to ensure that the vertical angle of each mooring line stays as small as practicable throughout the STS operation.

See Figure 7.6.1(1) for the maximum and minimum freeboard heights, height from the manifold centerline to the gunwale (note: height values are to specified in the figure).

Figure 7.6.1(2) illustrates the typical STS mooring arrangement. Additional lines are to be readily available to supplement moorings if necessary, or in the event of a line failure. Additional lines are preferably to be at the locations where the forward and aft mooring lines are stowed.

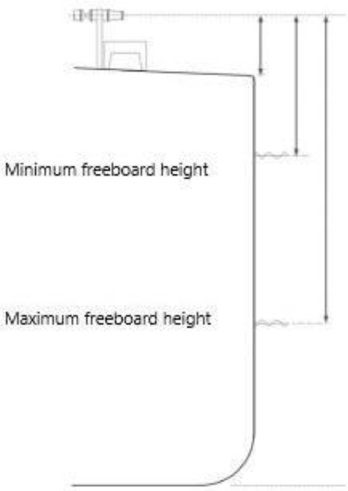


Figure 7.6.1(1) Maximum and minimum freeboard heights

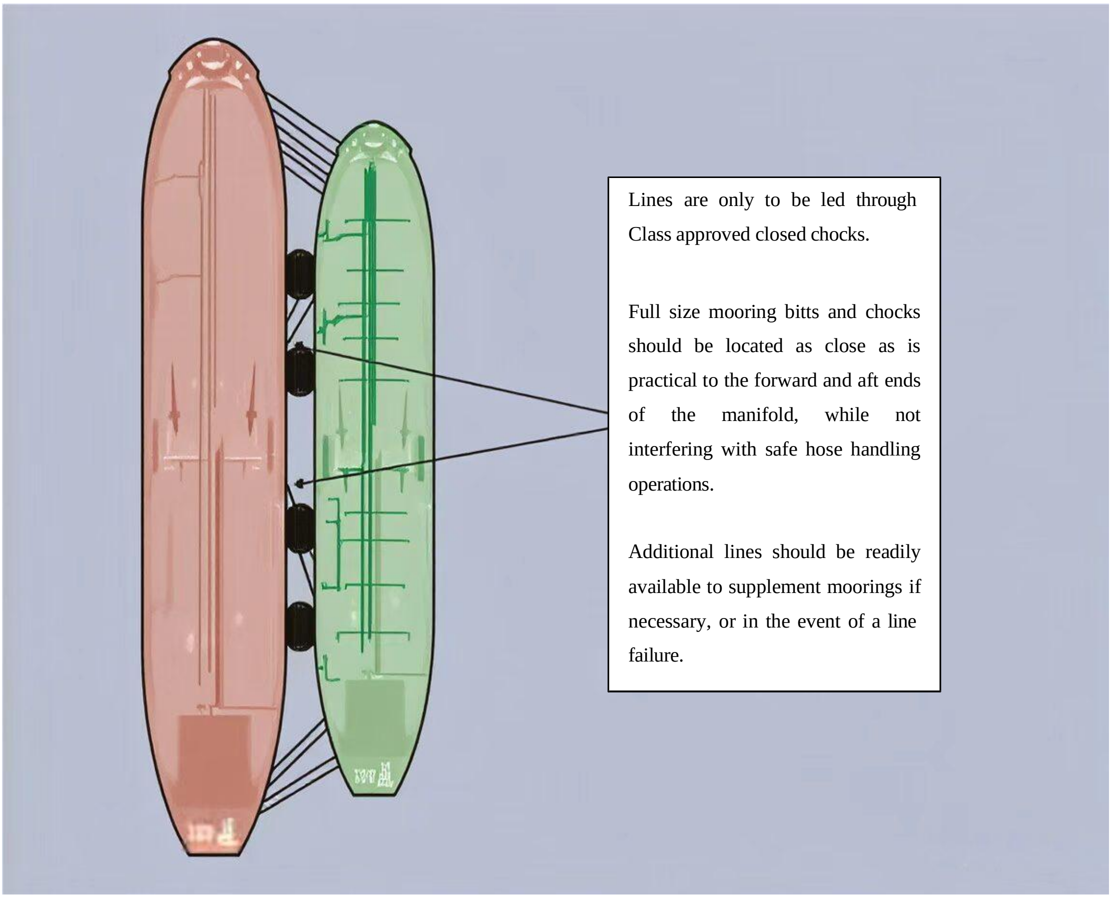


Figure 7.6.1(2) Typical STS mooring arrangement plan

7.6.2 Mooring analysis

To support the risk assessment of a transfer location, consideration should be given to conducting a mooring analysis modelling the range of ship sizes likely to be conducting STS operations at the location.

To support stakeholders in producing their mooring assessments to determine suitable weather criteria and ascertain an appropriate weather window to allow safe STS operations to be undertaken, users are to refer to OCIMF Mooring Load Analysis during Ship to Ship Transfer Operations. This allows for accurate assessment of mooring line loads anticipated for the scheduled STS operation. A full dynamic mooring approach was adopted for the assessment, covering a range of mooring thresholds and ship types from coastal ships to very large ships, both underway and at anchor.

From the generic findings of the study reported in OCIMF Mooring Load Analysis during Ship to Ship Transfer Operations, applicable to all STS operations, the following trends applied to the STS configurations analysed:

- The longer the wave period, the higher the load in the mooring lines, reducing the associated significant wave height threshold.
- The wave height threshold is lower when waves are on the beam, so beam exposure should be avoided.
- There is a larger relative roll between ships when the wave period is longer.
- MS mooring lines usually exceed their Working Load Limit(WLL) before the CHS's mooring lines.
- It is usually the innermost, shorter, mooring lines that fail first.
- As wave period increases,the wave height threshold decreases to a level where the threshold is insensitive to the ship load condition. This is the case irrespective of whether the STS operation is underway or at anchor.
- In general, the smaller ship will be protected from shorter period waves and its motion will reduce in the lee of the larger ship. However, the larger ship will still be affected by long period swells from either beam.

The mooring analysis conducted for a specific operation should include the ships in laden, partially laden and ballast conditions using environmental data corresponding to those identified for the region from metocean studies, along with guidance from OCIMF Mooring Load Analysis during Ship to Ship Transfer Operations.

The results of the mooring analysis are to be used to determine:

- Safe environmental operating limits for STS operations.
- Nominal ship speeds and headings for ships to proceed with respect to defined prevailing wind, sea and swell conditions to moderate ship movement. This will minimise dynamic loads and wear on mooring equipment, fenders and other ship systems, including cargo transfer equipment and cargo containment structures.

- Optimum criteria and methodology for aborting transfer operations and separation of ships as per the emergency response plan.
- Selection and/or configuration of mooring system components to maximise their effectiveness.
- Selection and rigging of fenders to maximise their effectiveness.

7.6.3 At sea mooring operations

Mooring operations are to be managed to ensure prompt and efficient mooring line handling.

Rope messengers are to be made ready on both ships and,in addition, stoppers are to be available for use on all bitts. These are to be either rope or chain, depending on the mooring tail material. Where possible, heaving lines and rope messengers are to be of buoyant materials. A minimum of four messengers, two each end of the ship, are to be provided and ready for immediate use. It is recommended that messengers are between 24 and 40mm, depending on ship size. Only one mooring line should be heaved by a single messenger to minimise risk of failure.

Lines are only to be led through closed fairleads suitable for STS operations.

Mooring lines are to be deployed in accordance with the agreed mooring plan. However, because mooring plans are usually derived from ships' drawings, any anomalies might not appear until both ships are alongside, possibly necessitating a last-minute plan change. When prevailing weather conditions or weather forecasts require it, additional lines are to be deployed. It is recommended that no more than two mooring lines are placed through each chock and secured on a set of bitts.

The sequence for passing mooring lines during mooring and releasing mooring lines during unmooring, are to be agreed when planning the STS operation. Where the STS service providers use quick release mooring arrangements, their use should be discussed during the JPO meeting and demonstrated during toolbox talks to ensure their correct use is understood.

Spare mooring lines and tails are to be available to supplement moorings if necessary or in the event of a line failure. While analysis of mooring loads alone may indicate a lesser number of mooring lines would be sufficient, it is prudent to provide some redundancy. However, where specialised mooring equipment is fitted (e.g.on a dedicated lightering ship) the number of headlines could be reduced where this is proven to be reliable for the local operating environment.

During the STS operation, freeboard differences are to be kept to a minimum. Initial ship selection criteria are to be considered where large freeboard differences may become significant and reduce the effectiveness of the mooring lines. On completion of mooring, it is recommended that messengers are prepared and positioned ready for unmooring in line with the unmooring plan.

To facilitate mooring and unmooring operations, some service providers employ a system that utilises a grommet and loop arrangement, sometimes known as a Double D. An example of this is shown in figure 7.6.3 and includes the optional use of a wire pennant to prevent chafing damage to the synthetic tail in way of the fairlead.

Care should be taken, when using wire pennants through fairleads that may be used for High Modulus Poly-Ethylene (HMPE) moorings, to avoid damaging the fairlead's surface.

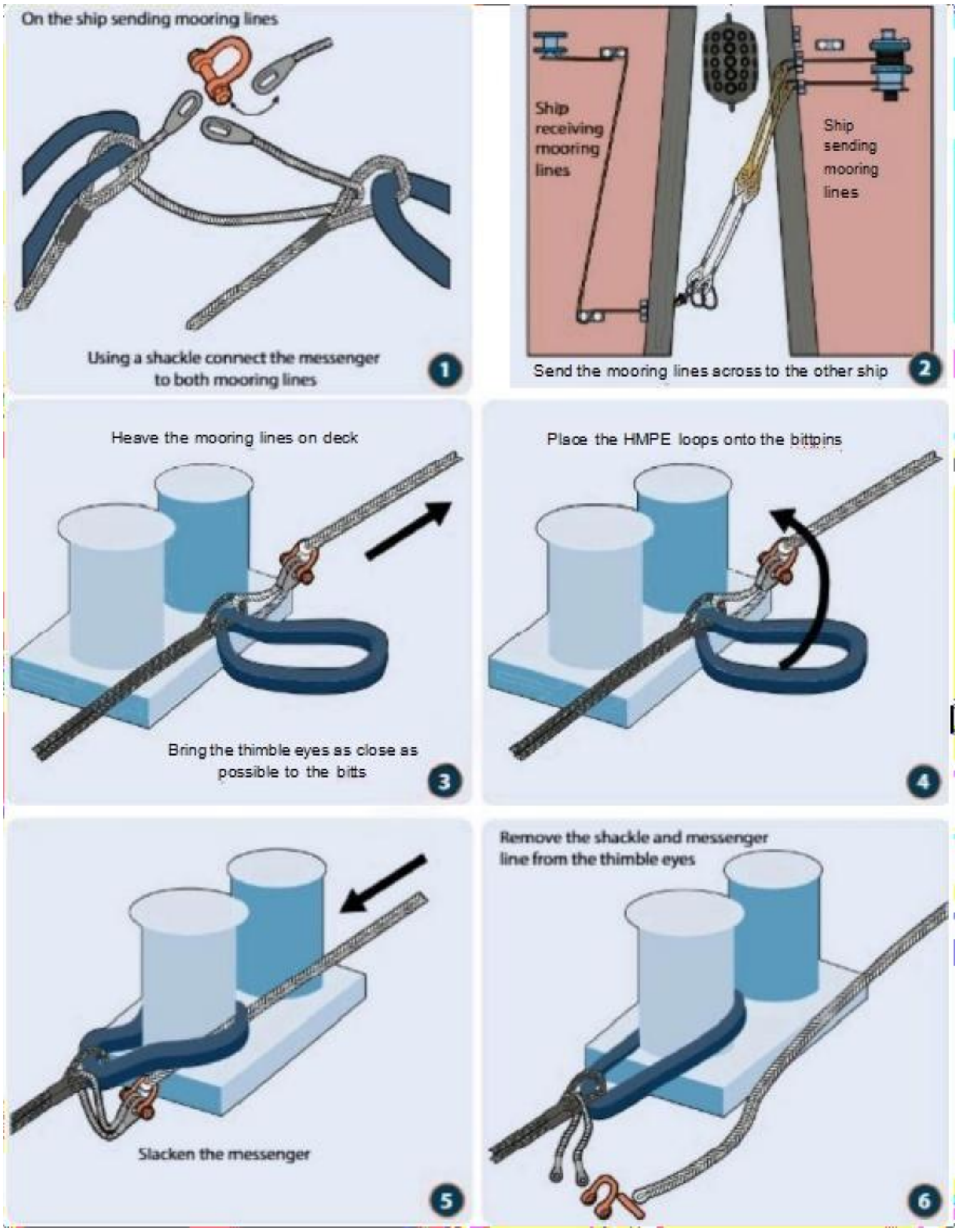


Figure 7.6.3 Securing the line on board using a Double D arrangement

7.6.4 Efficiency of Ship to Ship mooring systemS

Tension in mooring lines

Excessive or uneven tension in mooring lines should be avoided because it will significantly reduce the weather threshold at which the forces in mooring lines exceed their operating limits.

Attention should be given to this throughout the STS operation to ensure changes in relative freeboards do not create excessive load on the moorings.Ensuring uniform tension in mooring lines extending from both ships in the same direction is of paramount importance. Masters are to exercise diligence while finalising the mooring procedure to prevent any disparities in tension among lines stemming from either ship.

Mooring line lead angles

Peak loads on individual head and stern mooring lines can be minimised if the mooring lead angles are similar and more effectively sharing the mooring loads.

Winch brake settings

The SWL of the bitts on one ship will usually be lower than the MBL of the mooring lines of the other ship. This is usual where there is a large difference in deadweight between the ships. The Masters and POAC/STS Superintendent are to consider the possibility of higher SWL rated mooring lines causing damage to the smaller ship. Mitigating factors documented in a risk assessment may include having all lines run from the smaller ship,more frequent tension adjustment or reducing the weather parameters for the operation. Adjusting the winch brake settings of either ship,as a temporary mitigation measure, is not recommended.

Use of wire tails and grommets

Adding a soft rope (e.g.nylon or polypropylene) grommet style 'stretcher' and wire tail to a mooring line is an effective method of reducing the shock load on a mooring line. Provided the soft line section is correctly sized so that it remains outboard of both ships' fairleads, it will help reduce brake rendering and line failure.

Where a tail and grommet stretcher system are retrofitted to a mooring line, specifically for the STS operation, all added components, including any joining shackles, are to have an SWL comparable to that of the mooring line. This ensures that the connection maintains sufficient strength and integrity for safe and efficient mooring operations.

Weather thresholds

In general, higher weather thresholds for mooring loads can be tolerated when the CHS is at or close to fully loaded displacement. Masters and POAC/STS Superintendents are to be aware that weather thresholds may change significantly during an STS operation. A larger ship can be expected to have a higher mooring load weather threshold than a smaller one.

Long period waves and swell

STS operations in locations subject to long period waves are to be undertaken with caution. The load on mooring lines at any specific significant wave height increases as the wave period,or period of encounter, increases.

A long period swell will result in a greater rolling motion between the two ships. Care should be exercised when planning a turn in a long period swell to prevent moorings being over-stressed.

Direction of wave encounter

Wave encounter from a beam direction during STS operations should be avoided. This requires particular attention when using exposed anchorage STS locations that are subject to strong currents, where the ships can lie at a large angle to the wind and waves.

When conducting STS operations underway, the optimum wave direction to control mooring loads is usually considered to be from the quarter, with the larger ship to windward.However,depending on the relative size and displacements of the two ships ,this may not always be the case.For example, when both ships are of similar size and the receiving ship's displacement increases relative to the discharging ship,the optimum mooring load wave encounter direction may change to the starboard bow, with the receiving ship lying to windward. In such a case it may be advantageous to have sea room available for course alterations across the wind.

Elasticity of mooring arrangement

Nylon tails of approximately 11 m in length are recommended to improve the elasticity of the mooring arrangement. Under some circumstances in exposed locations, longer tail lengths may improve the overall integrity of the mooring system.

Chafing protection

Synthetic moorings passed through shipside fairleads may be subjected to chafing from cyclical loading due to the ship's motion. Lines can be protected with suitable chafing covers. The covers may be lubricated to minimise the potential of them being damaged.

7.6.5 In port double banking mooring operations

The mooring configuration should be agreed in advance between the CHS and MS expected alongside, so that crews have sufficient notice to prepare the moorings and ensure that there is no confusion as to when the mooring ropes will be sent out and from which location.

STS operations often involve mooring alongside ships with a higher freeboard and it is recommended that all lines are led through closed fairleads to avoid the possibility of lines jumping out of the lead. Mooring lines are to be secured to bitts, bollards or cleats, with the correct SWL.

Tugs can be used to control the approach to a ship that is moored alongside. Outboard anchors may also be used to assist, and a sufficient length of cable should be used to provide the necessary drag force.

Bow and stern thrusters, when fitted, are to be used to full advantage. Consideration should be given to the effects that the use of the thrusters may have on the CHS and any other ships alongside.

The first lines sent to the CHS will usually be the spring lines, followed by head and stern lines. Should the spring lines be used to assist in bringing the ship alongside, consideration should be given to the impact on the CHS and the added force being placed on their moorings.

Every effort should be made to prevent chafing of the mooring lines at the chocks or fairleads of both ships. The moorings are to be checked and tended regularly to ensure proper tension is maintained throughout the transfer operation.

Mooring plans are to anticipate and allow for the effects of port traffic passing near the transfer location.

7.7 Dynamically positioning ships involved in STS operations

When a ship purpose built for Dynamic Positioning(DP) operations is to be used for an STS operation, there are additional considerations to be taken when the mooring plan and JPO are being compiled.

During the planning phase, the STS organiser and service provider might decide that one of the conventional approach methods previously described in this chapter is preferred. However, the superior manoeuvrability and propulsion redundancy over a conventional tanker may make a DP ship more suited to be MS even if it is the larger and/or loaded ship. From a risk management perspective, it may be advantageous to derive an alternative approach plan where the DP ship is manoeuvred alongside the conventional ship. In such a case, it is recommended that a risk assessment and simulation studies are conducted to develop operating procedures with clearly defined parameters.

The following should be considered:

- Thrusters are most effective at low vessel speed, so the at-anchor approach method is preferrable to the underway approach.
- Tugs, if available, are to be made fast and used for the manoeuvring operation. Thrusters are to be available as redundancy only.
- Manoeuvring the ship in DP mode should be avoided during the approach as this is unlikely to correctly interpret and manage the external dynamic forces exerted by tugs and/or the other ship.
- If thrusters are to be used during the STS transfer operation, a mooring study should be conducted to develop operating procedures and to ensure the integrity of the mooring systems , on both ships, is not compromised.
- Where the DP ship is manoeuvring to a smaller ship at anchor the load on the smaller ship's anchor chain should be considered.

8 CARGO TRANSFER

8.1 Liquefied Petroleum Gas Carriers

While this section provides guidance on STS operations for LPG between LPG Carriers (LPGCs), the guidance may be useful for cargoes including ethylene, CO_2 and other chemical gases. However, a specific risk assessment should be conducted in each case and any additional measures deemed necessary should be considered before proceeding with the planned STS operations. Nearshore floating terminals that are within a port facility may find Liquefied Gas Terminals-Site Selection, Design and Operation of Marine Facilities useful.

8.1.1 Responsibility for cargo operations

Cargo transfer operations should be agreed while considering technical and operational limitations imposed by either ship and/or cargo transfer equipment. The person in charge of the cargo operations for each ship should be identified and their details exchanged with the other ship. Should an emergency occur, both ships crews should respond in accordance with their contingency manuals. Where applicable, a copy of the agreed JPO should be available on the bridge, Cargo Control Room (CCR) and Engine Control Room (ECR) and all personnel should make themselves familiar with its content.

8.1.2 Pre-transfer procedures

When the ships are securely moored and before cargo transfer starts, communications should be established between the personnel responsible for cargo operations on each ship and the pre-transfer checks should be completed, including joint completion of the STS Safety Checklist (see Appendix A).

Manifold connections: Once the cargo transfer equipment has been connected, the connections should be pressurised and tested for leaks.

Figure 8.1.2 Hose connection on LPG STS operation

Emergency Shutdown systems (ESD)

Both ships should test their ESD systems not more than 48 hours before STS operations commence and should advise the STS Superintendent of successful completion of these tests. The tests should be documented following the STS procedure.

Linked Emergency Shutdown systems

The IGC Code mandatorily requires all LNG carriers to be fitted with a ship/shore link (SSL) for ESD systems. It is strongly recommended that all STS cargo transfer operations use linked ESD systems. The purpose of the linked ESD systems is to mitigate the consequences of an emergency by allowing either ship to stop cargo transfer in a safe manner so as to minimize consequences of emergency to the greatest extent possible.

During cargo transfer operations all ships should, as far as practicable, conform to the philosophy for ship/shore ESD detailed in SIGTTO ESD Systems-Recommendations for Emergency Shutdown and Related Safety Systems.

Before cargo transfer commences, the ESD systems on both ships should be re-tested to ensure correct system operation. Both ships should discuss and agree actions in event of ESD activation, including vapour management procedures.

A risk assessment to ascertain the need for an ERC should be undertaken. Factors to be considered in the assessment include the number of hoses in use and the time required to disconnect them in an emergency.

8.1.3 Planning for cargo transfer

When preparing cargo loading and discharging plans, due regard should be given to ensuring that adequate stability is maintained, hull stresses remain within limits and free surface and sloshing effects are managed. Cargo transfer operations may have to be suspended at any time, for example due to adverse weather or loss of critical equipment.

All critical stages of the STS operations should be identified, discussed and included in the ships' cargo plans.

Damage stability requirements should be verified and complied with throughout the operation. Consideration should be given to including verification of both intact and damage stability requirements at the planning stage.

The cargo transfer operation should be agreed in writing between both ships and, where applicable, should include:

- Means of communication;
- Expected duration of operation;
- Watch or shift arrangements and measures to prevent fatigue, especially when back-to-back STS operations are scheduled;
- Quantity of each grade of cargo to be transferred, including quantities on board before and after cargo transfer;

- Specific requirements for handling static accumulator cargoes;
- Determining safe loading levels, considering the impact of ship motion on the accuracy of in-tank ullaging/gauging systems, the operation of independent high-level alarms and the potential for the carryover of cargo into vapour systems in the event of over filling;
- Sequence of grades, cargo density, temperature and specific precautions such as those that might be necessary for toxic, flammable and static accumulator products;
- Supply and compatibility of transfer hoses and equipment, including insulating arrangements;
- Details of cargo transfer system, number of pumps and maximum permissible pumping pressure/heat exchangers, compressors, reliquefaction plants;
- Cargo system's tank and piping maximum/minimum design temperatures/pressures. Cargo tank relief valve setting-Maximum Allowable Relief Valve Settings (MARVS), including in port and at sea settings;
- Cargo transfer rate determined for each stage of the operation (e.g. initial, maximum and topping-off). When determining the rate consider the design limits and recommended flow rates of the cargo transfer equipment, piping and venting systems and limitations due to inert gas/vapour management systems;
- Preventative measures to avoid surge pressure in the cargo lines (e.g. minimum number of tanks and lines to be open for bulk transfer rates);
- Ballasting/deballasting operations, including limitations on cargo transfer rates to maintain ship's stability;
- Quantity of ballast;
- Cargo heating/cooldown requirements;
- Details and capacity of vapour management;
- The time required by the discharging ship for starting, stopping and changing rate of delivery during topping-off of tanks;
- Agreed stopping and Emergency Shutdown(ESD) signals and procedures, including ESD arrangements and manifold valve closing times;
- Emergency and spill containment procedures;
- Applicable port and terminal requirements and local or government rules that apply to the STS operation;
- SDS information in respect of the cargo to be transferred and, if relevant, the receiving ship's previous cargo;
- Coordination of plans for cargo hose connection, monitoring, draining and disconnection;
- Personnel transfer;
- Sampling procedures;
- Any relevant SIMOPS taking place on either ship;
- Details of grades involved.
- Cargo tank pressure and temperature.

- Procedures for the use of a booster pump.
- Agreed procedures if blending or mixing is to be employed.

The agreed cargo transfer rate should not exceed the manufacturer's recommended flow rates for the cargo transfer equipment.

8.1.4 During cargo transfer

The receiving ship should control the cargo transfer operation, following the agreed cargo plan. The discharging ship should meet the requirements of the receiving ship.

Cargo transfer line cooldown

If line cooldown is required,attention should be paid to the integrity of cargo lines, the manifold area, flange connections and the cooldown rate. Increases in the flow rate should be at the receiving ship's request. Cooldown should be considered complete when the liquid lines and manifold lines on both ships have reached an agreed temperature.

Monitoring of manifolds area

Manifold connections should be tested for leak tightness prior to starting the cargo transfer. Throughout cargo transfer operations a competent person should monitor the cargo manifold areas of both ships to check the status of cargo hoses. In addition, a responsible person on each ship should be in communication with the other ship(s) and be able to immediately stop the cargo transfer in the event of any leak.

Closed operations

Cargo operations should be conducted under closed conditions.

Cargo transfer rates

Before starting the cargo transfer, the receiving ship should inform the discharge ship of the flow rates required for the different phases of the cargo operation. Cargo transfer should begin at an agreed slow rate to enable the receiving ship to check that the cargo pipeline system is correctly set. The cargo transfer rate should also be reduced to the agreed topping-off rate when the receiving ship's tanks are approaching their final ullage or sounding. Throughout the cargo transfer, and at least hourly, cargo transfer comparisons should be made between the two ships and the results logged. Any differences or anomalies should be carefully checked and, if necessary, cargo operations should be suspended until the differences are resolved. If variations in the cargo transfer rate become necessary, the receiving ship should advise the discharging ship of its requirements. The discharging ship should, similarly, inform the receiving ship of any variation in flow rates due to its operations.

Surge pressures

Incorrect operation of cargo pumps and valves may produce pressure surges that can cause damage to pipeline or cargo transfer equipment. Consideration should be given to the prevention of pressure surges by careful planning, good communication, effective control of pump speeds and the operation of valves, particularly when topping-off.

Maintaining trim and stability

During the cargo transfer, ballast operations should be performed to manage stress and stability and to minimise the differences in freeboard between the ships. Excessive trims should be avoided. Listing should be avoided, except for when cargo tank draining on the discharging ship. For STS operations at sea, to ensure full manoeuvring capability, propeller immersion should be maintained throughout the STS operation. All ballast operations should be conducted in accordance with the ship's ballast water management plan. Any national or local regulations controlling discharge of ships' ballast water must be complied with.

8.1.5 Vapour management

As with other LPG cargo transfer operations, there are safety advantages in providing a vapour return connection between ships. The vapour return can limit the need for vapour release to atmosphere and can act as a safety release or can be used to limit the need for reliquefication. However, while recommended, a vapour return connection is not essential for LPG STS operations and has the potential to lead to cargo contamination.
Refer to relevant operation guidance in ICS/OCIMF/IAPH ISGOTT.

8.1.6 Post-cargo transfer

After completion of cargo transfer the following should be carried out:

- Drain cargo hoses of liquid;
- Discharging ship to blow hot vapour/purge with nitrogen into one ship to clear the hose before disconnecting;
- Hoses disconnected,taking precautions to ensure that no liquid is left in the cargo transfer system. The pressure in the system should be released through a bleed valve or through the drain line into the vapour return line or the ship's cargo tanks;
- Cargo manifolds and cargo hoses blanked;
- Where required, authorities should be informed of completion of cargo transfer and the anticipated time of unmooring.

8.1.7 Cargo documentation and customs requirements

Companies should advise their Masters of customs' documentation requirements. It is normal for the quantity transferred to be agreed between both Masters in accordance with their individual company's instructions.

8.2 Liquefied Natural Gas Carriers

This section applies to STS operations for LNG between LNG Carriers (LNGCs) at anchor, double banking (see section 9.5 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, second edition, 2025) alongside a shore jetty or while underway.

Transfer systems should be designed and constructed to comply with the guidance in BS EN 1474 -3: Installation and equipment for liquefied natural gas. Design and testing of marine transfer systems-Offshore transfer systems.

This guidance may be used, where applicable, when establishing cargo transfer procedures for operations between ships and Floating Storage and Regasification Units (FSRUs), or LNG Floating Storage Units (FSUs) and Floating Liquefied Natural Gas (FLNG) vessels.

Nearshore floating terminals that are within a port facility may find Liquefied Gas Terminals-Site Selection, Design and Operation of Marine Facilities useful.

8.2.1 Responsibility for cargo operations

Cargo transfer operations are to be agreed considering any limitations imposed by either ship and/or the cargo transfer equipment.

The person in charge of the cargo operations for each ship should be identified and their details exchanged with the other ship.

During the cargo transfer operation two officers on each ship should be assigned cargo duties, for example, Chief Officer or gas/cargo engineer assisted by a deck officer.

Should an emergency occur, both ships' crews should respond in accordance with their respective contingency manuals. If the STS occurs within the jurisdiction of a terminal or port, the terminal/port's contingency plan and mitigating measures should be considered. Where applicable, a copy of the agreed JPO should be available on the bridge, CCR and ECR and all personnel should make themselves familiar with its content.

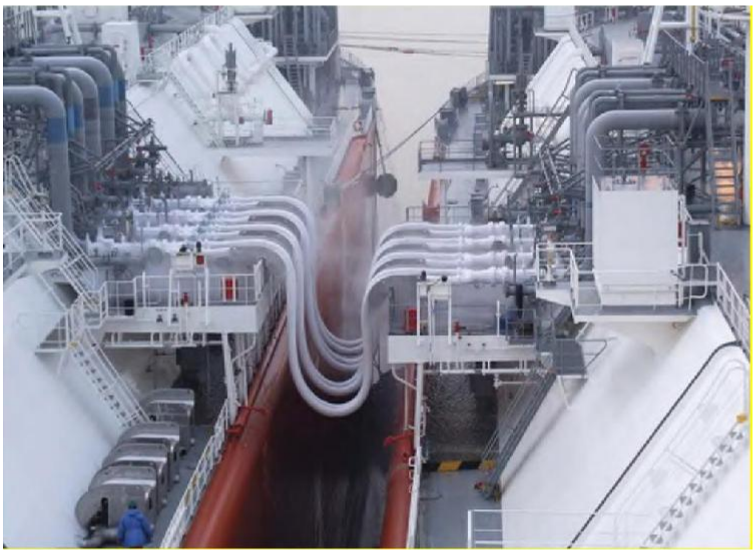


Figure 8.2.1 STS transfer of LNG carriers

8.2.2 Pre-transfer procedures

Pre-transfer checks

When the ships are securely moored and before cargo transfer starts, communications should be established between the personnel responsible for cargo operations on each ship and the pre-transfer checks should be completed, including joint completion of the STS Safety Checklist (see Appendix A).

Additional hull protection

Based upon the cargo transfer system employed,a full evaluation should be made of the need to extend the hull area protected by water in case of cargo spills. A water pool/bath under the manifold platform should be created to protect the ship's deck from potential cryogenic temperatures due to exposure from cargo leaks. For ships operating in arctic conditions, cryogenic paint is a suitable alternative to provide protection under the manifold platform (see figure 8.2.2).

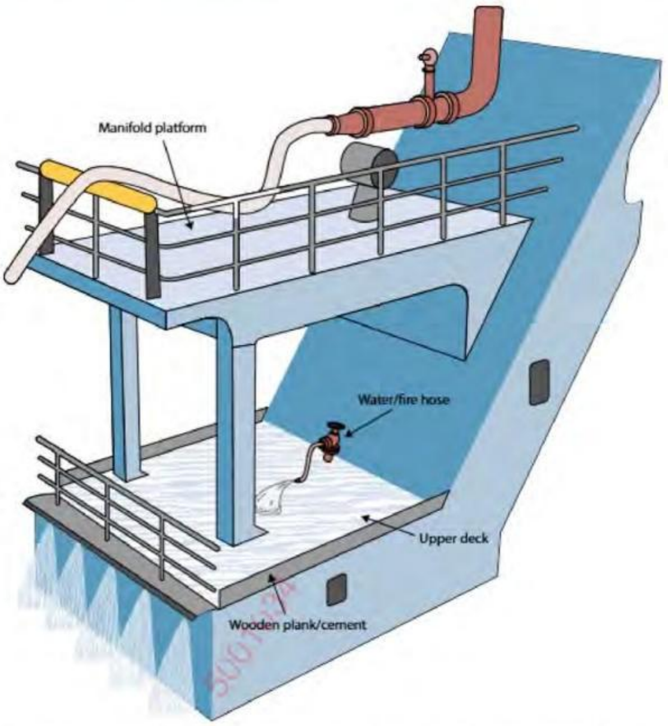


Figure 8.2.2 Typical arrangement of a water pool/bath under the manifold platform on an LNG Carrier

Manifold connection

Once the cargo transfer equipment has been connected and all cargo transfer lines have been purged using nitrogen, the connections should be pressurised and tested for leaks. Purging should be considered complete when the oxygen level at the outlet is reduced to less than 5% by volume.

Emergency Shutdown systems

Both ships should test their ESD systems not more than 48 hours before STS operations commence and should advise the STS Superintendent of successful completion of these tests. The tests should be documented following the STS procedure.

Emergency Release Systems

The ERS should be proved operational, before cargo transfer starts,by performing a functional test. This test should prove all components without separating the ERC. The system that ensures that ESD occurs prior to ERS activation should be proved operational during the functional tests. Testing the physical operation of the ERC to verify separation should be carried out once per year, or as per manufacturer's recommendations. For separation test intervals of more than one year, the manufacturer and owner should demonstrate an equivalent level of integrity. Owners should ensure that the equipment is serviced over its lifetime. Manufacturers should provide owners with sufficient information for operation, inspection, testing and condition status. Maintenance and testing should be carried out by the manufacturer or by a manufacturer approved contractor.

Linked Emergency Shutdown systems

Linked ESD systems are used in the LNG shipping industry and enable terminals and ships to execute a controlled rapid shutdown of the cargo transfer operation in abnormal or emergency situations. A linked ESD system should be used for LNG STS cargo transfer. During cargo transfer operations all ships should, as far as practicable,conform to the philosophy for ship/shore ESD detailed in SIGTTO ESD Systems-Recommendations for Emergency Shutdown and Related Safety Systems.

Emergency Shutdown system compatibility, connection and use

A detailed assessment should be made of the compatibility of the ESD systems of the ships, including confirmation of connector pin/channel allocations, as appropriate.

Electrical or optical systems offer near instantaneous activation of both ships' ESD systems under trip conditions and provide high reliability and continuous connection between the CCR hotline telephones.

In case of a sudden unexpected failure of the optical ESD system and electrical ESD systems during operations, a pneumatic system may be used as a backup. Cargo operations should not be started using pneumatic systems as the primary means of ESD. In all cases, the causes and effects of ESD system activation should be discussed and agreed. In addition, both ships should discuss and agree actions in event of ESD activation, including vapour management procedures. ESD communication channels may need to be reconfigured to ensure system functionality. Telephone links provided via the appropriate ESD link may be incorporated into communications planning discussions, as appropriate.

8.2.3 Planning for cargo transfer

When preparing cargo loading and discharging plans, due regard should be given to ensuring that adequate stability is maintained, hull stresses remain within limits and free surface and sloshing effects are managed. Cargo transfer operations may have to be suspended at any time, for example due to adverse weather or loss of critical equipment.

All critical stages of operations should be identified, discussed and included in the cargo plan.

Compliance with damage stability requirements should be verified and complied with throughout the operation. Verification of both intact and damage stability requirements should be made during cargo planning.

The cargo transfer operation should be agreed in writing between both ships and, where applicable, should include:

- Means of communication.
- Expected duration of operation.
- Watch or shift arrangements and measures to prevent fatigue, especially for ships conducting multiple STS operations back-to-back.
- Quantity of LNG to be transferred, including quantities on board before and after cargo transfer.
- Cargo and tank temperatures.
- Estimated Saturated Vapour Pressure (SVP) of the cargo to be transferred.
- When establishing safe filling levels, due account should be taken of the impact of ship motion on the accuracy of in-tank ullaging/gauging systems, the operation of independent high-level alarms and the potential for the carryover of liquid into vapour/BOG systems in the event of over filling.
- Supply and compatibility of cargo transfer hoses and equipment, including insulating arrangements.
- Details of cargo transfer system, number of pumps and maximum permissible pumping pressure, cargo tank and piping maximum/minimum design temperatures, capacity of vapour handling system and ESD arrangements.
- Cargo tank relief valve setting MARVS, including port and sea settings.
- Cargo transfer rate determined for each stage of the operation (e.g. initial, maximum and topping-off). When determining the rate, consider the design limits and recommended flow rates of the cargo transfer equipment/piping/venting systems and limitations due to vapour management systems.
- Preventative measures to avoid surge pressure in the cargo lines (e.g.minimum number of tanks, lines to be open for bulk transfer rates).
- Ballasting/deballasting operations, including limitations on cargo transfer rates to maintain each ship's stability.
- Details of BOG management.
- The time required by the discharging ship for starting, stopping and changing rate of delivery during topping-off of tanks.
- Agreed stopping and ESD signals and procedures,including ESD arrangements and manifold valve closing times.
- Location and quantity of ballast and slops, including disposal.
- Emergency and spill management procedures.
- Applicable port and terminal requirements and local or government rules that apply to the STS operation.
- SDS information in respect of the cargo to be transferred.
- Coordination of plans for cargo hose connection, monitoring, draining, purging and disconnection.

- Personnel transfer.
- Sampling procedures.
- Any relevant SIMOPS taking place on either ship.
- Line cooling requirements.
- Cooldown procedures.
- Initial cargo transfer rate.
- Maximum cargo transfer rate.
- Vapour pressure differentials and maximum allowable values.
- Procedures for the control of vapour pressure.
- If applicable, sloshing zones and a contingency plan for internal cargo transfer in the event of a prolonged interruption of cargo transfer.
- Draining and purging procedures.

The agreed cargo transfer rate should not exceed the manufacturer's recommended flow rates for the cargo transfer equipment.

Obtain metocean data for the STS area, including significant wave height,wave period, wave heading, velocities of currents and wind data. Ship motion in response to relatively low significant wave heights (height<1m) can be substantial, particularly if the wave period is long(more than 10 seconds).

Excessive ship motion is recognised as having the potential to generate sloshing damage in partially filled LNG membrane cargo tanks systems. While it is generally regarded that sloshing does not pose a significant risk of cargo tank damage for LNG Carriers alongside at LNG terminals, ship motion during STS operations at anchor or underway does pose a higher risk of damage.

Owners should be guided by their Classification Societies and the containment system designer regarding the risk of sloshing damage and safe operational parameters. Consideration should be given to numerical and/or physical modelling of the ships' motions and resultant sloshing loads for expected environmental conditions and if insufficient data is available to perform such detailed analysis, a sheltered location should be selected.

8.2.4 During cargo transfer

The receiving ship should control the cargo transfer operation, following the agreed cargo plan. The discharging ship should meet the requirements of the receiving ship.

The following is recommended:

Cargo transfer line cooldown

The use of one or more cargo spray pumps, set up to recirculate back to their respective tanks, is recommended for the cooldown of the cargo transfer lines. At the start of the cooldown of the cargo transfer lines, particular attention should be paid to the integrity of cargo lines, the manifold area, flange connections and the cooldown rate. Increases in the flow rate should be at the receiving ship's request. Cooldown should be considered complete when the liquid lines, manifold and cargo transfer lines on both ships have reached an agreed temperature.

Monitoring of manifolds

Throughout cargo transfer operations a competent person should observe the cargo manifold areas of both ships to monitor the status of the hoses. Observations should be from a remote location, such as the trunk deck or by closed circuit TV. In addition, a responsible person on each ship should be in communication with the other ship(s) and able to immediately stop the cargo transfer. Monitoring of the ERS equipment should be carried out throughout the cargo transfer.

Cargo transfer rates

Before starting the cargo transfer, the receiving ship should inform the discharge ship of the flow rates required for the different phases of the cargo operation. Cargo transfer should begin at an agreed slow rate to enable the receiving ship to check that the cargo pipeline system is correctly set. The cargo transfer rate is also be reduced to the agreed topping-off rate when the receiving ship's tanks are approaching their final ullage or sounding. Throughout the cargo transfer, and at least hourly, cargo transfer comparisons should be made between the two ships and the results logged. Any differences or anomalies should be carefully checked and, if necessary, cargo operations should be suspended until the differences are resolved. If variations in the cargo transfer rate become necessary, the receiving ship should advise the discharging ship of its requirements. The discharging ship should, similarly, inform the receiving ship of any variation in flow rates due to its operations.

Surge pressures

Incorrect operation of cargo pumps and valves may produce pressure surges that can cause damage to pipeline or cargo transfer equipment. Consideration should be given to the prevention of pressure surges by careful planning, good communications, effective control of pump speeds and the operation of valves, particularly when topping-off.

Maintaining trim and stability

During the cargo transfer, ballast operations should be performed to manage stress and stability and to minimise the differences in freeboard between the ships. Excessive trims should be avoided. Listing should be avoided except as required for cargo tank draining on the discharging ship. To ensure full manoeuvring capability, propeller immersion should be maintained throughout the operation. All ballast operations should be conducted in accordance with the ship's ballast water management plan. Any national or local regulations controlling discharge of ships' ballast water must be complied with.

Topping-off

LNG cargo tanks might be loaded to levels more than 98%capacity when the operation takes place alongside a shore terminal. However, in open waters there is the potential for greater ship motion, thereby risking activation of the tank protection and/or ESD systems by tank high-level alarms at lower cargo volumes. This should be considered when developing the cargo transfer plan. The topping-off of cargo tanks should be conducted at a reduced rate, one tank at a time in the sequence agreed with the discharging ship during pre-transfer discussions. The receiving ship should request decreases in flow rate.

8.2.5 Boil Off Gas management

Close liaison on Boil Off Gas (BOG) management should be maintained between the ships and a methodology should be agreed before the start of the cargo transfer to ensure no vapour is released to the atmosphere. Both Masters should clearly understand each ship's BOG burning capacities. The overall vapour load during the cooldown of the cargo transfer system may be reduced by pre-cooling the ships' liquid headers before mooring, provided the manifolds on the ships are isolated by double block valves.

Both ships should be aware of the potential for a rapid increase in vapour pressure during the initial stages of cargo transfer operations and be prepared to stop cargo transfer until the BOG management and vapour transfer systems reduce the vapour pressure to agreed operational levels.

8.2.6 Operations after completion of cargo transfer

On completion of the cargo transfer, all cargo transfer lines should be drained and purged with nitrogen until a reading at the disconnection point of less than 2% methane by volume is detected. At this stage, the cargo transfer equipment should be disconnected and blanked.

Certain composite hose types are known to entrain small quantities of vapour within the inner layers of the hose material. Procedures should be developed to ensure a non-flammable atmosphere is maintained in the hoses after disconnection. These procedures include the fitting of end blanks and additional purging.

Further information on the draining and purging of cargo transfer systems is contained in LNG Transfer Arms and Manifold Draining, Purging and Disconnection Procedure.

8.2.7 Cargo documentation and customs requirements

Companies should advise their Masters of customs documentation requirements. It is normal for the quantity transferred to be agreed between both Masters in accordance with their individual company's instructions.

9 UNMOORING

9.1 Preparations for unmooring

On completion of cargo transfer and hose disconnection, it is common practice for the unmooring of the ships to commence as soon as practicable. However, the POAC/STS Superintendent and Masters should assess the risk of this against delaying it for more favourable conditions. The factors to consider include:

- Fatigue of personnel.
- Daylight or nighttime unmooring.
- Restricted visibility.
- Existing and forecast metocean conditions.
- Cargo sampling requirements, which are not to delay unmooring if they will present an unacceptable risk.

Prior to unmooring, checklist 6B (see appendix A) should be completed by each ship and confirmation provided to the other ship that all items have been confirmed satisfactory.

The bridge teams and officers on mooring stations on both ships should understand the sequence in which lines will be released and the method of releasing. This should be discussed during the pre-operation toolbox talk.

If required, a broadcast should be made on the appropriate VHF channel(s) to alert vessels in the vicinity and request a wide berth during the unmooring manoeuvre (see section 6.4 of SIGTTO Ship to Ship Transfer Guide 2025, Second Edition).

9.2 Unmooring while one ship is at anchor

Unmooring at anchor should be carried out by trained and experienced persons who can accurately assess tidal conditions and yawing of the anchored ship. Unmooring operations are not to start during a change of tide. Where the ship is not fitted with thrusters, environmental conditions should be carefully assessed and the unmooring sequence carefully planned. Alternative considerations include the use of tugs or weighing the anchor for unmooring to be conducted when underway.

The sequence for singling up will be determined by the POAC/STS Superintendent and both Masters and will be dependent on factors including weather, current, tug availability and personnel experience. The unmooring sequence should be agreed and followed by all parties. Thrusters (if available), main engine movements and rudder angles should be used carefully, while being fully aware of the effect on the heading of the anchored ship and avoiding any inducement to cause it to yaw.

9.3 Unmooring after underway transfer

Where STS operations have taken place underway,options to assist in separating the ships include:

- Manoeuvring both ships to position the ship with the highest freeboard on the downwind side.
- With little or no wind, manoeuvring the ships so that the swell is ahead to assist with separating the bows.

To minimise the effects of interaction, it is recommended that minimum speeds are maintained that are appropriate for the prevailing weather conditions. All moorings are to remain on the winch brakes until instructions are received from the Master to place winches in gear.

The sequence of mooring line release should be planned for each operation, considering the prevailing weather conditions. The unmooring sequence should ensure that propellers are kept clear. The tension on the mooring lines and compression of individual fenders should be monitored throughout.

Sailing against the wind and waves helps ships to separate. The proximity of the aft ends of both ships and compression on the aftermost fender should be monitored closely as the bows move apart. The MS should avoid crossing close ahead of the CHS. The CHS should not start manoeuvring until it has been advised that the MS is clear.

Local conditions or ship configurations can cause difficulties in separating two ships and alternative manoeuvres may need to be considered.

9.4 Unmooring from a ship alongside a terminal

Where required, permission from harbour authorities and/or the terminal is to be obtained prior to starting unmooring operations. Unmooring operations should be conducted following procedures agreed by both Masters and particular attention should be given to prevailing weather and tidal conditions.

Where multiple ships are alongside, the POAC/STS Superintendent should give consent for the unmooring operation and all other vessels should be made aware of the planned departure. This also applies to the unmooring of unmanned barges.

If unmooring takes place during hours of darkness, consideration is to be given to reducing background lighting to be fully aware of other vessels and the proximity of navigational hazards, while ensuring that all working areas are adequately and safely lit.

Within port limits, the services of a pilot and tug support may be required by local regulation.

Bow and stern thrusters, when fitted, should be used to full advantage. Consideration should be given to the effects that the thrusters may have on the CHS and any other ships alongside. However, this is not to detract from the safety of ongoing cargo operations. Port regulations may require that licensed line handlers be used and these are to be arranged in advance, to board with the pilot.

If spring lines are used for springing off, consideration should be given to the added force likely to be placed on the other ship's moorings. Secondary fenders should be ready for positioning to prevent contact between the hulls.

9.5 Unmooring using quick release arrangements

Care should be taken to ensure that mooring lines are released in a sequential, efficient and safe manner and do not compromise the ability of either ship to use their engines for manoeuvring, including in emergency situations. This operation should be planned and requires clear communication and supervision.

POAC/STS Superintendents or Master and ships' crews can apply different methodologies to carry out this task safely and effectively. One method involves the use of quick release hooks secured around the mooring bitt, another uses a toggle pin in conjunction with a messenger to take the load of the mooring line while it is removed from the mooring bitt (see figure 9.5). There are some ships that have quick release hooks permanently mounted on deck and this needs to be considered in the STS mooring pre-planning stage as well as unmooring. Mooring lines attached to quick release hooks should not be released when under load and the lines should be slacked down prior to release.

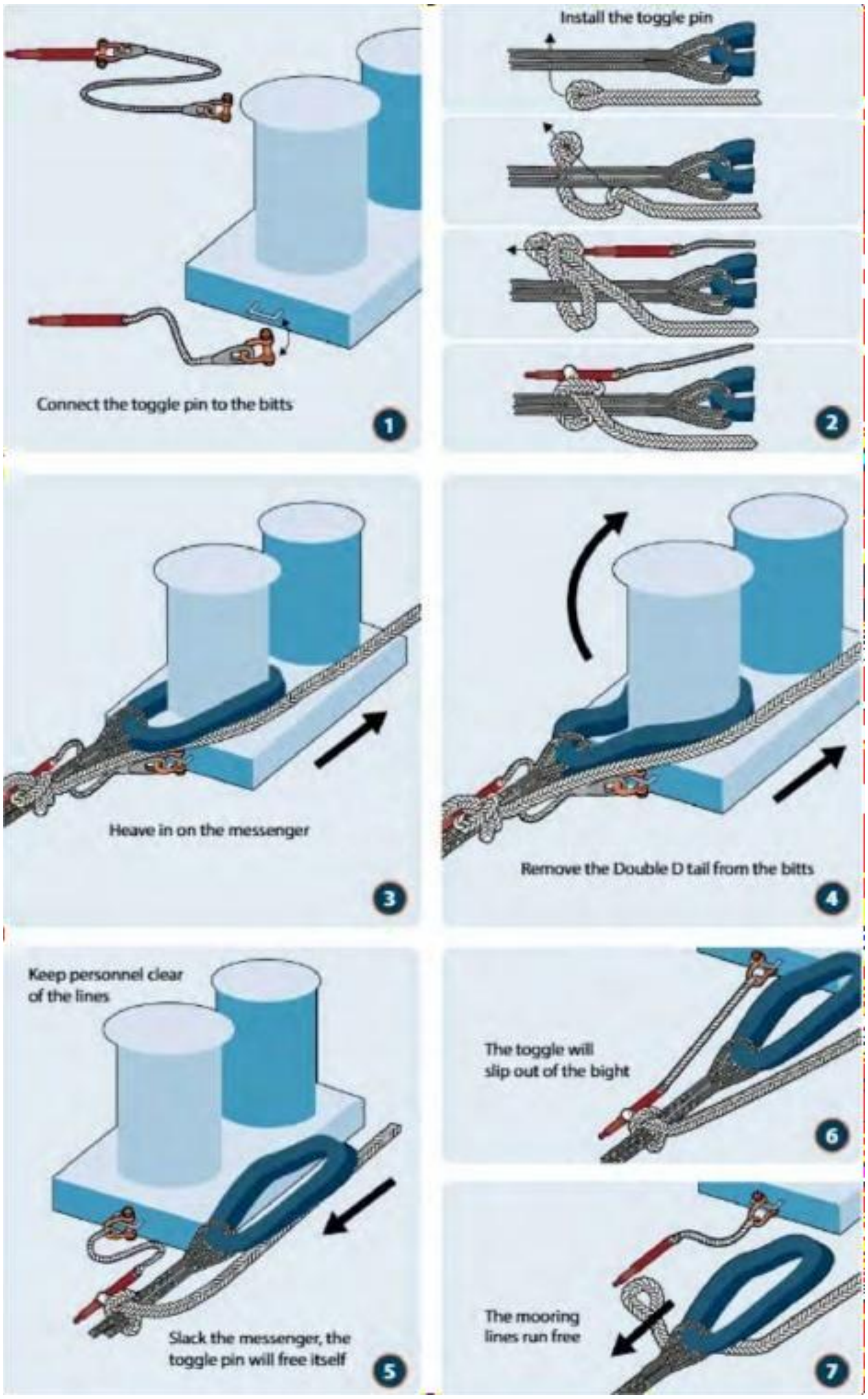


Figure 9.5 Unmooring with toggle pins with Double D tails installed

Step 1: Connect the toggle and pad-eye with shackles. (as shown in Figure 9.5①)

Step 2: Send out the messenger from the winch. The end of the messenger is to have a small eye ring. Wrap the messenger around the mooring line once and then pass it through the small eye ring at the end to form a rope loop (the rope loop is to be large enough for the toggle pin to pass through). Pass the toggle pin through the rope loop and then pull the rope loop tight. (as shown in Figure 9.5②)。

Step 3: Heave in on the messenger. (as shown in Figure 9.5③)

Step 4: Remove the Double D tail from the bits. (as shown in Figure 9.5④)

Step 5: Slack the messenger. (as shown in Figure 9.5⑤)

Step 6: The boggle will slip out of the bight. (as shown in Figure 9.5⑥)

Step 7: The mooring lines run free. (as shown in Figure 9.5⑦)

10 PERSONNEL TRANSFERS

10.1 Introduction

During STS transfer operations, the frequency of personnel transfers should be kept to a minimum. If the risk assessment identifies unacceptable risk to personnel by any transfer method, personnel transfer should not be allowed. Contingency plans for personnel transfer are be driven by the risk assessment produced for the personnel transfer operation and be available before transfer of personnel begins.

During STS transfer operations, pilot ladder/combination ladder transfer, Personnel Transfer Basket (PTB) transfer, helicopter transfer and gangways transfer may be adopted. The safest transfer method should be selected based on the specific transfer circumstances and risk assessment, with the following personnel transfer methods recommended:

Pilot ladder/combination ladder transfer

This method is best suited in sheltered waters/in port conditions with a highly manoeuvrable fit for purpose support craft, such as a pilot boat.

PTB transfer

This is most common in offshore and anchorage locations where the Lightering Support Vessel (LSV) used for personnel transfer is a multi-purpose craft designated to handle fenders and transfer hoses.The limited manoeuvrability and lack of suitable boarding areas make LSVs less suited to pilot/combination ladder boarding but can offer the open aft deck as a safe landing zone for the PTB.

Helicopter transfer

This method is applicable to ships with a certified helideck/winching areas. For the relevant guidelines, see ICS *Guide to Helicopter/Ship Operation*s.

Gangways transfer

This method is commonly used in port STS operations between small vessels with similar freeboards, with barges alongside ships with a low freeboard.

It is recommended that:

- Gangways should only be used in sheltered locations where there is little ship movement. If used, gangways should be of a lightweight electrically insulated type fitted with rails and complete with a safety net and should be maintained to ensure they always remain within safe design operating limits.
- Open rung ladders should not be used.
- Guidance on the provision of safe access equipment can be found in ISGOTT by ICS/OCIMF/IAPH. When support boat transfers take place using accommodation/pilot ladder combinations, these should be rigged as per SOLAS Regulation V/23 - Pilot Transfer Arrangements

and IMO Resolution A.1045(27) - Recommendations to Pilot Transfer Arrangements, amended by IMO Resolution A.1108(29)·

- Consideration should be given to the sea conditions, the manoeuvrability of the support boat and its suitability for the proposed transfer method.
- Consideration should be given to the experience and fitness of transferring personnel.
- A hazard identification and risk assessment should be conducted for each STS operation that will include personnel transfer.
- Confirmation that equipment is inspected, maintained and tested following:
  - Flag State, Classification Society and manufacturers' requirements.
  - The ship's planned maintenance system.
- Key personnel should be trained in crane operations for PTB use. These include crane operators, signallers, responsible person and support vessel crew.
- Ships should have specific procedures for personnel transfer by crane. The procedures should include the requirement to perform a hazard identification and risk assessment for the transfer of personnel using a PTB (see section 10.2.2).
- Contingency and emergency planning should include guidance on requirements for Personal Flotation Devices (PFD), personal protective equipment (PPE), rescue boats, provision of emergency response teams, life-saving equipment and plans for evacuation of injured personnel.

The use of cranes with PTB has long been practised between offshore support vessels and offshore platforms, where regulations and guidelines cover this activity. An equivalent level of regulation and guidance does not currently exist for transfers of personnel between ships engaged in STS operations.

10.1.1 Hazard identification and risk assessment

The following elements should be considered or confirmed before selecting the transfer method and starting personnel transfer:

- Any national or local regulations, or relevant codes of safe working practice, for transfers of personnel at sea.
- Maintenance and inspection records of relevant equipment.
- Personnel involved in the transfer operation are trained and understand the risk assessment.
- Physical condition of the personnel being transferred.
- A deck officer is available to supervise the personnel transfer operation.
- The method of transfer is suitable for prevailing and anticipated environmental conditions.
- All required equipment is available for the selected method of personnel transfer.
- A risk assessment that evaluates the risks associated with the potential options for transfer (see Appendix B). The risk assessment should document the mitigation measures required, during the personnel transfer operation, to manage any residual risk.

The following potential hazards should be considered when developing the personnel transfer risk assessment:

Lifting equipment:

- Failure of critical components due to inadequate inspection, maintenance or exceeding equipment limitations (such as dynamic loading or continued use of a defective/damaged PTB/ladder).
- Power failure resulting in inability to recover the PTB.
- Brake failure resulting in an uncontrolled drop of the PTB.
- Failure of hoisting winch or luffing rams during critical stages of the operation.

Environmental:

- Excessive ship motion.
- Excessive winds leading to instability of the PTB.
- Poor visibility or inadequate lighting (inability to see the other ship or the personnel being transferred).
- Severe cold weather conditions, such as ice or snow (restriction of personnel movements due to additional protective clothing).

Human error:

- Loss of lee during the transfer causing excessive ship motion.
- Failure to properly secure vehicle (PTB slips from hook, fouled tag lines or ladder improperly secured).
- Loss of control due to inadequate training, poor planning or failure to follow procedures.
- Miscommunication results in loss of control.
- Loss of control due to fatigue.
- Loss of control due to distractions during SIMOPS.
- Loss of control due to complacency.

Human error (personnel being transferred):

- Failure to maintain points of contact with the PTB, i.e. letting go of the PTB due to vertigo, contact with structure or icy conditions.
- Loss of control due to lack of experience, inadequate training, or failure to follow safe techniques or the transfer plan.
- Loss of control due to fatigue, distraction, complacency or miscommunication.

Inadequate planning:

- Exceeding equipment limitations, i.e.: crane reach/height, ladder too long or short, inadequate landing/lifting area.

- SIMOPS in the vicinity of the landing/lifting area.
- Obstructions in the landing/lifting area.
- Liquids discharged overboard, e.g. ballast water, creating turbulence in the water and causing loss of control of smaller ships engaged in the personnel transfer.

10.2 Transfer using a Personnel Transfer Basket and ship's crane

10.2.1 Cranes

For ships transferring personnel at sea by crane, it is recommended the equipment should be certified for personnel transfer. This applies to both newbuildings and existing ships.

It is recommended that cranes intended to be used for personnel transfer, which are not certified for personnel transfer, meet the following minimum requirements, along with Flag State and/or Classification Society requirements where applicable.

- Cranes located in the parallel mid-body of the ship (at the ship's manifold) should be used for personnel transfer. Cranes at the ship stern, e.g. stores cranes, should not be used.
- There should be sufficient outreach to safely clear the other ship's rails, considering the fender diameter to be used.
- SWL of the cranes should be reduced to 50% of the normal rating when transferring personnel.
- Safety Factor (SF) of the crane wire should be at least 10:1.
- Brakes should be automatically activated when:
  - Controls are in the neutral position.
  - The emergency stop has been activated.
  - There is a power failure.
- Brakes should be fitted with a manual override.
- Crane hooks should be fitted with a positive locking (safety) latch.
- Freefall or non-powered lowering should not be used when transferring personnel.
- Safety limit devices for upper and lower limits of hoisting and luffing should be fitted and tested prior to use.
- The crane and all its components should be maintained in accordance with the ship's planned maintenance system and manufacturer's recommendations.

10.2.2 PTB

All PTBs intended to be used for personnel transfer should be certified and meet local regulations, and should be confirmed that the certification is valid. All PTB equipment, including hooks, slings and shackles, should be marked with their SWL.The PTB should be marked with the capacity limit or SWL.

It is recommended that PTBs meet the following criteria:

- The empty weight should be stated on the PTB certificate.

- Crane hook pennants should be long enough to keep the crane block clear of personnel being transferred but allow the PTB to be lifted over the ship's rail.
- Hooks used for personnel transfer should be provided with latches fitted with positive locking to prevent accidental opening. A locking device and/or arrangement that operates by retaining spring force is not considered to be a positive locking latch.
- Two tag lines appropriate for the specific operation should be secured to each PTB and never be wrapped around or secured to a strong point. Tag lines should:
  - have a diameter between 16 and 19mm (5/8 to 3/4 inches).
  - be secured at opposing ends of the base ring of the PTB or at the lowest point reasonably accessible. This ensures best control of the PTB, particularly when the crane is slewed.
  - be long enough to reach the water at the lightship draught of the active ship with sufficient handling allowance.
  - have ends that are seized. Knots or back-splices should not be used as they may get snagged, causing the PTB to tip.
- The PTB should be inspected in accordance with the manufacturer's guidelines before the transfer begins.

10.3 Responsibilities during personnel transfer

The vessel whose crane is to be used for the personnel transfer is known as the active vessel. The passive vessel is the one whose crane will not be used. The passive vessel could be a ship, a launch or an LSV.

The decision to transfer personnel by crane should be made by:

- Both Masters.
- The personnel being transferred.

All personnel involved have the authority to stop the transfer.

10.4 Personnel transfer by crane plan

Company policies concerning personnel transfer by crane are to include a requirement for a crane plan to be documented (see Appendix B). The crane plan should include requirements for a risk assessment to be undertaken for the personnel transfer operation. All personnel involved in the proposed transfer should be involved in the risk assessment process and crane plan development. The output from the crane plan should include statements confirming the reason for the transfer and that it is agreed to be the safest personnel transfer method available.

The crane plan is to include:

- A risk assessment conducted before each transfer or group of transfers. The risk assessment should include all personnel involved in a personnel transfer operation, including personnel to be transferred. The risk assessment should also include confirmation that the transfer of personnel by crane is the safest method of transfer available and detail the reasons for the transfer.

- An assessment of weather conditions, including visibility, wind, seas, swell and vessel movement, and agreed limitations to stop the transfer.
- A permit to work for personnel transfer by crane, where required by the SMS.
- Confirmation that the ship's equipment has been inspected, maintained and tested as detailed in the ship's planned maintenance system.
- A compatibility analysis that confirms the crane has sufficient outreach length to vertically lower or raise the PTB to or from the deck of the passive vessel without meeting any obstruction.
- Confirmation that all transferring personnel are familiar with the PTB and personnel transfer procedures.
- Confirmation that personnel being transferred have agreed to the transfer operation.
- Confirmation that all required PPEs are available, in good condition, are appropriate for conditions and personnel understand their correct use.
- Additional precautions required to conduct transfer operations after dark or in poor visibility, including additional lookouts, retro-reflective PPE, LSV on stand-by, life rings with strobes, Personal Locator Beacons (PLB).
- Confirmation that a contingency plan is in place.

Refer to the crane plan in Appendix B. Company procedures covering the transfer of personnel by crane, the agreements of ship Masters and personnel involved in the provisions in the crane plan, should be available on board both ships. It is the responsibility of the Masters to ensure procedures are followed.

10.5 Transfer preparations

10.5.1 Pre-transfer preparation

Maintenance, inspection and tests of equipment should take place before the ship arrives at the transfer location.
If multiple personnel transfers are expected over a prolonged period, the equipment should be re-inspected and, if required, re-tested.

Crane

Competent ship's personnel should inspect the crane and any lifting equipment.
The inspection should verify that the planned maintenance programme is up to date.The condition of wires and end fittings should be confirmed. An operational test of the crane and all its components should be made during the inspection.
Tests should include:

- Topping lift, where applicable, to maximum and minimum extent.

- Runner to maximum height.
- Limit switch function.
- Slewing, clockwise and anti-clockwise.
- Secondary brake.
- Mechanical brake for cylinders.
- Emergency means of recovery.

Inspections should include:

- Hydraulic systems, including oil levels, hoses and fittings.
- Hoist wire, by lowering the hook to the water and visually checking the wire condition.
- Blocks, sheaves and hook, including the operation of the safety latch.

PTB

The PTB should be inspected following the manufacturer's recommendations. A routine maintenance and inspection programme should extend the life of the equipment. Manufacturer's retirement recommendations should be followed.

10.5.2 Landing/lifting area

A suitable landing and lifting area should be so selected that will facilitate the safe embarkation/disembarkation of personnel considering:

- Size of the PTB and space required for crew members assisting the PTB as it is lowered or raised.
- Presence of obstructions, including above-deck-framing, piping, tank vents/ventilation facilities, machinery and structures, including personnel walkways, catwalks and ladders.
- Presence of overhead obstructions that might interfere with the crane's range of motion.
- Maximum and minimum crane reach limits.
- Line of sight of the crane operator and signaller.
- Presence and direction of lighting that might interfere with the crane operator's vision.
- Protection from waves resulting in seawater on deck.
- Lighting for nighttime transfers.

When selecting a landing/lifting area, the number of individual crane movements expected should be considered and an area selected that keeps crane movements to a minimum. For example, selecting a landing/lifting area further away from the crane pedestal may eliminate the need to top the boom to safely board personnel. A landing/lifting area along the arc of the maximum swing radius can be advantageous if the available topping height is sufficient.

If an LSV is used, the crane should be slewed away from that vessel's wheelhouse. If necessary, select a secondary landing/lifting area on the opposite end of the manifold.

One or more lifebuoys with water lights/strobes should be positioned on the ship's rail close to the landing/lifting area.

10.5.3 Environmental conditions

Environmental conditions should be assessed and both vessel Masters and personnel to be transferred should agree that the current weather conditions are safe for personnel transfer by crane.

10.5.4 Test transfer

Limiting conditions should be established during the risk assessment and will depend on the capabilities of the passive vessel, the size of the vessels, the relative freeboards, the conditions of load, crane limitations and vessel manoeuvrability.
If conditions are unsafe, personnel transfer operations should be postponed until conditions improve.
A test transfer, often referred to as a “dummy transfer” or “dry run”, should be made to ensure that the transfer of personnel can be safely conducted in the prevailing conditions. The test transfer should be carried out according to the personnel transfer by crane plan. The plan should be updated to include the results of the test transfer. Personnel transfer should only take place once all parties understand the risks and agree that risk mitigation measures are in place. Common practice is to transfer luggage during the test transfer, as it is not recommended to transfer these items at the same time as personnel.

10.5.5 Toolbox talk

Masters should ensure that all members of the personnel transfer by crane team and personnel to be transferred understand the crane plan .A toolbox talk should be held before the transfer begins.

10.6 Personnel transfer

The number of people and/or total weight riding in a PTB should not exceed the manufacturer's recommendations. The personnel to be transferred should:

- confirm they are willing to be transferred by crane.
- conform they are physically able to make the transfer.
- understand safe riding practices.
- secure any loose items before the transfer.
- wear PPEs, including:
  - A properly fitted PFD with reflective tape, whistle and light. The PFD should be suitable for transfer by crane, considering the height above sea level. Entering water from heights while wearing a PFD may be dangerous and personnel should be briefed on the safest

means of entering water with the available PFD. In some areas an immersion suit may be more appropriate, but the reduced mobility should be considered before use.

- A safety helmet.
- Safety shoes.
- Suitable clothing considering the prevailing conditions.

In periods of reduced visibility or at night, a personal strobe light should be attached to personnel being transferred. If the strobe is manually activated, it should be switched on before the transfer. This strobe should not be attached in a way that interferes with the individual's vision. The use of a Personal Locator Beacon (PLB) attached to the PFD is recommended.

During the transfer, personnel should:

- be evenly distributed around the PTB diameter when two or more people are being transferred.
- always grasp the PTB with both hands and follow the PTB manufacturer's instructions.
- not give signals to the crane operator.
- take guidance and instructions from the officer(s) in charge of the personnel transfer operation.
- keep knees bent during lifting and landing to absorb any sudden impacts.
- be prepared to move clear of the PTB when it is close to the deck, for example on a LSV that may suddenly rise on a wave or swell.

Any personnel who have not previously taken part in a personnel transfer by crane are to ride with an escort to guide them through the entire process.

Personnel should never stand under a load, because even with careful planning objects may fall out of a hoisted PTB.

The PTB should be lifted sufficiently to clear obstacles. The crane operator should not raise the PTB to excessive heights.Topping the boom to the extreme height is to be avoided.

Care should be taken to prevent tag lines from falling into the water or dropping onto personnel below.

Crew members working on the deck of a ship that is lower than the other should look out for falling tag lines. Personnel lowering tag lines down to the other vessel should warn the receiving crew and ensure they have visual contact with the crew below before lowering the lines.

Tag lines should never be wrapped around a railing or strong point.

Adequate lighting should be available for the landing and lifting areas. Lights should not interfere with the signaller's or crane operator's vision.

If the ship is underway, transfers by crane can be considered work that restricts a vessel's ability to manoeuvre as described in the International Regulations for Preventing Collisions at Sea (COLREGS). At that time, the Master should display lights and day shapes appropriate for a vessel restricted in its ability to manoeuvre.

10.7 Contingency and emergency planning

Contingency planning for all methods of personnel transfer should include mitigation measures documented in the personnel transfer risk assessment. The contingency plan should ensure that:

- Personnel being transferred will wear PFDs, together with survival suits where environmental conditions require.
- Personnel being transferred are equipped with strobe lights when in conditions with reduced visibility, or at night, to aid recovery in case of a fall to water.
- Rescue boats for personnel transfer recovery should:
  - be prepared for immediate deployment.
  - be manned by personnel trained and qualified in their operation.
  - have good manoeuvrability and station keeping capabilities.
  - be of a design appropriate to personnel recovery operations.
  - be compliant with Flag State small craft regulations or another internationally recognised appropriate standard.
- An emergency response team, including trained medical support members, is designated.
- Lifebuoys,boat hooks and/or heaving lines are available for immediate use.
- Ways to evacuate any seriously injured personnel to a shore-based medical facility are included.

APPENDIXA SHIPTO SHIPSAFETY CHECKLIST

1. General

Safe Ship to Ship (STS) operations require good communication between all parties, from pre-arrival to post-departure at the STS transfer area. Additionally, during an in port STS operation multiple stakeholders will be involved, who should be included in communications. The STS Safety Checklist detailed in this Appendix is designed to ensure that all the required checks are made, formally agreed and recorded.

The STS Safety Checklist is provided to support:

- Ships conducting STS operations underway, at anchor or in a port on buoys or dolphins where no terminal is involved.
- Ships conducting STS operations in port alongside a terminal.

During the preparation phase for the STS operation (see Chapter 7 and Section 3.1.1 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2025, 2nd Edition), the companies involved are planning the operation and, in the case of an in port operation, will contact the terminal to gain permission for the operation alongside the terminal.

The ship operator should conduct a compatibility assessment, which can be supported by a third party such as a POAC/STS Superintendent who can facilitate and support the operations (see Sections 1.1 and 3.1.1 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2025, 2nd Edition).

After completing the compatibility assessment for the STS operation and drafting the JPO, the STS Safety Checklist should be completed and provided to all parties.

Responsibility for the safe conduct of STS operations is shared between both Masters and if applicable the terminal operator. Each Master, at all times, remains responsible for their own ship.

Before STS operations start, the Masters (or their representatives) and, if applicable, the terminal representative, should communicate and do the following:

- Sign a copy of the JPO, or acknowledge receipt and agree to the contents.
- Agree the actions to be taken in case of an emergency.
- Complete the STS Safety Checklist.

Communication requirements (see Chapter 6 of SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2025, 2nd Edition) should be agreed before the ships arrive at the STS transfer area, to agree on the STS operations and manage any issues identified.

All parties should agree any actions and record them on the STS Safety Checklist.

Responsibility for the statements in the STS Safety Checklist is noted within each checklist and the supporting guidance. Each party accepts responsibility by ticking or initialling the appropriate box and signing the declaration in the checklist. Once signed, the checklist is the agreed basis for safe operations.

If there are any outstanding items, these should be noted for pre-arrival review by responsible parties.

2. Composition and use of the Ship to Ship Safety Checklist

The STS operation is split into five phases with each having its own checklist:

- Run and mooring.
- Pre-transfer.
- Pre-transfer conference.
- Cargo transfer.
- Post-cargo transfer.

Each party should keep the original copy of their relevant sub-sections and any declarations. A copy of checklists 3, 4 and, in case of a terminal involvement, checklist 7 is to be exchanged, as these checklists document the joint declaration.

Each party should review all statements and accept responsibility for compliance, either jointly or individually, as required. Each statement provides a primary reference where additional guidance on this subject may be found in the SIGTTO Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, 2025, 2nd Edition.

Figure A depicts how the STS Safety Checklist aligns with each phase of the STS operation.

3. Additional guidance for completing the Ship to Ship Safety Checklist

STS transfer of LPG or LNG have additional checklists 3B, 4D and 4E that should be used in addition to the main checklists.

STS transfer of chemicals, LPG and LNG have additional checklists that should be used in addition to the main checklists.

For an STS transfer alongside a terminal, checklist 7 should be used.

When checklists 3 and 4 or 7 are completed, the responsible ships' officers and, in case of in port STS operations, the terminal representative should check the relevant boxes and sign the declaration.

To complete the pre-transfer conference, all parties should agree the intervals at which they will undertake repetitive checks of items on the checklists for which they are responsible. These intervals should be noted on the declaration and on checklist 5B and, in case of terminal involvement, 5C.

All parties should retain a copy of the checklists and declarations for their files, in accordance with the operator's document retention period.

Not applicable

If the “Not applicable” tick box is used, all parties are to agree that the relevant safeguard is not applicable.

If the 'Yes' box cannot be ticked

If during the use of the checklists it is not possible to tick a “Yes” box when the check is applicable, the issue should be brought to the immediate attention of the other parties and corrected before the start of the operation. If it is not possible to correct the issue, then a joint review should be undertaken to confirm whether the STS operation can safely proceed and whether additional mitigations are required.

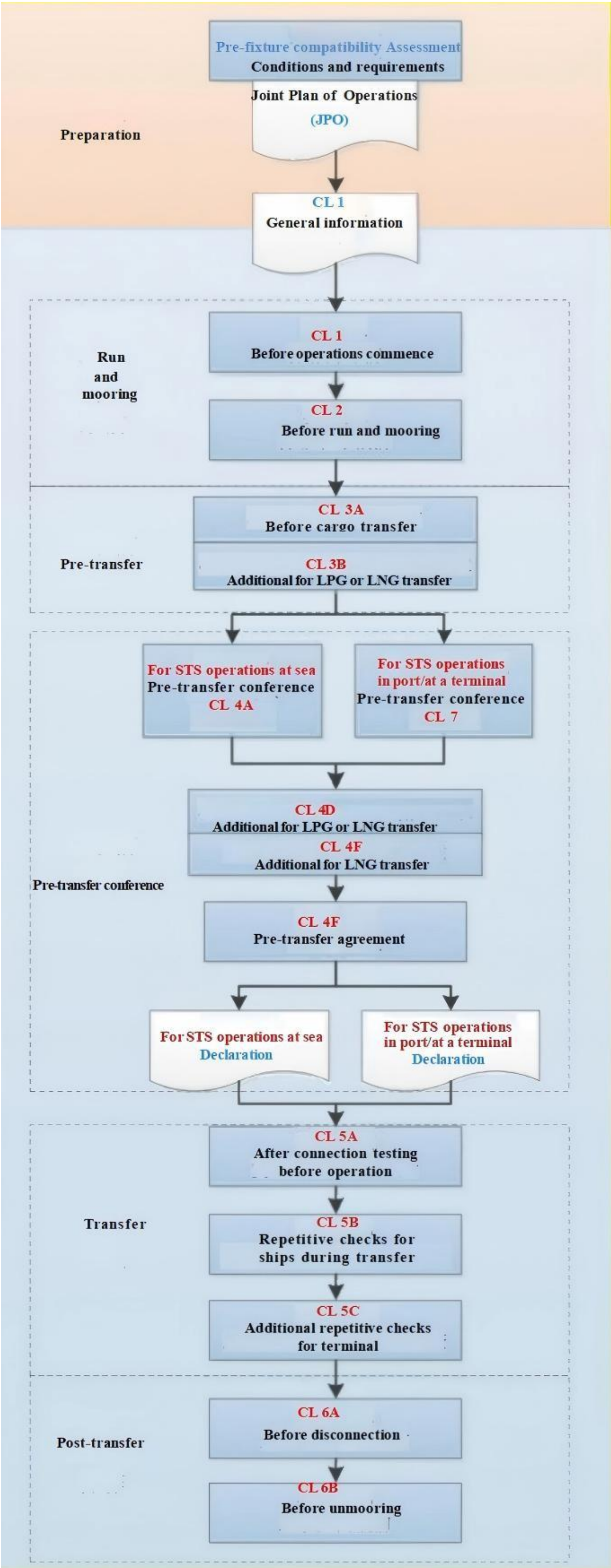


Figure A How the STS Safety Checklist aligns with the phases of the STS operation

Checklist 1 General information

Planned date and time: ____________________

Transfer location: ____________________

Terminal (if applicable): ____________________

Cargo: ____________________

Constant Heading Ship or Terminal Berthed Ship: ____________________

Manoeuvring Ship or Outer Ship: ____________________

POAC/STS Superintendent (if applicable): ____________________

Applicable specific Joint Plan of Operations (JPO): ____________________

For ship:

Checklist 1 Before operations commence

CL1	Generic Checks	Status	Remarks
1	A copy of the JPO has been received (7.2)	□Yes	
2	Effective communications are established (Chapter 6)	□Yes	Note the agreed working language in CL4F
3	Ship handling characteristics exchanged (3.1.1, 9.2)	□Yes	
4	The shipis upright at a suitable trim, without any overhanging projections (7.3)	□Yes	
5	Manoeuvring,mooring and navigational equipment has been tested and found in good order (7.3, 9.7.1, 9.7.2)	□Yes	□Not applicable if moored
6	Engineers have been briefed on engine speed (and speed adjustment) requirements (9.2.1)	□Yes	□Not applicable if moored
7	Main engine(s) are available without any power limitations (4.12)	□Yes	
8	Weather forecasts have been reviewed and will be monitored (3.4,7.3)	□Yes	
9	Crew briefed on the mooring procedure and JPO (9.7.3)	□Yes	
10	STS contingency plan agreed and an appropriate emergency drill has been conducted (Chapter 12)	□Yes	
11	Notifications required by local regulations are sent (3.2)	□Yes	

For ship:

Checklist 2 Before run in and mooring

CL2	Generic Checks	Status	Remarks
1	Fenders and associated equipment are visually inspected, in good condition, correctly positioned and rigged (1.1)	□Yes	
2	There are no overhanging projections on the side of berthing (9.2.1)	□Yes	
3	A proficient helms person is at the wheel(9.2.1)	□Yes	□Not applicable if moored
4	Course and speed information is agreed (7.1)	□Yes	□Not applicable if moored
5	The method for controlling the ship's speed is agreed (9.2.1)	□Yes	□Not applicable if moored
6	Navigational signals are displayed (7.5)	□Yes	□ Not applicable if moored
7	Adequate illumination is available (8.4)	□Yes	
8	Power is available for mooring winches and they are in good order (8.3)	□ Yes	
9	Mooring lines, rope messengers, rope stoppers, chain stoppers and heaving lines are ready for use (Chapter 8)	□Yes	
10	Crew are standing by at their mooring stations (7.3, 9.2.4)	□Yes	
11	Communications are established with mooring personnel and with the other ship (6.5)	□Yes	
12	Firefighting and anti-pollution equipment is ready for use (4.16 and Chapter 12)	□Yes	
13	Shipping traffic in the area is being monitored and, if applicable,Vessel Traffic Services (VTS) are informed (6.4 and Chapter 9)	□Yes	
14	The Automatic ldentification System (AIS) is appropriately set (4.14.2)	□Yes	
15	Cargo tanks are inerted (10.1.5, 10.2.6)	□Yes	□Not applicable

Checklists 3ABefore cargo transfer

CL3A	Generic Checks	Status	Remarks
1	Mooring and fendering arrangement is effective (Chapter 8)	□Yes	
2	Unused cargo connections are blanked	□Yes	
3	The ships plan to use vapour balancing (10.1.5, 10.2.6)	□Yes	□Not applicable
4	Inert Gas System (IGS) is ready for use (10.1.5, 10.2.6)	□Yes	□Not applicable
5	Firefighting equipment is ready for use (4.16)	□Yes	
6	Spill response equipment is on station and ready for immediate deployment (Chapters 10 and 12)	□Yes	
7	Scuppers and save-alls are plugged	□Yes	
8	Cargo system sea connections and overboard discharges are secured	□Yes	□Not applicable
9	Designated transceivers are in low power mode and designated radio antennae are isolated (4.14.2)	□Yes	
10	External openings in superstructure are closed	□Yes	
11	Spaces to be routinely monitored for any build-up of flammable and/or toxic vapour have been identified	□Yes	
12	Pumproom ventilation is operational	□Yes	□Not applicable
13	Accommodation spaces are at positive pressure	□Yes	
14	Fire control plans are readily available	□Yes	
15	Cargo monitoring system is fully operational and tested	□Yes	
16	Cargo gauging system operation and alarm set points are confirmed	□Yes	

17	Emergency Shutdown (ESD) system is tested and operational (7.2, 10.3.2, 10.3.3, 10.4.2)	□Yes	
18	Transfer equipment is in safe condition (isolated, drained and de-pressurised), Cargo manifold connections prepared, blanked and marked (7.3, 10.1.6)	□Yes	
19	The cargo transfer hoses/arms have been tested and certified and they are in apparent good condition (8.2)	□Yes	
20	The hose lifting equipment is suitable and ready for use (3.1.1)	□Yes	
21	P/V valves are operational (3.4.1, 3.4.3, 10.2.5)	□Yes	□Not applicable

Checklists 3B Additional for LPG or LNG transfe

CL3A	Generic Checks	Status	Remarks
1	Cargo lines have been cooled (10.3.4, 10.4.3)	□Yes	
2	All safety systems, including firefighting, cryogenic protection, ESD, gas detection and ventilation system are ready for use/in use (10.4.2)	□Yes	
3	All cargo transfer equipment tested and ready for use (10.3.2,10.4.2)	□Yes	

Constant Heading Ship (CHS) or Berthed Ship:

____

Manoeuvring Ship (MS) or Outer Ship:

____

Checklist 4A Pre-transfer conference

CL4A	Generic Checks	CHS Status	MS Status	Remarks
1	Local requirements including permissions are obtained and complied with (1.1. 3.2)	□Yes	□Yes	□Not applicable
2	JPO procedures for cargo and ballast operations reviewed and agreed by all parties (7.2)	□Yes	□Yes	
3	Present and forecast weather and sea conditions are within the agreed limits (7.3)	□Yes	□Yes	
4	Cargo specifications ,hazardous properties, SDS and any requirements for inerting, heating, reactivity and inhibitors have been exchanged (4.5, 10.2.3)	□ Yes	□Yes	□Not applicable
5	Tank venting system and dosed operation procedures agreed	□Yes	□Yes	
6	Procedures for vapour control/balancing have been agreed (Chapter 10)	□Yes	□Yes	□Not applicable
7	Procedures for the transfer of personnel have been agreed (Chapter 5, Appendix B)	□ Yes	□Yes	□Not applicable
8	All personnel engaged in the cargo operation are provided with PPE including, where necessary, personal gas detectors/monitors in accordance with the ship operator's PPE matrix (2.2, 4.3 ,5.1, 5.4 and Chapter 10)	□ Yes	□Yes	
9	Cargo transfer and, if applicable, the vapour return equipment is: ·In good condition. ·Of the appropriate type. ·Properly fitted with gaskets/seals. ·Lined up correctly. ·Properly rigged. ·Secured to the manifolds. ·Sufficiently supported.	□Yes	□Yes	

10	Electrical insulation of the ship/ship interface is effective (4.13)	□Yes	□Yes	
11	Effective STS communications established (Chapter 6)	□Yes	□Yes	
12	Emergency signals and shutdown procedures are agreed (7.3 and Chapter 10)	□ Yes	□Yes	
13	The engine room will be manned and the main engine kept on standby or on short notice of readiness	□Yes	□Yes	
14	Officers in charge of the cargo transfer on both ships are identified and details have been exchanged and posted (Chapter 10)	□Yes	□Yes	
15	Procedures for cargo and ballast handling operations and transferparametersagreed(7.2andChapter10)	□Yes	□Yes	
16	Simultaneous Operations (SIMOPS) are identified and agreed: (4.9, Chapters 7 and 10) □Nitrogen purging or inerting □Repairs/maintenance □Tank cleaning □Waste discharge □Bunkering □Receiving stores □Personnel transfer □ Crew change □ Planned drills	□ Yes	□ Yes	
17	Messengers and toggle pins are prepared and positioned ready for unmooring in accordance with the unmooring plan (7.2)	□ Yes	□Yes	
18	Means of emergency escape from both ships are established (9.5)	□Yes	□ Yes	
19	STS operation supervision and watchkeeping is adequate	□Yes	□Yes	
20	There are sufficient personnel to deal with an emergency(chapter 12)	□Yes	□Yes	
21	Naked lights,smoking restrictions and designated smoking areas are established	□Yes	□Yes	
22	Controlofelectrical and electronic devices is agreed	□Yes	□Yes	

23	Routine for regular checks and exchange of information on cargo transferred are agreed (Chapter 10)	□Yes	□Yes	CL5B, 5C: repetitive checks
24	The procedure for stopping transfer is agreed (Chapter 10)	□Yes	□Yes	
25	Cargo and vapour balancing hoses are supported and protected from chafing and the hose release area is clear of obstructions (8.2.5)	□Yes	□Yes	
26	Tools required for rapid disconnection are located at the cargo manifold (1.5, 7.3, 8.2.6, 12.1, 12.6)	□Yes	□ Yes	

Ship to Ship Transfer Safety Checklist

Constant Heading Ship (CHS) or Berthed Ship:

____

Manoeuvring Ship (MS) or Outer Ship:

____

Checklist 4D Additional for LPG or LNG transfer

CL4D	Additional for LPG or LNG Transfer	CHS Status	MS Status	Remarks
1	Inhibition certificate received (if required) from manufacturer(10.2.3)	□Yes	□Yes	□Not applicable
2	Maximum working pressures are agreed between ships (10.3.3, 10.4.3)	□Yes	□Yes	
3	Cargo handling rate and relationship with valve closure times and automatic shutdown systems is agreed (10.3.3, 10.4.3)	□Yes	□Yes	
4	Maximum/minimum temperatures/pressures of thecargo to be transferred are agreed (10.3, 10.4)	□Yes	□Yes	
5	Cargo tank relief valve settings are confirmed (10.3.3, 10.4.3)	□Yes	□Yes	Record relief valve settings CHS: MS:
6	Cooldown procedures have been agreed (10.3.4 and 10.4.4)	□Yes	□Yes	
7	Procedures for increasing/reducing transfer rates have been agreed (7.2, chapter 10)	□Yes	□Yes	
8	The potential for cargo roll-over has been considered	□Yes	□Yes	
9	The deck watch is aware of the location and activation method of ESD systems on deck (1.5, 10.3.2, 10.4.2)	□Yes	□Yes	

Constant Heading Ship (CHS) or Berthed Ship:

____

Manoeuvring Ship (MS) or Outer Ship:

____

Checklist 4E Additional for LNG transfer

CL4E	Additional for LNG Transfer	CHS Status	MS Status	Remarks
1	ESD and ERS system arrangements are in place and tested: (10.4.2) · ESD warm test has been undertaken from both ships. · ERS release mechanism functional test only (with no coupling release) has been tested.	□Yes	□Yes	
2	Cargo transfer lines have been purged with nitrogen to below 5%O_2 (10.4.2)	□Yes	□Yes	
3	Cargo transfer line connections are leak tested (10.4.2)	□Yes	□Yes	
4	The nitrogen plant will be operational throughout the transfer	□Yes	□Yes	
5	The protective water curtain is running (10.4.2)	□Yes	□Yes	

Constant Heading Ship (CHS) or Berthed Ship:

____

Manoeuvring Ship (MS) or Outer Ship:

____

Checklist 4F Pre-transfer agreements

CL4F	Reference to Check	Description	Agreement
1	(7.2)	Latest version of the JPO	Date/version JPO:
2	(7.2)	Working language	
3	(7.2)	Agreed SIMOPS	
4	(7.3)	Ships ready for manoeuvring	□Not applicable for heading ships Notice period (maximum for full readiness to manoeuvre): Ship1..............................min. Ship2..............................min.
5	(CH.6)	Agreed communication system and backup arrangement	Primary system: Backup system:
6	(1.3)	Operational supervision and watchkeeping	Ship 1 responsible persons: Ship 2 responsible persons: Terminal (if applicable) responsible persons:
7	(4.10)	Dedicated smoking areas and naked light restrictions	Ship 1 restrictions: Ship 2 restrictions: Terminal (if applicable) restrictions:
8	(4.2.2)	Maximum wind, current and sea/swell criteria or other limiting environmental factors	Stop cargo transfer: Maximum wind speed: Current: Swell: Disconnect: Unmooring:
9	(CH.10)	Limits for cargo and ballast handling	Maximum transfer rates: Topping-off rates: Maximum manifold pressure:

			Cargo temperature: Other limitations:
10	(CH.10)	Pressure surge control	Loading ship: ·Minimum number of cargo tanks open: ·Tank switching protocols: ·Full load rate: ·Topping off-rate: ·Closing time automatic valves:
11	(CH.10)	Cargo transfer management	Action notice periods: Transfer stop protocols:
12	(CH.10)	Routine for regular checks on cargo transferred are agreed	Routine transferred quantity checks:
13	(CH.12)	Emergency signals	Ship 1 signal: Ship 2 signal: Terminal (if applicable) signal:
14	(CH.10)	Tank system	Ship 1 system: Ship 2 system:
15	(CH.10)	Closed operations	□Not applicable Requirements:
16	(10.3.2, 10.4.2)	ESD and ERS systems (LPG and LNG)	□Not applicable Fibre optic/electrical link Closing time ESD valve unloading ship:________seconds Closing time ESD valve loading ship:________ seconds ERS □Yes □No

Ship to Ship Transfer Safety Checklist

Constant Heading Ship (CHS) or Berthed Ship:

____

Manoeuvring Ship (MS) or Outer Ship:

____

Declaration for STS operations at sea

The undersigned have checked and agreed the applicable checklist questions and confirm in the declarations below.

		Constant heading ship or berthed ship	Manoeuvring ship /outer ship	Not applicable
Checklist 3A	Before cargo transfer	◻	◻	
Checklist 3B	Additional for LPG or LNG transfer	◻	◻	◻
Checklist 4A	Pre-transfer conference	◻	◻	
Checklist 4D	Additional for LPG or LNG transfer	◻	◻	◻
Checklist 4E	Additional for LNG transfer	◻	◻	◻
Checklist 4F	Pre-transfer agreements	◻	◻	

In accordance with the guidance in the Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, the entries we have made are correct to the best of our knowledge and that the ships agree to perform the STS operation.

Repetitive checks, noted in checklist 5B of the hip to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, shall be carried out at intervals of not more than ______ hours.

If the status of any item changes, the other ship should be notified immediately.

Constant Heading Ship or Berthed Ship	**Manoeuvring Ship or Outer Ship**
Name:	Name:
Rank:	Rank:
Signature:	Signature:
Date:	Date:
Time:	Time:

Ship to Ship Transfer Safety Checklist

Terminal Berthed Ship: _

Outer ship:

Terminal:

Declaration for STS operations in port/at a terminal

The undersigned have checked and agreed the items in the applicable checklists and confirm in the declarations below.

		Terminal Berthed Ship	Outer Ship	Terminal	Not application
Checklist 3A	Before cargo transfer	□	□		
Checklist 3B	Additional for LPG or LNG transfer	□	□		□
Checklist 7	Checks pre-transfer conference alongside a terminal	□	□	□	
Checklist 4D	Additional for LPG or LNG transfer	□	□		□
Checklist 4E	Additional for LNG transfer	□	□		□
Checklist 4F	Pre-transfer agreements	□	□		

In accordance with the guidance in the Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, the entries we have made are correct to the best of our knowledge and that the ships agree to perform the STS operation.

Repetitive checks, noted in checklist 5B of the hip to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, shall be carried out at intervals of not more than ______hours.

If the status of any item changes, the other ship should be notified immediately.

	Terminal Berthed Ship	Outer Ship	Terminal
Name:			
Rank:			
Signature:			
Date			
Time:			

For ship:

Checklist 5A After connection checks before operation

CL5A	Check	Status	Remarks
1	Gas detection systems are tested and operational	□Yes	
2	Deck seal and P/V breaker levels have been checked and are satisfactory	□Yes	□Not applicable
3	Oxygen analyser has been checked and calibrated	□Yes	□Not applicable
4	Ship's ESD arrangements, including automatic valves, are tested and ready for activation (Chapter 10)	□Yes	
5	Linked ESD connections are established and tested (10.3.2, 10.4.2)	□Yes	□Not applicable
6	Other parties informed on 'ready to transfer' (10.3.2, 10.4.2)	□Yes	

For ship:

Checklist 5B Ship repetitive checks during transfer

Note interval: hrs.**CL5B**	**Check**	**Time**	**Time**	**Time**	**Time**	**Time**	**Time**	**Remarks**
Ref:	Date/time of check							
(7.2)	Weather/wave conditions within limits	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
(CH.8, 10)	Mooring and fendering arrangement is effective	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
(1.6)	Access to and from the ship is safe and controlled	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
	IGS and monitoring and recording system are operational, tank atmospheres are at positive pressure	□Yes	□Yes	□Yes	□ Yes	□Yes	□Yes	□ Not applicable
(CH.6)	Communication is effective	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
(8.4)	Illumination is sufficient and effective	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
	Cargo transfer and level monitoring system is operational	□Yes	□Yes	□Yes	□Yes	□Yes	□ Yes	
	External openings in superstructures are controlled	□Yes	□Yes	□ Yes	□Yes	□Yes	□Yes	
	Pumproom ventilation is effective	□Yes	□Yes	□ Yes	□Yes	□Yes	□Yes	□Not applicable
	Ignition source and toxicit, restrictions are observed	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
(7.2)	SIMOPS restrictions are observed	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	□Not applicable
(10.3, 10.4)	ESD system is operational	□ Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
	Initials							

Checklist 5C Terminal repetitive checks during transfer

Note interval: ______________________________ hrs.

CL5C	**Check**	**Time**	**Time**	**Time**	**Time**	**Time**	**Time**	**Remarks**
Ref:	Date/time of check							
(7.2)	Weather/wave conditions within limits	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
(CH.8, 10)	Mooring and fendering arrangement is effective	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	
(1.6)	Access to and from the ship and terminal is safe and controlled	□Yes	□Yes	□ Yes	□ Yes	□ Yes	□ Yes	
(CH.6)	Communication is effective	□Yes	□Yes	□Yes	□Yes	□Yes	□ Yes	
(8.4)	Illumination is sufficient and effective	□Yes	□Yes	□Yes	□Yes	□ Yes	□ Yes	
	Ignition source and toxicity restrictions are observed	□Yes	□Yes	□ Yes	□Yes	□Yes	□Yes	
(7.2)	SIMOPS restrictions are observed	□Yes	□Yes	□Yes	□Yes	□Yes	□Yes	□Not applicable
	Terminal emergency response is prepared	□Yes	□Yes	□ Yes	□Yes	□ Yes	□Yes	
	Initials							

Checklist 6A Checks after transfer before disconnection

CL6A	Checks before Disconnection	Status	Remarks
1	Cargo hoses,fixed cargo pipelines,vapour return lines and manifolds are drained and confirmed to be liquid-free	□Yes	
2	Cargo hoses,vapour return lines,fixed pipelines and manifolds are: ·Purged. ·Inerted. ·Depressurised.	□Yes	
3	All remotely and manually operated valves are closed ready for disconnection	□Yes	
4	Sufficient personnel with responsible officer available for disconnection	□Yes	
5	Correct PPE is used	□Yes	
6	The other ship is notified on "ready to disconnect”	□Yes	

For ship:

Checklist 6B Checks after disconnection before unmooring

CL6B	Checks before Unmooring	Status	Remarks
1	Cargo hoses and/or manifolds are securely blanked	□Yes	
2	Cargo area on the ship is cleared and restored to standard condition	□Yes	
3	Cargo documents signed and exchanged	□Yes	
4	Terminal or transfer location authority is notified on the completion of the STS operation	□Yes	□Not applicable
5	The transfer side of the ship is clear of obstructions (including hose lifting equipment)	□Yes	
6	The method of letting go of moorings and separation of ships has been agreed	□Yes	
7	Mooring winches ready for operation	□Yes	
8	Rope messengers and stoppers are available at mooring stations	□Yes	
9	Communications are established with mooring personnel and with the other ship	□Yes	
10	Shipping traffic in the area is being monitored and a VHF alert has been transmitted	□Yes	
11	Manoeuvring, mooring and navigational equipment has been tested and is ready for departure	□Yes	
12	The other ship has been notified that unmooring can commence	□Yes	

Terminal Berthed Ship: _

Outer ship:

Terminal:

Checklist 7 Checks pre-transfer conference alongside a terminal

CL7	Check	Terminal Berthed Ship	Outer Ship	Terminal	Remarks
1	Relevant local requirements, including permissions, are obtained and complied with (3.2)	□Yes	□Yes	□Yes	
2	Procedures for cargo and ballast operations have been reviewed and accepted by all parties	□Yes	□Yes	□Yes	
3	Effective communication between the ships and the terminal is established (Chapter 6)	□Yes	□ Yes	□ Yes	
4	Security information has been exchanged and, if required, a Declaration of Security has been completed (1.6)	□Yes	□Yes	□Yes	
5	Present and forecast weather and sea conditions have been considered (3.4)	□Yes	□Yes	□Yes	
6	Cargo specifications, hazardous properties, SDS and any requirements for inerting. heating, reactivity and inhibitors have been exchanged (4.5)	□Yes	□Yes	□Yes	
7	Tank venting system and closed operation procedures are agreed	□Yes	□ Yes		
8	Procedures for vapour control/balancing have been agreed (Chapter 10)	□Yes	□Yes		□ Not applicable
9	Access to the cargo deck is restricted and controlled during cargo transfer operations (1.6)	□Yes	□Yes	□Yes	
10	All personnel on deck are wearing appropriate PPE, including gas detectors as per company PPE matrix (4.3)	□Yes	□Yes		
11	Cargo transfer and, if applicable, the vapour return equipment is confirmed: · In good condition. · Of the appropriate type. · Properly fitted with gaskets/seals · Lined up correctly. · Properly rigged. · Secured to the manifolds. · Sufficiently supported.	□Yes	□Yes		
12	Electrical insulation of the ship/ship interface is effective (4.13)	□Yes	□Yes		

13	Where applicable, firefighting provision has been made for unmanned barges (3.1.3)	□Yes	□Yes		
14	Emergency signals and shutdown procedures are agreed (Chapter 12)	□Yes	□Yes	□Yes	
15	Ships are ready to move at agreed notice period (4.12)	□Yes	□Yes	□Yes	
16	Officers in charge of the cargo transfer on both ships and the terminal representative are identified and details have been exchanged and posted (1.1)	□Yes	□ Yes	□Yes	
17	Procedures for cargo and ballast handling operations and transfer parameters are agreed (7.2)	□Yes	□Yes		
18	SIMOPS are agreed (4.9, Chapter 10) □ Nitrogen purging or inerting □ Repairs/maintenance □ Tank cleaning □ Waste discharge □ Bunkering □Receiving stores □Personnel transfer □Crew change □Planned drills	□Yes	□Yes	□Yes	□Not applicable
19	Messengers are prepared and positioned ready for unmooring in accordance with the unmooring plan (7.2)		□Yes		□Not applicable
20	Means of emergency escape from both ships are established (9.5)	□Yes	□Yes		
21	Operation supervision and watchkeeping is adequate	□Yes	□Yes	□Yes	
22	There are sufficient personnel to deal with an emergency (Chapter 12)	□Yes	□Yes	□Yes	
23	Naked lights and smoking restrictions and designated smoking areas are established (4.10)	□Yes	□Yes	□Yes	
24	Control of electrical and electronic devices is agreed	□Yes	□Yes	□Yes	
25	Routine for regular checks and exchange of information on cargo transferred are agreed (Chapter 10)	□Yes	□Yes		CL5B, 5C repetitive checks
26	The procedure for stopping transfer is agreed (Chapter 10)	□Yes	□Yes	□Yes	

APPENDIX B: CRANE PLAN - TRANSFER OF PERSONNEL BY CRANE BETWEEN VESSELS

The following template can be used to develop a plan for the transfer of personnel between two vessels at sea.

The first section is a comparative risk assessment which addresses the environmental conditions and the characteristics of the two vessels. This section is used so all parties can agree on the best method for transferring personnel.

The second section is a permit to work focusing on the inspection and functionality of the crane and the Personnel Transfer Basket (PTB).

The third section is a compatibility analysis of the vessels and the PTB.

The final section is the actual transfer plan template.

Some sections are to be completed by the responsible person on the active vessel and some sections by the responsible person on the passive vessel. Before the transfer, the two responsible persons are to contact each other via VHF radio (or other mutually acceptable means of communication) to discuss their completed sections and complete the plan. The Masters on both vessels and the personnel being transferred should jointly agree on the personnel transfer by crane plan.

If it is impractical for all parties to sign the personnel transfer by crane plan in advance of the operation, the contents of the plan should be communicated and each responsible person should sign their own copy of the plan to confirm they have reviewed, understood, implemented and agreed on relevant sections.

Personnal transfer by crane plan

(blue)	Blue fields to be completed by the active vessel (the vessel operating the crane)
(grey)	Grey fields to be completed by the passive vessel
(yellow)	Yellow fields to be completed by the vessel providing the PTB
(white)	White fields to be agreed between both vessels before the transfer-this can be done over VHF

Name of active vessel:	Name of passive vessel:
Date of transfer:	Location of transfer:

Risk assessment

Environmental conditions

Winds	Direction: °True	Speed: kn	**Seas**	Direction: °True	Height: m
Swell	Direction: °True	Height: m	**2nd swell**	Direction: °True	Height: m
	Swell period sec.			Swell period sec.	

Visibility

☐ Day ☐ Night ☐ Restricted visibility Other ______

Taking into account environmental conditions and the vessel characteristics,is it safest to transfer:

☐ Via crane ☐ Via pilot ladder ☐ Via accommodaiton ladder ☐ Await for safer conditions

Confirm there is sufficient sea room to complete the personnel transfer ☐

The passive vessel is better designed and equipped for transfer by:

☐ Crane ☐ Pilot ladder ☐ Accommodation ladder

Taking into account environmental conditions and the vessel characteristics, is it safest to transfer:

☐ At anchor ☐ Underway but stopped ☐ Underway making way

Taking into account environmental conditions and available sea room,the active ship will provide a lee:

Optimal heading to best provide a le ______ °True to ______ °True

Taking into account environmental conditions and the vessel characteristics,is it safest to transfer:

☐ Bow to bow ☐ Bow to stern

Permit to work for transfer by crane

Crane Derricks should not be used for personnel transfers

For the personnel transfer the crane will be [ ] This is equal to or less than 50%of the crane's SWL.

Date of last crane inspection by class		Wire replaced		End-for-end	

Date of last shipboard inspection [ ]

The following items were checked:

- ☐ Hoist wire ☐ Blocks ☐ Sheaves ☐ Drums
- ☐ Wire terminaitons ☐ Hydraulics ☐ Hook ☐ Swivel

Are in good order? [ ]

☐ Hook fitted with a safety latch? ☐ Additional slings removed?

Ship staff last tested the operation of the crane on [ ]

The following were tested and are functioning properly

- ☐ Topping lift to maximum and minimum extent ☐ Runner lifted to maximum height
- ☐ Limit switch ☐ Crane slewed 90° clockwise and anti-clockwise
- ☐ Brakes ☐ Fall arrestor (if fitted)

ADVISORY Dirty or excessively lubricated wires cannot be inspected effectively. Spot cleaning at random intervals should be performed for a proper inspection to take place.

Personnel Transfer Basket (PTB)

Type of PTB

☐ Collapsible

☐ Rigid

☐ Canopy

☐ Capsule

PTB supplied by: ☐ Active vessel ☐ Passive vessel

Date of manufacture	Certificate date
PTB last certified on (if applicable)	Last shipboard inspection

The following were inspected:

- ☐ Base ring ☐ Lift sling ☐ Tensioner ☐ Netting
- ☐ Top ring ☐ Lift ring ☐ Tag lines ☐ All in good order

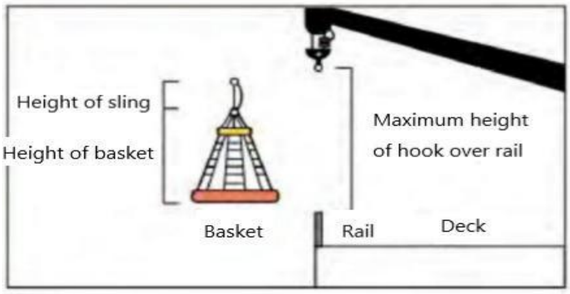
Comments

Compatibility analysis

Number of personnel being transferred	Capacity of PTB: SWL ☐ Or number of people ☐
Number of transfers	Confirm the active vessel's freeboard is greater than the pasive vessel's freeboard ☐

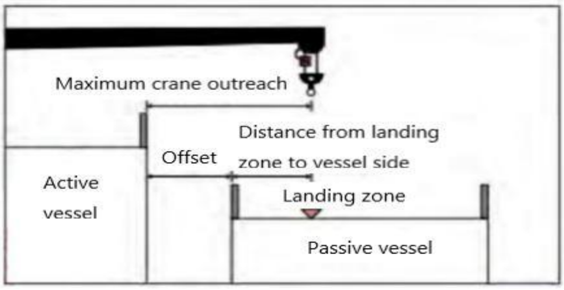
Height of basket		m
+ Height of lifting sling		m
Overall PTB height		m

Maximum height of hook		m
- Overall PTB height		m
Available clearance		m



Will the PTB safely clear the rail? ☐ Yes ☐ No

Is there sufficient crane outreach so the PTB can be landed or lifted safely without having to pull the PTB out of vertical alignment with the crane hook? ☐ Yes ☐ No



Are there any obstructions on the deck of the active vessel? ☐ Yes ☐ No

Please describe, if any

Are there any obstructions on the deck of the passive vessel? ☐ Yes ☐ No

Please describe, if any

Transfer by crane plan

Radio communications have been established and the following plan has been agreed.

The active vessel will be ☐ Underway ☐ at anchor	On heading: °True	Speed: kn
☐ Port ☐ Stbd midship's crane shall be used to transfe	Number of people:	Number of transfers:

The passive vessel will approach ☐ bow to bow ☐ bow to stern alongside the active vessel

A test load will be conducted to test the plan.Luggage ☐ will ☐ will not be transferred during this test

On the active vessel the responsible person will be (Title)	The signaller will be (Title)
On the passive vessel the responsible person will be (Title)	The signaller will be (Title)
Number of personnel attending on the active vessel	Number of personnel attending on the passive vessel

Personnel being transferred will wear the following Personal Protective Equipment (PPE):
☐ Personal Flotation Device (PFD) ☐ Safety shoes ☐ Hard hats ☐ Strobe light Other(specify)

In an emergency the following lifesaving equipment is available:
☐ Liferings ☐ Smoke signalling buoy ☐ Rapid rescue craft ☐ Additional lighting
Other(specify) ____________________

Permits to work have been completed: ☐ Active vessel ☐ Passive vessel

All personnel with responsibilities described above have been found competent.They have been briefed,understand and agree to this transfer pl
☐ Active vessel ☐ Personnel being transferred ☐ Passive vessel

It is understood and agreed that both vessels and the personnel being transferred have the authority to stop the transfer if conditions are unsafe or if they have become unsafe. ☐

The contents of this transfer plan have been exchanged between responsible persons on each vessel and with personnel being transferred.All parties have agreed to this plan.

Signature

Rank

Time(zone description)

Date

APPENDIX C: FENDER SUITABILITY CALCULATIONS

Selecting the correctly sized primary fender string is crucial to ensuring safe STS operations.

Using undersized fenders increases the risk of over-pressurisation and damage during berthing. If the fender diameter is too small, resulting in inadequate stand-off distance, there is an increased risk of the two ships making steel-to-steel contact during the STS operation.

Using oversized fenders can cause operational issues. Rebounding may occur due to a large reaction force, and this is to be considered during STS operations. For ships with low freeboard, an oversized fender may jump on board when squeezed or cause an obstruction when running mooring lines. Additionally, oversized primary fenders can create a stand-off distance exceeding the safe reach of one or both ships' cranes.

Determining the optimal primary fender size for any STS operation depends on factors including:

- Size of both vessels involved.
- Exposure of the STS location to environmental conditions (i.e. whether the operation is in port or open sea).
- Expected weather conditions for the STS operation.
- Water depth of the STS location.
- Pressure rating of the available fenders.
- Cargo transfer equipment, including hoses, manifold connections and crane reach.

Measured or assumed numerical values in relation to the above are used to calculate a theoretical Berthing energy (B_e). This assumes that the B_e is absorbed by a single fender as the Manoeuvring Ship (MS) lands on the Constant Heading Ship (CHS) with a small angle of approach.

With a calculated B_e value, the optimal sized fender is to be where the Guaranteed Energy Absorption (*GEA*) value of the fender exceeds the B_e value (ie.:$GEA \geq B_e$).

$$B_e = 0.5 * C_{AM} * V^2 * C_e * SF$$

B_e: berthing energy (kNm);

C_{AM}: combined added mass;

V: relative approach velocity (m/s);

C_e: coefficient of eccentricity;

SF: safety factor.

The recommended formula to calculate B_e is:

While the above formula is used globally by service providers and manufacturers, the final B_e value can vary depending on how the factors are interpreted.

Combined Added Mass

In STS operations, ships experience hydrodynamic forces from the mass of water that moves with them. These increased inertial forces slow ship responses and viscosity drag slows vessel motions overall. These forces create an Added Mass that is to be applied to the displacement of both ships to determine the Combined Added Mass (C_{AM}).

This Guide recommends using the following formula and tables derived from the PIANC Fender Guidelines 2024 (WG211).

The formula for C_{AM} is:

$$C_{AM} = \frac{M_1 * C_{m1} * M_2 * C_{m2}}{(M_1 * C_{m1}) + (M_2 * C_{m2})}$$

Where:

M_1 is the displacement of ship A;

M_2 is the displacement of ship B;

C_{m1} is the added mass factor of ship A;

C_{m2} is the added mass factor of ship B.

Added Mass Factor

Graph C.1: Added Mass Factor (PIANC Fender Guidelines 2024 (WG211))

Relative Approach Velocity

The Relative Approach Velocity (*V*) is an assumed value considering the effects of local weather, sea and swell conditions, and size of the smallest ship (MS) involved in the STS operation.

Table C.1 is derived from PIANC Fender Guidelines 2024 (WG211) Table 5.13. The Relative Approach Velocity is to be extracted using the summer deadweight of the MS and the forecast sea conditions for the STS location.

Relative Approach Velocity **Table C.1**

Summer Deadweight of MS	Calm Sea State: 0-3 Wave Height (m): 0-1.25	Moderate Sea State: 4 Wave Height (m):1.25-2.5	Rough Sea State: 5 Wave Height (m):2.5-4.0
Less than 10,000	0.30m/s	0.40m/s	0.50m/s
10,000-50,000	0.25m/s	0.325m/s	0.40m/s
50,000-100,000	0.20m/s	0.25m/s	0.30m/s
Over 100,000	0.15m/s	0.20m/s	0.25m/s

Coefficient of Eccentricity

In most cases, ships do not land exactly parallel on all fenders in the string. The first point of contact is typically on the first or last fender. The reaction to this single-point landing causes the ship to yaw, dissipating the B_e. C_e varies between 0.1 and 1.0, where 1.0, the maximum, applies when the centre of gravity of the MS is parallel with the first point of contact. As it is difficult to quantify in a dynamic real-time scenario, many users of this formula commonly use a C_e value of 0.5.

Safety Factor

Including a Safety Factor (SF) allows for uncertainties (such as excess approach velocity at time of mooring) and operator's experience of the STS area.

The SF is to be user defined, based on their experience of STS operations at the STS transfer location. Where there is no experience for a particular STS location the following *SF*s are recommended:

2.0 for most conditions, including at sea, in open or at anchor STS operations.

1.5 for in port STS operations where the STS operation takes place in sheltered conditions.

Worked example:

Depth of water = 29m

Moderate conditions = 1.25 - 2.5m wave height

Ship A: (Loaded VLCC)

Displacement = 360000 tonnes, Summer Deadweight = 310100 tonnes, Draught = 22m

Ship B: (Ballasted Aframax)

Displacement = 63000 tonnes, Summer Deadweight = 105000 tonnes, Draught=7.4m

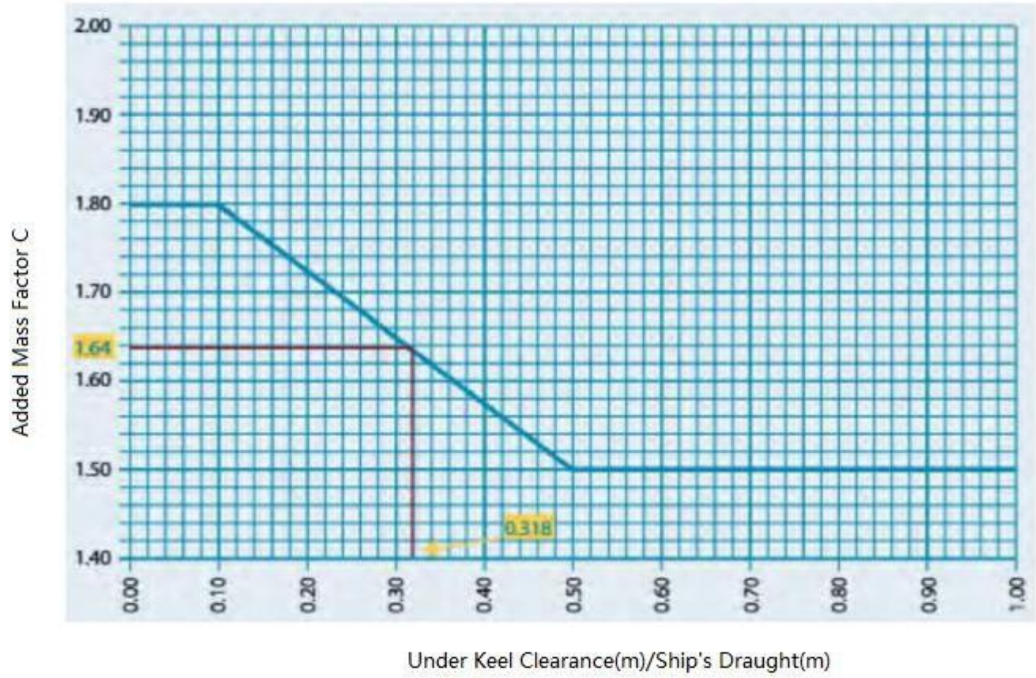
Ship A:

29m depth - 22m draught = 7m UKC

UKC/draught = 7m/22m = 0.318

Refer to graph C.1 to derive the Added Mass Factor C_{m1}.

Added Mass Factor C_{m1} = 1.64.



Graph C.2: Added Mass Factor (Ship A)

Ship B:

29m depth - 7.4m draught = 21.6m UKC

UKC/draught = 21.6m/7.4m = 2.919

Refer to graph C.1 to derive the Added Mass Factor C_{m2}.

Added Mass Factor Cm_2 = 1.5.

Graph C.3: Added Mass Factor (Ship B)

To calculate the Combined Added Mass,

$$C_{AM} = \frac{M_1 * C_{m1} * M_2 * C_{m2}}{(M_1 * C_{m1}) + (M_2 * C_{m2})}$$

$$= \frac{360000 * 1.64 * 63000 * 1.5}{(360000 * 1.64) + (63000 * 1.5)}$$

$$=55792800000/684900 = 81461 \text{ t}$$

Relative Approach Velocity（relisted here for reference) **Table C.1**

Summer Deadweight of MS	Calm Sea State: 0-3 Wave Height (m): 0-1.25	Moderate Sea State: 4 Wave Height (m):1.25-2.5	Rough Sea State: 5 Wave Height (m):2.5-4.0
Less than10000	0.30m/s	0.40m/s	0.50m/s
10000-50000	0.25m/s	0.325m/s	0.40m/s
50000-100000	0.20m/s	0.25m/s	0.30m/s
Over100000	0.15m/s	0.20m/s	0.25m/s

Extract the Relative Approach Velocity (*V*) for moderate conditions from Table C.1, using the summer deadweight for the MS.

Approach velocity V is 0.2m/s, $V^2 = 0.04$.

To calculate the berthing energy B_e:

= 0.5 × 81461 × 0.04 × 0.5 × 2.0

= 40730.5 × 0.04 × 0.5 × 2.0

= 1629 kNm

Entering the fender *GEA* table (Table C.2) with the STS B_e value of 1,629kNm, the user is to select the fender size for the next higher *GEA* value for the respective pressure rating.

Example STS fender sizes and *GEA* table **Table C.2**

Fender Size Diameter × Length (mm × mm)	Guaranteed Energy Absorption (GEA) (kNm) Initial Pressure 50kPa	Guaranteed Energy Absorption (GEA) (kNm) Initial Pressure 80kPa
500×1000	6	8
600×1000	8	11
700×1500	17	24
1000×1500	32	45
1000×2000	45	63
1200×2000	63	88
1350×2500	102	142
1500x3000	153	214
1700×3000	191	267
2000×3500	308	430
2500x4000	663	925
2500×5500	943	1317
3300×4500	1175	1640
3300x6500	1814	2532
3300x10600	3067	4281
4500×9000	4752	6633
2500x12000	6473	9037

Referring to the above Table, the optimal sized fenders are:

For 50kPa: 3300 × 6500mm

For 80kPa: 3300 × 4500mm

Having selected the optimal fender size check that the fender will provide sufficient stand-off distance for the STS operation. See the example calculation below.

Most service providers maintain a limited stock of commonly available fender sizes. The three most common fender sizes are (diameter/length):

- 2500 × 5500mm.
- 3300 × 6500mm.
- 4500 × 9000mm.

Optimal sized fenders, based on the above calculation method,may not be available. For example, a service provider may not have a 3300 × 4500mm size and is to use the more commonly available 3300 × 6500mm fender.

Stand-off Distance

Having selected the optimal fender size based on B_e and *GEA* it is recommended that a check is made to ensure the optimal fender provides sufficient stand-off distance.

Stand-off is the horizontal distance maintained between the parallel body lengths of both ships, to avoid contact between the hulls and superstructures due to ship motions when the ships are moored together during an STS operation.

It should be ensured that the optimal fender, based on the B_e and *GEA* calculation, will provide sufficient stand-off distance.

APPENDIX D HOSE STRING CONNECTION GUIDANCE

Hoses are usually delivered in individual lengths to one of the ships nominated to perform an STS operation. Ship's personnel will connect the individual hose lengths together to make one, or more, hose strings with sufficient length for the STS operation.

The hose connection flanges that will be situated outside the containment areas of both ships should be joined to ensure their liquid containment integrity for the duration of the cargo operation.

Ship's personnel should connect the hose lengths using:

- New gaskets, suitable for the products to be transferred.
- Fasteners, bolts or studs and nuts, of correct diameter and length, suitable for ANSI class 150 flanges typical of STS hoses.
- Torque wrench.
- Gasket manufacturer's instructions regarding the final torque compression setting for the supplied gaskets.

The following guidance should be followed to ensure the hose strings are liquid/vapour tight when assembled.

Preparation

Before connecting individual hoses, the flange faces should be inspected and cleaned to ensure all residue and debris from previous gaskets or fixatives is removed. Use a metal flange scraper, an aerosol gasket remover and a wire brush, then inspect the flange for damage. Be sure the surface finish and flatness are satisfactory.

Lubricate nut and bolt threads and nut bearing face (where it contacts the flange).

Centre the gasket on the flange[①].

Do not use old gaskets.

Typical tightening process

After the flange has been assembled and all nuts have been run down by hand with the gasket in place, wrench tightening should follow the sequence of numbers indicated on the flange diagram in Figure Appendix D. Marking the number on the flange with a wax crayon helps follow the tightening sequence.

The following tightening guidance will ensure the flange is liquid/vapour tight:

(1) First time around: The nuts should be just snugged with a hand wrench.

(2) Second time around: The nuts should be tightened firmly with the same wrench. A torque wrench should then be used for the following steps:

① American National Standards Institute(ANSI): ring gaskets, when cut properly, should centre themselves with the bolts in place.

(3) Third time around: Apply approximately 25% recommended torque.

(4) Fourth time around: Apply approximately 75% of recommended torque.

(5) Fifth time around: Apply 100% of recommended torque.

(6) Continue tightening nuts until they do not move under 100% recommended torque.

Nuts should be re-torqued periodically. It should be noted that most of the short-term bolt preload loss occurs within 24 hours after initial tightening.

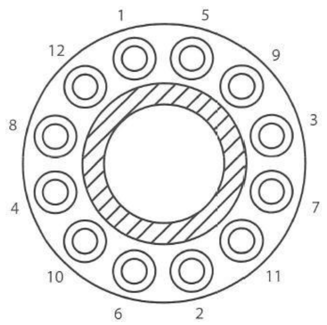


Figure Appendix D　Flange diagram

Appendix E Example-Liquefied Natural Gas Ship to Ship compatibility questionnaire

Ship's Name:	
Date:	

Documents to be forwarded with this questionnaire:

General arrangement plans;

Mooring arrangements;

Vessel Particulars Questionnaire (VPQ).

Ship' Name	

Ship Contact Details

Tel:	
Fax:	
Tlx:	
Mobile:	
Email:	
MMSI:	

Owner Contact Details:

Name:	
Address:	
Tel:	
Fax:	
Tlx:	
Email:	

Technical Managers

Name:	
Address:	
Tel:	
Fax:	
Tlx:	
Email:	

Commercial Managers

Name:	
Address:	
Tel:	
Fax:	
Tlx:	
Email:	

Charterer

Name:	
Address:	
Tel:	
Fax:	
Tlx:	
Email:	

Ship' Name:

General

Call sign:	
IMO number:	
Flag:	
Port of registry:	
Date of delivery:	
Classification Society:	
Class notation:	

Dimensions

Length Overall (LOA):	
Length BP (LBP):	
Breadth moulded:	
Depth moulded:	
Keel to masthead:	

Tonnages

Gross tonnage:	
Net tonnage:	

Loadline

Summer deadweight:	
Displacement:	
Normal loaded draught:	
Normal loaded freeboard:	
Normal ballast draught:	
Normal ballast freeboard:	

Propulsion

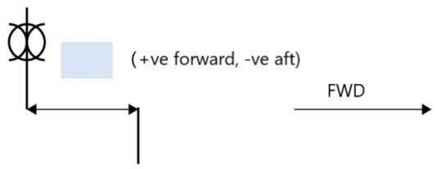
Type of engine:					
	MCR:		HP/kW at:		RPM
	NCR:		HP/kW at:		RPM
Type of propeller:					
Bow thruster:	Number:				
	Power/unit:		HP/kW		
Stern thruster	Number:				
	Power/unit:		HP/kW		

Crew

Common language on board:	
Are officers and the manifold watch proficient in English?	

Ship's Name:

Indicate distances, in mm



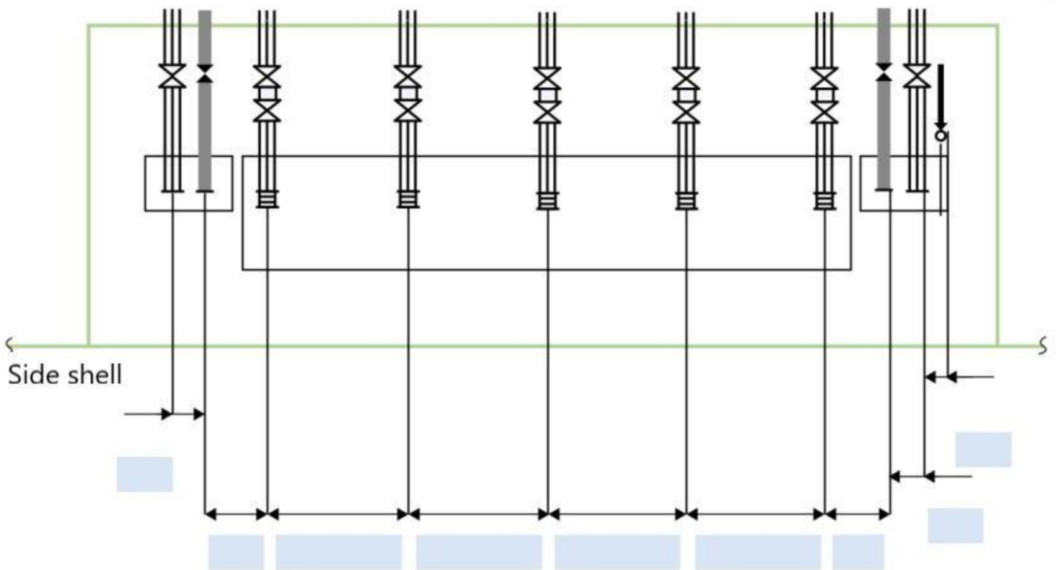
State liquid or vapour size:

Flange ANSI:

Face size (inches):

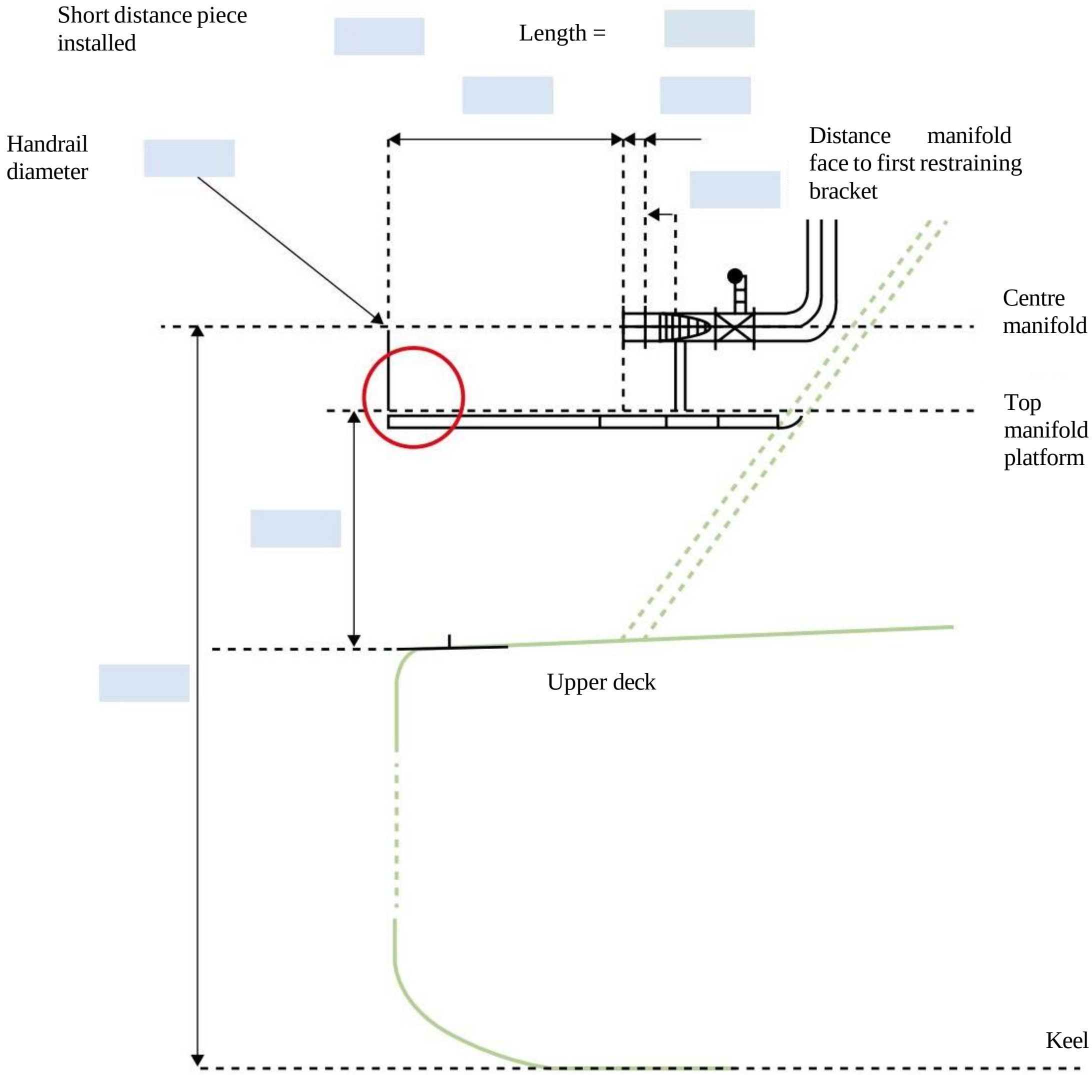
Thickness (mm):

Flange face:

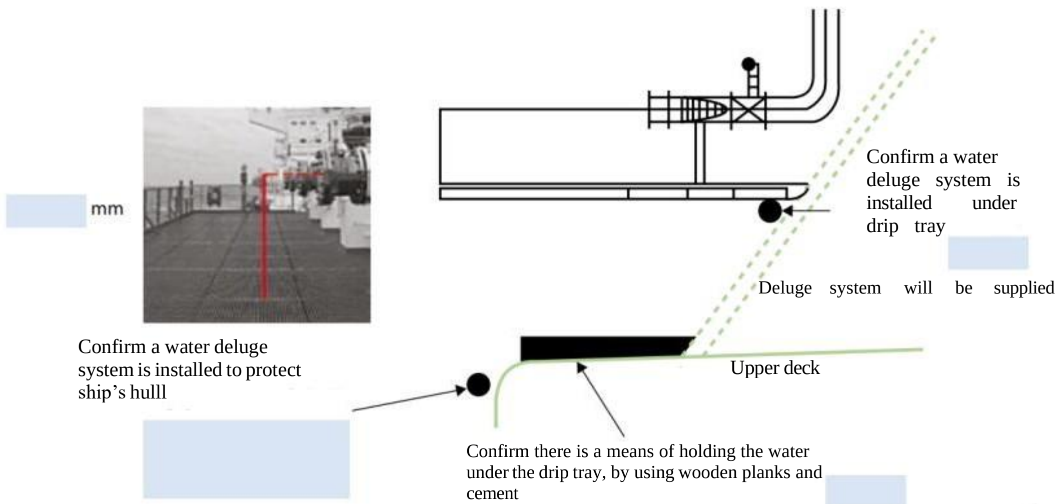


Type of manifold valves:

Number and types of reducers:

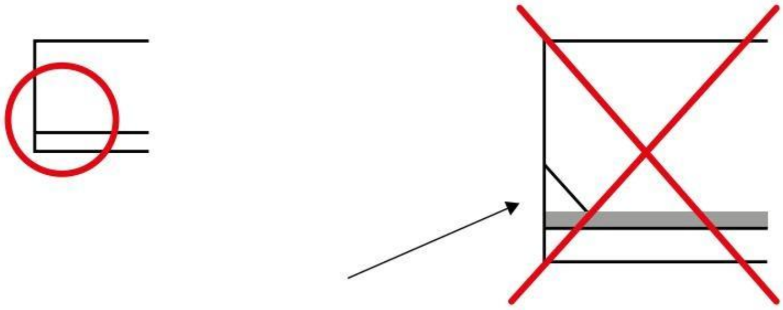


Height centre of manifold measured to grating of manifold



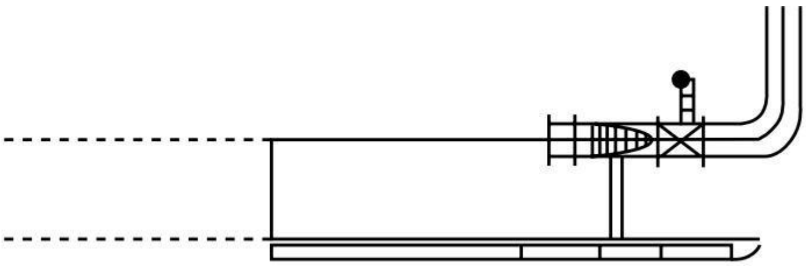
No obstructions (railing supports or others) between railing stanchions and manifold platform:

Are obstructions removable?



No inclination between ship's manifold and manifold platform:

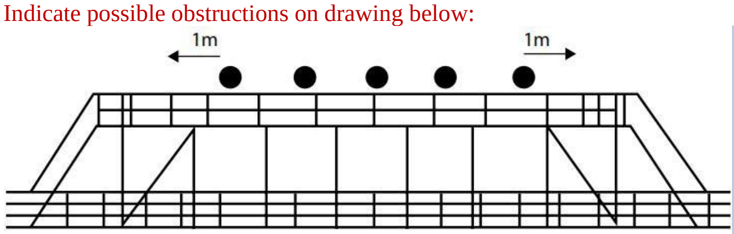
State degree of inclination:



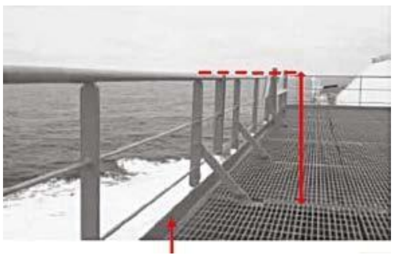
Confirm strainer is not obstructing any (bypass) valve or others:

No obstructions over full handrail from 1m outwards (as per drawing)?

Indicate possible obstructions on drawing below:



Height of railing measured to grating of manifold platform: mm



Confirm gutter plate installed

Height: mm

Insert a picture as per example below for port and starboard side:

Confirm the centerlines of the manifolds are marked as shown on the grating.

Inset the photo of port side	Insert the photo of starboard side

Cargo containment system

	1		2		3		4		5
Capacity 98.5% per tank:		m^3		m^3		m^3		m^3	
Total:		m^3							
Sloshing limits Lower:									
Higher:									

State the maximum time needed to re-arrange the cargo tanks to be out of the sloshing limits, at any moment during discharging at a rate of 5,400 m^3/hr: ____ hrs

Maximum cargo tank working pressure: ____ kPa

Tank pressure relief valve settings: ____ kPa

Cargo pumps Capacity:	m^3/hr		Spray pumps Capacity:	m^3/hr
Number:			Number:	
Head:	m		Head:	

Maximum pressure at manifold:		Type:	
Gas to shore counter fitted:		Type:	
Gas from shore counter fitted:		Type:	
Gas to engine counter fitted:		Type:	

Boil Off Gas (BOG) burning capacity: ____ t/h

Reliquefaction fitted: ____

If yes, capacity: ____

N_2 plant
- Capacity: ____ m^3/hr
- Working pressure: ____ MPa
- Max O_2 content: ____ %Vol
- Type of connection: ____

Hose handling cranes: ____
- Number: ____
- SWL: ____ t

Maximum outreach of the ship's side: ____ m

Approved for personnel transfer? ____

LBP:		m	Normally length of the ship’s waterline when loaded
Breadth:		m	
Depth:		m	Measured from keel to main deck
Target (ship’s manifold)		m	Forward from midships (negative if aft of midships)
		m	Above deck level
End-on projected windage area:		m^2	Above main deck
Side projected windage area:		m^2	Above main deck
Current drag data based on:			Conventional or cylindrical bow
Wind drag data based on:			Prismatic or spherical
Wave motion data based on:			Prismatic or user-defined
Distance main deck to keel:		m	

Starboard Side

Mooring Linfes on Winches

No	Fairlead Distances				Winch Brake	Line				Tail Rope		
	From AP to Fairlead	Centerline to Fairlead	Height Above Main Deck	Fairlead to Winch		Size	Type	BL	Length	Size	Type	BL
	m	m	m	m	Tonne	mm		Tonne	m	mm		Tonne
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												

Mooring Bitts and Enclosed Fairleads

No	SWL	From AP to Fairlead	Centerline to Fairlead	Height Above Main Deck	Distance to Bollard	Bollard SWL	<35m from Center	Capstan	
	Tonne	m	m	m	m	Tonne	y/n	y/n	Capacity
1									
2									
3									
4									
5									
6									
7									
8									

LBP:		m	Normally length of the ship's waterline when loaded
Breadth:		m	
Depth:		m	Measured from keel to main deck
Target (ship's manifold)		m	Forward from midships (negative if aft of midships)
		m	Above deck level
End-on projected windage area:		m^2	Above main deck
Side projected windage area:		m^2	Above main deck
Current drag data based on:			Conventional or cylindrical bow
Wind drag data based on:			Prismatic or spherical
Wave motion data based on:			Prismatic or user-defined
Distance main deck to keel:		m	

Port Side

Mooring Lines on Winches

No	Fairlead Distances				Winch Brake	Line				Tail Rope		
	From AP to Fairlead	Centerline to Fairlead	Height Above Main Deck	Fairlead to Winch		Size	Type	BL	Length	Size	Type	BL
	m	m	m	m	Tonne	mm		Tonne	m	mm		Tonne
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												

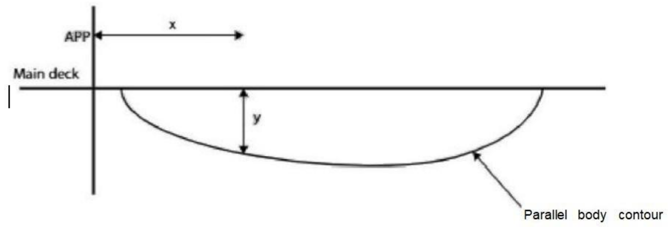
Mooring Bitts and Enclosed Fairleads

No	SWL	From AP to Fairlead	Centerline to Fairlead	Height Above Main Deck	Distance to Bollard	Bollard SWL	<35m from Center	Capstan	
	Tonne	m	m	m	m	Tonne	y/n	y/n	Capacity
1									
2									
3									
4									
5									
6									
7									
8									

If ship fitted with 2×2 soft spring ropes between spring wire and rope tail, connected by Mandal or Tonsberg shackles?

LBP m

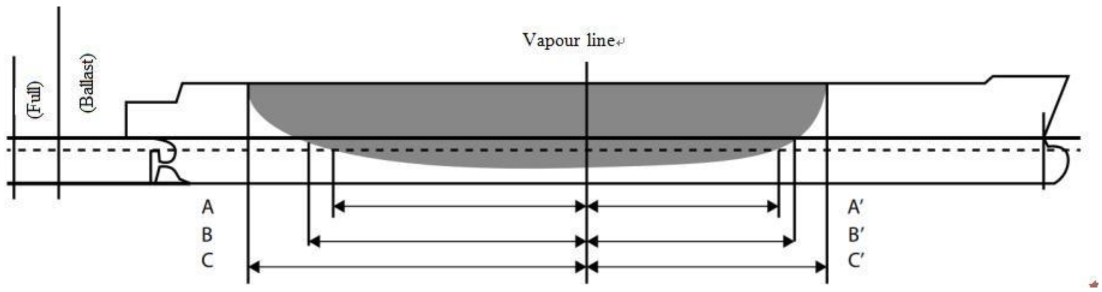
Parallel body contour for ballast condition



Indicate below the vertical distances from main deck to parallel body contour in ballast condition for different distance (1 to 12) to APP.

Parallel Body Counter	1	2	3	4	5	6	7	8	9	10	11	12
Distance in m, from APPX												
Depth in m, from main deck Y												

Parallel body length for different conditions

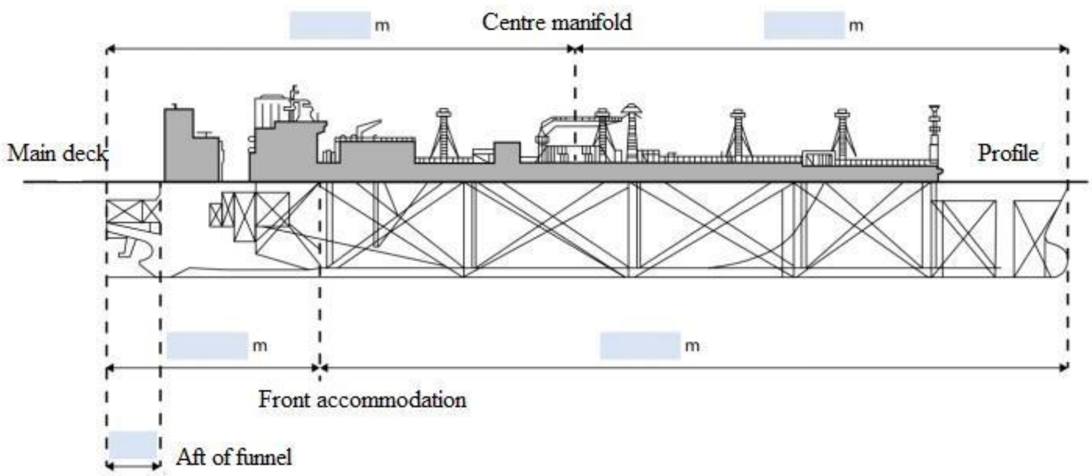


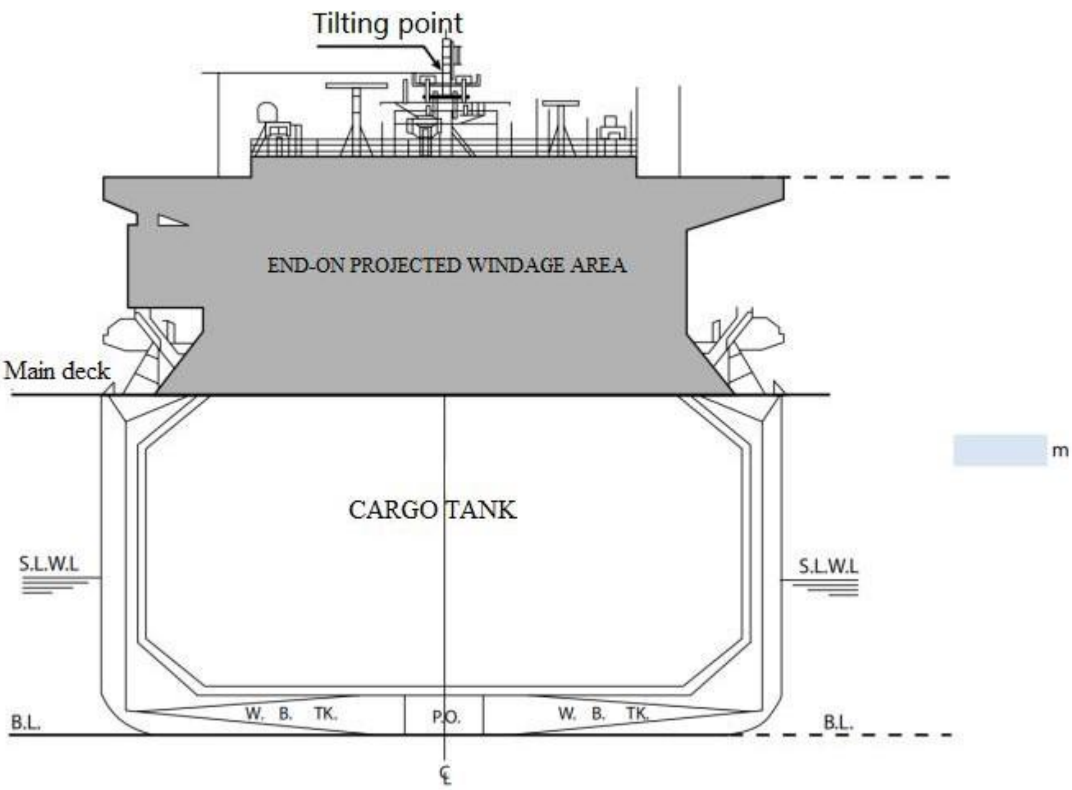
Ballast: A= m A'= m

Full laden: B= m B'= m

Main deck: C= m C'= m

Hull pressure limit: t/m ^{2}


m
Centre manifold
m
Main deck
Profile
m
m
Front accommodation
Aft of funnel


Tilting point
END-ON PROJECTED WINDAGE AREA
Main deck
m
CARGO TANK
S.L.W.L
S.L.W.L
W. B. TK.
P.O.
W. B. TK.
B.L.
B.L.

Emergency Shutdown (ESD) links

Optical fibre:		
Connector type:		
Connection point position to centre manifold:		m
Pneumatic:		
Connector type:		
Connection point position to centre manifold:		m
Setting pressure in MPa:		MPa
Electrical:		
Connector type:		
Connection point position to centre manifold:		m
Include plug pin arrangement:		
Are ESD cables and/or hoses available?		
ESD valves closure time:		sec

APPENDIX F HUMAN FACTORS

F.1 General

Human factors are summarised in the following principles:

- People will make mistakes.
- People's actions are rarely malicious and usually make sense to them at the time.
- Mistakes are typically due to conditions and systems that make work difficult.
- Understanding the conditions in which mistakes happen helps prevent or correct them.
- People know the most about their work and are key to any solution.
- Plant, tools and activities can be designed to reduce mistakes and manage risk better.
- Leaders contribute by shaping conditions that influence what people do.
- It matters how leaders respond when things go wrong and that they take the opportunity to learn.

F.2 Identification and analysis of safety critical tasks

A Safety Critical Task (SCT) is a task related to hazards where human error, action or inaction may cause or fail to avoid a serious incident.

Ship operators and STS service providers should:

- Identify which tasks are safety critical.
- For each task, identify opportunities for error and the conditions that make that error more likely or the consequences more serious.
- Design tasks to eliminate or minimise error and error-producing conditions.
- Identify barriers that will reduce the likelihood of human error and mitigate any consequences if error occurs.

The following areas of STS operations include tasks where error has the potential to lead to a serious incident:

- Communications and information sharing.
- Personnel transfer.
- Non-cargo related operations, including rigging fenders, handling of cargo hoses, tending of mooring lines and maintenance activities.
- Manoeuvring, mooring and unmooring operations.
- Cargo transfer operations.

Having identified SCTs, ships and STS service providers should use a Safety Critical Task Analysis approach to identify possible errors, the things that make error more likely and ways of making tasks more resistant to error.

The background conditions that increase the likelihood of human failure include:

- Tasks that are complex, difficult to understand or hard to perform.
- Insufficient training.
- Parts of a task that are inefficient to do or where there is insufficient time available.
- Tasks or steps that are boring, trivial or repetitive.
- Tasks or steps that are unusual, infrequent or involve unfamiliar situations.
- Inaccessible or hard to use controls, valves, platforms, steps or emergency stops.
- Poor access or operation or maintenance challenges from hazardous or moving equipment.
- Difficult system or equipment interfaces, labelling, controls or alarms.
- Unclear signs, signals, instructions or other information.
- Over-reliance on error-free communications in difficult noise or light conditions.
- Working environment: excessive noise, high or low heat, inadequate lighting, inadequate ventilation, no easy access, poor visibility, and no line of sight.
- Over-reliance on recognising emerging hazards, risk or change in a dynamic situation.
- Multitasking.
- Interruptions or distractions.
- Fatigue, stress and distraction.

Controlling exposures to hazards in the workplace is vital to the protection of workers. The hierarchy of controls is a way of determining which actions will best control exposures. The hierarchy of controls has five levels of actions to reduce or remove hazards. The preferred order of action, based on general effectiveness is:

1. Elimination (of hazard or task) - removes the hazard at the source, for example changing the work process to stop using a toxic chemical, heavy object or sharp tools. It is the preferred solution to protect workers because no exposure can occur.
2. Substitution (with a less hazardous material or process) - using a safer alternative to the source of the hazard. An example is using water based or biodegradable cleaning agents instead of solvent-based cleaners. When considering a substitute, it is important to compare the potential new risks of the substitute to the original risks. This review should consider how the substitute will combine with other agents in the workplace. Effective substitutes reduce the potential for harmful effects without creating new risks.
3. Engineering controls - such as reconfiguring a complex pipe manifold, reduce or prevent hazards from coming into contact with workers. Examples of engineering controls include modifying equipment or the workspace, using protective barriers and ventilation.
4. Administrative controls - such as control of work procedures, signs to establish work practices that reduce the duration, frequency or intensity of exposure to hazards.

5. Personal Protective Equipment (PPE) is equipment worn to minimise exposure to hazards. Do not rely on PPE alone to control hazards when other effective control options are available. PPE can be effective, but only when used correctly and consistently.

Using this hierarchy can lower worker exposures and reduce risk of illness or injury. Elimination of a task altogether will always provide the best protection against the risk from that task, especially when compared to the less effective controls of additional procedures or signage or depending on PPE.

Ships and STS service providers should identify ways of eliminating tasks identified as SCTs or re-designing them to reduce the likelihood of error and increase the likelihood of detection and control.

F.3 Human-centred design

Including input from people operating equipment and controls can help to make them intuitive and resistant to error. Human-centred design ensures that human factors are considered at each stage of the design and implementation of a piece of equipment. Human-centred design aspects that may be considered include:

- The usability of permanent equipment used in the ship/ship interface (e.g. closed chocks, fairleads, vapour balancing).
- Layout and equipment issues that emerge from the combination of STS equipment (e.g. landing areas, manifold access, 2D or 3D mooring plan for STS operation, ship compatibility analysis).
- The modification of any piece of equipment.
- The introduction of automation, including new and emerging technology.

For ease of use, the right information needs to be available to people operating equipment and making operational decisions. Controls need to be intuitive, minimising the potential for confusion or mistakes. When designers are updating or modifying an existing design, they should consult users. Where users report that existing equipment is leading to mistakes or difficulties, design of new equipment can include ways of reducing or detecting errors or minimising the consequences.

When introducing automation, alternative, emerging or innovative technology, the impact on users should be carefully considered. Users need to be consulted early in the design stage and throughout the prototype and final installation. While automation can bring considerable advantages to ships, the unintended consequences of introducing technology should also be considered.

Humans may be better than machines for several reasons:

- People can reach conclusions and make decisions based upon little data or unusual/unexpected circumstances.

- Equipment designers cannot foresee all future situations and operating conditions that their equipment may be used in, but skilled operators can complement the design and make it work in practice.

Automation and alternative, emerging or innovative technology can have unintended consequences, for example:

- Simplifying or eradicating one task may increase the number and complexity of other tasks.
- Eliminating some tasks may:
  - Reduce the operator's monitoring of a situation or system.
  - Reduce the crew's manual skills or their ability to effectively manage when things go wrong.
  - Lead to boredom and lack of engagement in the task.
  - Trigger over-reliance on the automation or new technology.
  - Lead to lost opportunities arising from human involvement, i.e. suggestions for optimising or improving a task.

Before considering the adoption of automation or an alternative, emerging or innovative technology, a preliminary design review or product assessment should be completed to evaluate the following:

- General description and equivalency to existing technologies.
- Functional description and equivalency to existing technologies.
- Equivalency to existing product types and safe methods of handling transfers.
- Interface with existing technologies, systems and operational processes.
- Documentation, design drawings, general arrangements, product specifications and applicable codes and standards.
- Detailed safety and risk assessment plans, including assessment of human factors.
- Consistency with other industry reference materials, e.g. the World Association for Waterborne Transport Infrastructure (PIANC) or the International Association of Classification Societies (IACS).

Ships and their operators and, where applicable, STS service providers or port authority overseeing transfer operations for a location specific lightering area, should complete an impact assessment before agreeing to use an alternative, emerging or innovative technology at the STS marine interface. For example, changing mooring equipment has implications for both ships engaged in STS operations, so this process should be documented to ensure that all parties have assessed and understood the risks of using the alternative, emerging or innovative technology.

If any of the involved parties are unable to complete the impact assessment, they should inform the other parties what technology is being used and share all relevant documentation to support its use, e.g. the risk assessment and evaluation reports of design and product specifications.
If the automation, alternative, emerging or innovative technology only affects one party (e.g. ship, LSV or terminal) the above exchange does not need to happen unless a common understanding would be useful.

Equivalency should be demonstrated through analysis of engineering or design studies, product compatibility, prototype and/or on-site testing and experience. Compare the analysis of the alternative, emerging or innovative technology with the existing technology or product it is replacing or being used alongside.
Equivalency should show that the alternative, emerging or innovative technology is at least as good as the existing technology in delivering:

- The safety of ship and, where applicable, terminal personnel.
- Assurance that the risks continue to be effectively managed.
- Suitable margins of safety including the probability and consequence of system failure.
- Operational effectiveness and integrity.
- Compliance with applicable regulations, standards, industry guidance and best practices.
- Compatibility with equipment used to handle the product and other products carried or being handled.

F.4 Procedures

Procedures are instructions that help trained and competent personnel conduct tasks. To improve the effectiveness of procedures, ships and STS service providers should consider:

- Involving the people who will be using the procedures in the creation and updating of them. This will improve accuracy, ownership, compliance and conformance.
- Well-presented procedures, i.e. concise, written clearly and making it easier to get it right and harder to get it wrong. A procedure should help users but cannot replace training or experience.
- Essential hardware and task step components of an operation should be covered, highlighting key critical issues and hazards.

Procedures should be specific to the work assigned and should describe the full scope of the work involved. A procedure should represent the best and most efficient way of performing the work. Procedural content should accurately reflect how a job is expected to be performed and should include only the information that is useful to the individuals who are involved in, or who have responsibility for, completing the work.

Procedures should highlight steps where an error could occur, be detected, or be recovered from. Where personnel have a problem with procedural compliance or conformance, the following should be considered:

- Are important SCTs covered by procedures?
- Are procedures available, accessible and usable?
- Are there multiple or conflicting procedures for a task?
- Are procedures clear and understandable, particularly in relation to the education and experience of the user?
- Are procedures in the first or native language of the user?
- Are procedures accurate, correct, complete and workable?
- Are procedures current and valid?
- Have procedures been communicated to, or trained for by, the workforce?
- Is the requirement to follow, update or revise the procedures clear?

F.5 Leadership

Leaders have a significant impact on the safety of an operation. Evidence shows that incidents of all types are reduced when those in leadership work to build trust and respect between themselves and the workforce by:

- Promoting the need to speak up.
- Respecting and acting on concerns of junior team members.
- Encouraging everyone to resolve safety issues.
- Promoting, supporting and communicating continuous proactive improvement.
- Encouraging learning when things go wrong, not reacting with blame.

Those with leadership roles should be alert to junior crew or team members being unwilling to challenge those in senior positions, or those in senior positions ignoring the challenges of junior members. This is particularly relevant because of the strongly hierarchical tradition in shipping operations and the different cultures that exist on board ships. STS operations are multinational by nature, with varying degrees of willingness to speak up or challenge.

Everyone involved in STS operations has a responsibility for their own and their colleagues' health and wellbeing at work. Poor health and wellbeing can cause incidents and accidents. Healthy and happy crews and teams are more likely to identify opportunities to enhance the operation through improvements in equipment design, improved controls or safety management procedures.

Those with leadership roles in STS operations can address these issues by:

- Making themselves available to the workforce. This could be through walkabouts and discussion where they set expectations and standards but also listen and learn what makes work difficult.

- Collaborating with those who do the job, tackling the problems they encounter.
- Resisting the temptation to blame and instead looking for the systems and conditions that set the stage for people to make mistakes.

F.6 Confidence to stop work or speak up

Ship operators and STS service providers should emphasize to their personnel that everybody has Stop Work Authority (SWA). There are many reasons why a person might not speak up or stop work, including the following:

- They see others not stopping work or challenging and think they know what they are doing.
- More experienced people around them are not doing anything.
- They think they have misread the situation.
- They worry about upsetting a co-worker by calling attention to an unsafe situation.
- They think they do not have authority.
- They think that authority may be disputed because of multiple parties or authorities and responsibilities involved (Masters, POAC/STS Superintendents and Mooring Masters).
- They feel if they are wrong, they could get into trouble.
- They think they could make a situation worse.

In the case of STS operations, where authority and responsibility are split and may be shared between several persons, a clear "cessation policy" with references to wind force, wave height and directions will provide strong "stop work" support if a decision to stop operations is challenged.
Those with leadership roles in STS operations should build people's confidence to act by:

- Taking action themselves to step back, slow, pause or stop.
- Encouraging people to ask for help and work as teams to solve problems.
- Always supporting a decision to step back, slow, pause or stop.
- Thanking and recognising even when it turns out that there is not a problem.

F.7 Learning

The UK Health and Safety Executive defines a learning organization as one that values and encourages learning from its own experiences, looks beyond itself for lessons and avoids complacency. Incidents and near-misses should be investigated, the lessons learned communicated widely and any recommendations implemented.
Where lessons are noted but not put into practice, learning can be said to be "passive". "Active learning" is where lessons are fully implemented and embedded in the organization's culture and practice.

In such learning organizations, the lessons of previous incidents and the improved practices will be remembered, even with personnel changes and turnover.

Learning organizations actively seek out information and listen to the experiences and views of all staff.

F.7.1 Value of learning from successes and failures

Understanding how and why mistakes occur and applying lessons learned can reduce incidents. Characteristics of high reliability organizations include emphasis on continual learning, encouragement of open reporting, investigation of successes as well as failures, and use of simulators.

F.8 Fatigue

Fatigued people are more likely to make mistakes due to mental and physical impairment. Fatigue can be caused by lack of sleep, poor quality sleep or being awake for too long. Fatigue can accumulate over time with unsociable working hours or shift patterns. Fatigue can be caused by a lack of staffing, poor adherence to work/rest periods, insomnia and extended operations (for example, lengthy passages/long STS operations at unsociable hours, series of STS operations).

Workload can increase due to extended operations, poorly planned work and/or difficult to use equipment/tools. High or low temperature extremes, or exposure to poor lighting, noise and inclement weather can also contribute to performance impairment. Additionally, a fatigued person may be a poor judge of their own level of fatigue or impairment. Ships and STS service providers should:

- Determine operational workload and required competencies and match manning levels and support resources.
- Manage workload, hours of work and rest.
- Understand and safeguard tasks where fatigue could increase mistakes.
- Consider the scheduling of SCTs or duties to avoid times when people may be less alert due to fatigue.
- Train personnel in the causes and effects of fatigue.
- Ensure there is sufficient opportunity to rest when planning work.
- Maintain a healthy exercise, nutrition and stress-aware environment.
- Monitor fatigue symptoms.
- Investigate fatigue-related causes of accidents and incidents.
- Consider suspending complex or extended operations to make sure that people, especially those most heavily involved, get enough rest.

STCW and the Maritime Labour Convention (MLC) require ships' officers and crew to have enough hours of rest to be fit for duty and able to carry out their duties safely and define minimum rest hours and periods of rest per day. Ships are also required to maintain individual records of hours of work and rest for everyone on board.

Detailed guidance on how to mitigate and manage fatigue is contained in the IMO's Guidelines on Fatigue.

F.9 Personnel levels

Not having enough people available on board can lead to accidents or incidents. Marine regulations require:

- Flag States to issue ships with a legal minimum safe manning requirements document.
- Ships to be appropriately crewed to undertake all aspects of safe operations on board.

Operating companies should consider how many people are needed for both regular operations and any emergency that might be encountered. A deck and bridge watch should be established and maintained on each ship for the duration of the operation, whether underway or at anchor. Where appropriate, the principles of bridge team management should be observed (refer to Bridge Procedures Guide). When alongside in port, normal safe deck and cargo watchkeeping duties should be maintained by all ships involved.

During the planning phase for an STS operation, in cooperation with the Masters of the nominated ships, due account should be taken of the estimated duration and complexity of the operation and an assessment made of the additional workloads associated with the activity. The aim should be to ensure that all personnel (including POACs/STS Superintendents and Mooring Masters) remain fatigue free and that minimum rest periods, as required by applicable legislation, are complied with, particularly when conducting multiple transfers. If necessary, additional personnel should be placed on board to assist with the STS operations. Consideration may also need to be given to the provision of an additional POAC/STS Superintendent where workloads are indicated to be high, or operations are likely to be over an extended period.

F.10 Skills to respond to emerging situations

To respond to emerging situations, personnel need to develop and apply a set of skills, including situational awareness and effective communications, which can help them adapt, collaborate and make decisions.

F.10.1 Situational awareness

Situational awareness is the understanding of what is happening around you, what others are doing and what might happen next. It is a key skill for decision making, especially in situations where quick and accurate actions are required.

The three levels of situational awareness are perception, comprehension and projection. Each level builds on the previous one and requires different types of information processing and mental models.

Perception is the basic level where information is collected about the current situation, using some or all of the five senses-vision, hearing, touch, taste and smell. In a navigational setting, a seafarer may use vision and hearing to observe what is outside the bridge windows, shown on the radar or what sound signals can be heard. Perception also involves actively seeking information from other sources, such as automated systems or other team members.

Comprehension is the level where the information gathered during the perception phase is interpreted to build up a mental model of the situation. The aim is to understand the meaning and the implications of the perceived elements and how they relate to each other and the goal of the operation. For example, a seafarer may ask whether a crossing ship poses a threat to their ship. Previous knowledge, experience and expectations can be used to make sense of the situation. However, if the inputs are wrong or incomplete, the mental model may also be wrong or incomplete.

Projection is the level where the future state of the situation and the possible outcomes of actions are anticipated. For example, how will the crossing ship's course and speed change in the next few minutes and what impact will that have? Projection helps with the planning and execution of actions and monitoring and adjusting them as the situation evolves. Projection requires a high level of situational awareness and can be challenging in uncertain and dynamic situations.

Situational awareness is not an individual task, but a collective one. Tasks should be shared, so that there is always someone who is on the lookout and sees the whole picture.

F.11 Communications

Effective communication is vital in safe STS operations. It helps to prevent accidents, coordinate actions and share information.

Spoken and written communication play a critical role in conveying safety information. This includes sharing key findings from risk assessments, toolbox talks, completion of checklists and issuing emergency instructions and safety warnings. The following are examples of communication techniques for safety:

- Using clear and concise language and avoiding jargon or ambiguity.
- Using visual aids such as signs, posters and diagrams to reinforce messages.
- Using multiple channels such as email, phone, radio and face-to-face to ensure reach.
- Using feedback and confirmation to ensure understanding and compliance (closed loop communication).
- Challenge and response.

Effective communication between team members and different teams during STS operations is essential. It ensures that everyone is aware of hazards and can work safely. The following are examples of team communication for safety:

- Using briefings and debriefings to communicate goals,roles and procedures.
- Using handover and shift change protocols to communicate status and issues.
- Using checklists and standard operating procedures to ensure consistency and accuracy.
- Using communication tools such as radios, headsets and intercoms to facilitate coordination and collaboration.

Communication is particularly crucial in SCTs including mooring operations, lifting operations, personnel transfer and emergency response. Clear communication helps prevent accidents and ensures coordinated efforts. The following are examples of communication for SCTs:

- Using pre-task briefings and risk assessments to identify and mitigate hazards.
- Using permits and authorisations to ensure compliance and accountability.
- Using signals and codes to communicate actions and commands.
- Using alarms and alerts to communicate emergencies and hazards.

All personnel should have access to essential information. This includes understanding risks, emergency procedure and safety protocols. The following are examples of providing access to key information:

- Using training programmes and emergency drills to educate and inform personnel.
- Using safety manuals and guides to provide reference and guidance.
- Using safety audits and inspections to monitor and improve performance.
- Using safety boards and displays to provide updates and reminders.

Good communication is not just about words, it is about ensuring that everyone understands and acts on critical safety information.

APPENDIX G SECURITY

G.1 Security objectives

Ship owners and operators have limited influence over the intent or capability of threat actors. However, there are measures that can mitigate opportunity and reduce the likelihood of a successful attack. These are linked to six security objectives:

- Secure the perimeters and access points (anti-climb barriers, good lookout).
- Screening entry and exit points (gangway control).
- Securing the interior (e.g. citadel and locking down accommodation blocks).
- Preventing violence and loss of life/asset (drills for crew on responding to an incident).
- Communications and security systems (satellite phone in citadel, Ship Security Alert System (SSAS) alarm).
- Security equipment (interior hardening, supplies in the citadel, removing tools from upper deck).

Threat and risk assessments are a critical component of voyage planning and should consider the capability, intent and opportunity to compromise the six security objectives, including the consequence of an attack. Ship owners, operators and STS service providers should identify the security safeguards they have, or need, in place to mitigate these risks. The risks should be assessed and measures identified and implemented for prevention, mitigation and recovery. The mitigation measures should create a defence in depth posture, this means deter, detect, delay, respond and recover.

G.2 Security risk assessments

The security risk assessment should consider:

- How attackers locate targets.
- How attackers try to overcome perimeter security measures.
- The timeline for attacks (how long you have to respond/defend yourself before assistance arrives).
- The attacker’s objective (kidnap for ransom, theft of cash and valuables or product theft).
- Where attacks have taken place in the last three years.
- What intelligence or indicators and warnings, if any, a ship would have.
- How bridge teams should identify/recognise an attack is developing.
- What security measures should be implemented and at what distance from an area of increased threat.

- What threats cannot be mitigated and remain a risk. These may require go/no go decisions on routing and operations.

Additionally, parties may consider the following factors that make ships engaged in an STS operation particularly vulnerable:

- When engaged in slow speed manoeuvring, mooring and/or cargo transfer, both ships' personnel will be preoccupied with the operation at hand and may not be able to maintain a normal level of security alertness.
- The ship with the lowest freeboard and/or the weakest VHP may provide the easiest access for potential attackers.
- An STS operation will invariably require personnel to be present on deck throughout, thereby affecting the crew's ability to reach the citadel.
- Where ships are conducting an STS operation at sea or are outside the protection of the port authority, they may not have the benefit of protection from designated security forces.
- Unmooring to escape from an attack requires close coordination of both ships' personnel.

Security risk assessments should be regularly reviewed to ensure:

- New threats are identified and existing risks are confirmed or removed.
- Mitigations remain robust, practical, and realistic.
- The VHP is updated.
- Updates to industry best practice are noted.

G.3 Security plans

The Ship Security Plan (SSP) and Port Facility Security Plan (PFSP) should include procedures for STS operations. These should reflect the threat to STS operations and specify who is responsible for carrying out security measures. The SSP should include the following:

- Security organisation.
- Security training and drills.
- Basic security measures for normal operation.
- Additional measures that will allow the ship and terminal, if applicable, to respond quickly to changes in threats, e.g. by reducing or increasing the level of security.
- Procedures for linking ship and terminal security activities with the security activities of port authorities, other ships, terminals and facilities in the region and other local authorities and agencies, e.g. police and coast guard.
- Arrangements for regular reviews of the security plan and for amendments based on experience or changing circumstances.
- Access control measures.

- Measures to prevent unauthorised weapons, dangerous substances or devices intended to harm people, ships or terminals being taken onto the ship or into the terminal.
- Procedures for responding to security threats or breaches of security, which may include evacuation.

A VHP should be created based on the risk assessment, detailing mitigation measures needed to reduce risk to As Low As Reasonably Practicable (ALARP). The VHP can be a standalone document, part of company procedures, or included in the SSP. All voyages and offshore activities including STS operations require advanced planning using all available information. Maritime threats are dynamic, making it essential to have a detailed threat and risk assessment for each voyage and STS activity. Further guidance on risk assessments and how to develop a VHP can be found at the Maritime Global Security website, which brings together guidance, endorsed by several maritime industry organisations, on security risks and issues.

G.4 Responsibilities under the International Ship and Port Facility Security Code

For STS operations under the control of a port authority, the port is responsible for security and must appoint a Port Facility Security Officer (PFSO) who may be designated one or more port facilities (terminals) and is responsible for the port security plan. The person should be trained and capable of implementing all security measures. For ships at a terminal, while the PFSO is responsible for the port security plan, the Master has overriding authority to make decisions about the safety and security of the ship. A Ship Security Officer (SSO) should be appointed who is trained and capable of implementing the SSP and security measures on board. The SSO could be the Master but is often one of the senior officers.

G.5 Cyber safety and security

Cyber security is concerned with the protection of Information Technology (IT), Operational Technology (OT), information and data from unauthorised access, manipulation and disruption. Cyber safety covers the risks from the loss of availability or integrity of safety critical data and OT. The cyber security risk assessment should consider threats to cyber safety and cyber security because attacks on either can harm personnel, the environment and the ship or terminal. The IMO has adopted resolution MSC.428(98) on Maritime Cyber Risk Management. Effective cyber risk management starts with senior management, who should develop a culture of cyber risk awareness at all levels of an organisation. For practical guidance for Masters and ship’s crew, refer to The Guidelines on Cyber Security Onboard Ships, and Cyber Security Workbook for On Board Ship Use.

G.6 Preparation for Ship to Ship operations

Before starting the STS operation, the following security issues should be discussed and any decisions recorded:

- Exchange of a Declaration of Security.
- Agreement on how and between whom communications regarding security are to be made.
- Actions to be taken in the event of a breach of security, such as suspending operations and separating ships.

Local regulations may impose exclusion zones around the STS operation. Consideration should be given to establishing safe distances to be maintained from other ships and actions to take if safe distances are compromised.

G.7 Security on ships conducting a Ship to Ship operation alongside a terminal

The port, terminal and ships alongside should all have security plans in compliance with the ISPS Code or applicable local legislation. The POAC/STS Superintendent should be aware of the current security level and requirements imposed by the port and this information should be communicated to all parties in the STS operation. Where the STS operation is to take place alongside a terminal, the terminal and the gangway security watch should monitor all personnel movements to/from the shore. Other ships coming alongside the ship moored alongside the terminal should provide details of all visitors expected. If unreported visitors, for any of the ships involved in the STS operation, present themselves at the gangway of the ship moored alongside the terminal, they should not be allowed access until confirmation has been received from the relevant ship(s) alongside. The STS organisers, when planning the STS operation, should complete a security assessment. If there is any concern that security is not properly managed at the port, a risk assessment should be undertaken for all aspects of the STS operation and risks mitigated, where necessary. The assessment should identify:

- Any gaps in security measures and procedures in place.
- Any potential security threat to the port or ships involved in the STS operation.
- Suitable mitigating steps needed to address the threats or close any gaps.

Where security in a port cannot be properly assessed or managed, the STS organisers should suspend the operation or seek an alternative location.

APPENDIX H STS OPERATION RECORDS

Voyage	STS position	Other ships	Type of cargo	Remark

- It should be retained on board the ship for at least three years.
- Checklists for each STS operation and other relevant records should be attached.
- A summary of each STS operation recorded by the loading instrument should be attached for reference.

APPENDIX I SHIP DRAWINGS

I.1 Mooring arrangement plan and anchor equipment arrangement plan (if applicable)

The mooring arrangement plan or the general arrangement plan including the mooring equipment and anchor equipment (if applicable) is to be attached.

I.2 Capacity plan

I.3 Cargo piping diagram

I.4 Manifold and drip tray arrangement plan