



# Deck Cargo Management Onboard Offshore Vessels

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## Glossary

The following are agreed definitions for terms used within this paper.

**Backload** Deck cargo transferred from any offshore facility onto an Offshore Support Vessel (OSV).

**Best practice** OCIMF views this as a method of working or procedure to aspire to as part of continuous improvement.

**Cargo Carrying Unit (CCU)** A full range of cargo carrying units for the offshore industry including equipment such as containers, tank containers, skips, baskets and slings for packing and lifting exploration and production equipment.

**Guidance** Provision of advice or information by OCIMF.

**Line of fire** The zone in a work area where there is a risk of injury due to a release of energy from machinery, equipment or objects that are moving or under tension.

**Maritime Industry Participants (MIPs)** Any stakeholders involved in the chartering, management, logistics and supply chain relevant to offshore vessel operations.

**Mousing** A process where marine twine under tension is used to bind the slings in position and is secured with a series of knots. In the offshore industry, as a best practice when handling tubulars, slings (including soft slings) are moused to keep the sling from sliding or shifting from its taut bundled position.

**Non-routine lift** A lift that has been identified as a complicated or complex lift; a heavy lift; a lift involving personnel transfer baskets or a lift considered by management or the crane operator to be unique.

**Offshore facility** Any physical surface structure or vessel in the vicinity of marine operations, e.g. fixed production platforms, Floating Storage and Offloading facilities (FSOs), Mobile Offshore Drilling Units (MODUs), flotels and Floating Production, Storage and Offloading facilities (FPSOs).

**Recommendations** OCIMF supports and endorses a particular method of working or procedure.

**Routine lift** Uncomplicated lifts that are performed on a regular basis using fixed, dedicated lifting equipment. This type of lift consists of normal crane operations within the installation to or from supply vessels.

**Shore base** Onshore support facilities that during joint operations provide services to the joint property such as a receiving and transshipment point for materials; a debarkation point for drilling and production personnel and services; a communication, scheduling and dispatching centre and other associated functions serving the joint property.

**Stinger** A short length of wire or synthetic rope with a safety hook, of suitable Safe Working Load (SWL), that is attached to the lifting hook of a crane or derrick to avoid manhandling the heavy lifting block.

**Toolbox talk** An informal safety meeting that is part of a company's overall safety programme. Toolbox talks are generally conducted at the job site before the start of a job or work shift and cover safety aspects related to the specific job.

**Tugger wire** Steel or fibre wire used for tugger winch (see *Guidelines for Offshore Marine Operations (G-OMO)*).

## Abbreviations

<b>ASOG</b>	Activity Specific Operating Guidelines
<b>CAM</b>	Critical Activity Mode
<b>CCU</b>	Cargo Carrying Unit
<b>CoG</b>	Centre of Gravity
<b>CSM</b>	Cargo Securing Manual
<b>CSS Code</b>	Cargo Stowage and Securing Code
<b>DP</b>	Dynamic Positioning
<b>FMEA</b>	Failure Modes and Effects Analysis
<b>FPSO</b>	Floating Production, Storage and Offloading facility
<b>FRC</b>	Fast Rescue Craft
<b>FSO</b>	Floating Storage and Offloading facility
<b>G-OMO</b>	Guidelines for Offshore Marine Operations
<b>H<sub>2</sub>S</b>	Hydrogen Sulphide
<b>IMDG Code</b>	International Maritime Dangerous Goods Code
<b>IMO</b>	International Maritime Organization
<b>JHA</b>	Job Hazard Analysis
<b>MIP</b>	Maritime Industry Participants
<b>MLC</b>	Materials and Logistics Coordinator
<b>MODU</b>	Mobile Offshore Drilling Unit
<b>MOPO</b>	Matrix of Permitted Operations
<b>MRU</b>	Motion Reference Unit
<b>OIM</b>	Offshore Installation Manager
<b>OSV</b>	Offshore Support Vessel
<b>SIMOPS</b>	Simultaneous Operations
<b>SOLAS</b>	International Convention for the Safety of Life at Sea
<b>SOPEP</b>	Shipboard Oil Pollution Emergency Plan
<b>SWL</b>	Safe Working Load

## **Bibliography**

*A.714(17) Code of Safe Practice for Cargo Stowage and Securing (CSS Code) 2011* (International Maritime Organization (IMO))

*Guidelines for Offshore Marine Operations (G-OMO)* (previously NWEA Guidelines), [www.g-omo.info](http://www.g-omo.info) (Assorted industry bodies)

*International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended, Part A, Regulation 5 Stowage and Securing* (IMO)

*MSC.122 Adoption of the International Maritime Dangerous Goods (IMDG) Code* (IMO)

*MSC.1/Circ.1353/Rev.1 Revised Guidelines for the Preparation of the Cargo Securing Manual* (IMO)

# 1 Introduction

In the past two decades, unsafe events in the offshore marine industry have indicated that deck cargo operations pose a high safety risk. The main contributing factors were:

- Large amounts of water on deck (green water).
- Unsecured cargo on deck.
- Personnel in the line of fire.
- Lack of combined operations communications.

These events highlight the need to provide guidance and align stakeholders across the industry to increase safety. Furthermore, the International Maritime Organization (IMO) *Code of Safe Practice for Cargo Stowage and Securing (CSS Code) 2011* does not address deck cargo securing arrangements for Offshore Support Vessels (OSVs).

## 1.1 Purpose

This information paper provides risk-based guidance, including best practices, to offshore industry personnel, vessel crews and Maritime Industry Participants (MIPs) on safe working practices involving deck cargo handling between shore base operations, offshore facilities and vessel operators. It will help vessel Masters make decisions that ensure people on vessels are safe.

## 1.2 Scope

This information paper covers work performed in the offshore industry by personnel involved in managing offshore facilities, shore bases and vessels engaged in deck cargo operations, including:

- Accountability of key personnel involved in safe deck cargo handling operations.
- Best practice for a safe deck during operations.
- Routine lifts performed during offshore deck cargo operations.
- Deck cargo manifests and stowage plans.
- Deck cargo loading/backloading and discharge plans.
- Methods for deck cargo securing and lashing.
- Communication.
- Weather parameters.

Appendix A outlines best practices for a safe deck that can be used as a checklist for Masters. Appendix B provides an example of a Matrix of Permitted Operations (MOPO), which defines critical changes in conditions, operations or barriers and offers guidance on management of such change.

## 2 Deck cargo planning

Thorough planning and coordination are essential to safe deck cargo operations. This includes preparing deck cargo manifests, deck cargo stowage plans, vessel scheduling and Simultaneous Operations (SIMOPS) plans. This section describes the elements needed for safe deck cargo operations.

### 2.1 Regulatory compliance

Regulations VI/5 and VII/5 of the International Convention for the Safety of Life at Sea (SOLAS) require cargo units and cargo transport units to be loaded, stowed and secured throughout the voyage. This must be done in accordance with the Cargo Securing Manual (CSM) approved by the vessel's Flag State administration and drawn up to a standard at least equivalent to the IMO resolution MSC.1/Circ. 1353/Rev.1 *Revised Guidelines for the Preparation of the Cargo Securing Manual*. These guidelines have been expanded to consider the CSS Code.

### 2.2 Roles and responsibilities

Managing deck cargo onboard offshore vessels and safely executing supply operations at a facility depends on suitably qualified and experienced people performing their tasks safely.

Best practice is to allocate responsibilities to anyone involved in deck cargo operations before operations begin. This includes all personnel across the supply chain on shore bases, OSVs or offshore facilities.

#### 2.2.1 Onshore Materials and Logistics Coordinator or equivalent

The nominated onshore Materials and Logistics Coordinator (MLC), or any shoreside person who performs this role, coordinates loading activities at the shore base and serves as a single point of contact for shore base operations. The onshore MLC is traditionally a representative of the charterer, and is responsible for:

- Coordinating all loading and discharge activities at the shore base.
- Coordinating deck cargo prioritisation with the offshore MLC.
- Acting as the single point of contact ashore for communication and coordination with the offshore MLC, vessel Master and onshore supply base.
- Preparing and disseminating draft outbound vessel stowage plans and deck cargo manifests to the offshore MLC and the vessel Master before the deck cargo operation.
- Coordinating port call planning for deck cargo discharge and loading, heavy lifts, dry and liquid bulk transfers (including bunkers) and dangerous goods shipment.
- Preparing and disseminating the final outbound vessel stowage plan, deck cargo manifest and sailing instructions to the vessel Master and the offshore MLC, in accordance with port and Flag State regulations.



### 2.2.2 Vessel Master

The vessel Master has overriding authority and the responsibility to make decisions with respect to vessel crew and vessel safety and pollution prevention. The vessel Master is responsible for (but not limited to):

- Using the contents of this information paper.
- Reviewing and approving all stowage plans and the deck cargo manifest.
- Checking that deck cargo is loaded in accordance with the agreed stowage plan.
- Securing deck cargo after each loading or discharging event is completed.
- Stability considerations regarding vessel load conditions and sea-keeping qualities.
- Planning and execution of safe voyage routing, manoeuvring, positioning and station keeping.
- Allocating suitably qualified and experienced vessel crew for safe bridge and deck management during deck cargo operations.
- Preparing and updating the deck cargo stowage plan according to the discharging and backload sequence, in coordination with the offshore MLC.
- Issuing the final inbound stowage plan after offshore deck cargo operations are completed.

### 2.2.3 Offshore Materials and Logistics Coordinator or equivalent

The nominated offshore MLC serves as a single point of contact and coordinates the movement of all deck cargo and backload between the facility, the vessel and the shore base. The offshore MLC is responsible for:

- Coordinating deck cargo prioritisation with the onshore MLC.
- Preparing the discharge and backload sequences for deck cargo movements between facility and vessel, in coordination with the vessel Master and primary contacts (Offshore Installation Manager (OIM), facility crew, crane operators and radio operator).
- Planning daily vessel schedules and forecasts of offshore deck cargo operations in coordination with vessel Master, OIM and primary facility contacts.
- Preparing and disseminating draft and final deck cargo manifests.
- Liaising with the vessel Master to understand the vessel's performance or safety limitations, either operational or environmental, that may affect planned deck cargo operations.

## 2.3 Deck cargo stowage plan and deck cargo manifest

### 2.3.1 Deck cargo stowage

The following factors should be considered when stowing cargo on deck:

- Deck cargo discharge/backload sequencing to minimise the time the vessel is close to the facility.
- Vessel design, including open stern, open sides (no gunwale/bulwarks), low freeboard and the possibility of green water on deck.
- Emergency escape routes and safe access.
- The location and number of dedicated strong points, lashing points and post mounts.
- Deck cargo dimensions, deck cargo mass (empty/full), contents and Centre of Gravity (CoG), if known.
- Vessel deadweight/maximum payload and deck loading capacity.
- Block stowage of deck cargo, including number, type, design, size and mass of Cargo Carrying Units (CCUs) in a block and securing arrangement.
- Placement of refrigerated CCUs to allow safe access for monitoring.
- Safe placement of hazardous goods in accordance with approved stowage plan and the International Maritime Dangerous Goods Code (IMDG Code).
- Forecast weather, current and sea state conditions offshore.
- Even distribution of deck cargo for vessel stability.
- Deck surface friction.

### **2.3.2 Deck cargo stowage plan**

The deck cargo stowage plan is a visual representation of the cargo stowed on deck. It is a live, vessel-specific document that may be changed many times before it becomes a final document. Compliance with the deck cargo stowage plan helps to ensure the vessel's safety during transit, and safe cargo loading and discharge at the shore base and offshore facility.

The deck cargo stowage plan should include:

- Scaled representation of cargo on deck.
- Deck surfaces and loading capacities.
- Emergency escape routes and safe access.
- Vessel strong points, lashing points, deck equipment and securing machinery, e.g. tugger winches or capstans, frame and deck block numbers, as applicable.
- Colour identification of deck cargo if required, e.g. in order of priority or by facility.
- Clear identification and segregation areas for dangerous goods.
- Location of and clear access to power outlets for refrigerated CCU.

A deck cargo stowage plan should be developed before starting or restarting all deck cargo operations, using the information in the deck cargo manifest.

The deck cargo stowage plan and backload sequencing should take into account appendix A: Safe deck best practice.

Starting deck cargo operations should be allowed only after the vessel Master and the MLCs review and agree the deck cargo stowage plan.

### **2.3.3 Deck cargo stowage planning tool**

Appropriate software or a spreadsheet should be used to develop and monitor the deck cargo stowage plan. An example of a deck cargo stowage plan using a spreadsheet is shown in figure 2.1.

- Plan to be completed in conjunction with Job Hazard Analysis (JHA) for deck cargo operations and using the safe deck best practice criteria.
- Installation is to inform vessel of deck cargo required to be loaded or discharged. Both parties then agree on the load/discharge plan sequence.
- All crew to conduct a toolbox talk and discuss sequencing of deck cargo operations.
- Identify on plan the order of discharge and backloading sequence. Plan to be shared with the facility.
- No lashings to be removed until vessel is in position. Two-staged securement should always be considered.
- Only unlash/secure one block of cargo at a time.
- Maintain continuous communication between all parties during deck cargo operations. Any deviation from the proposed plan should be toolboxed and further risk assessed.

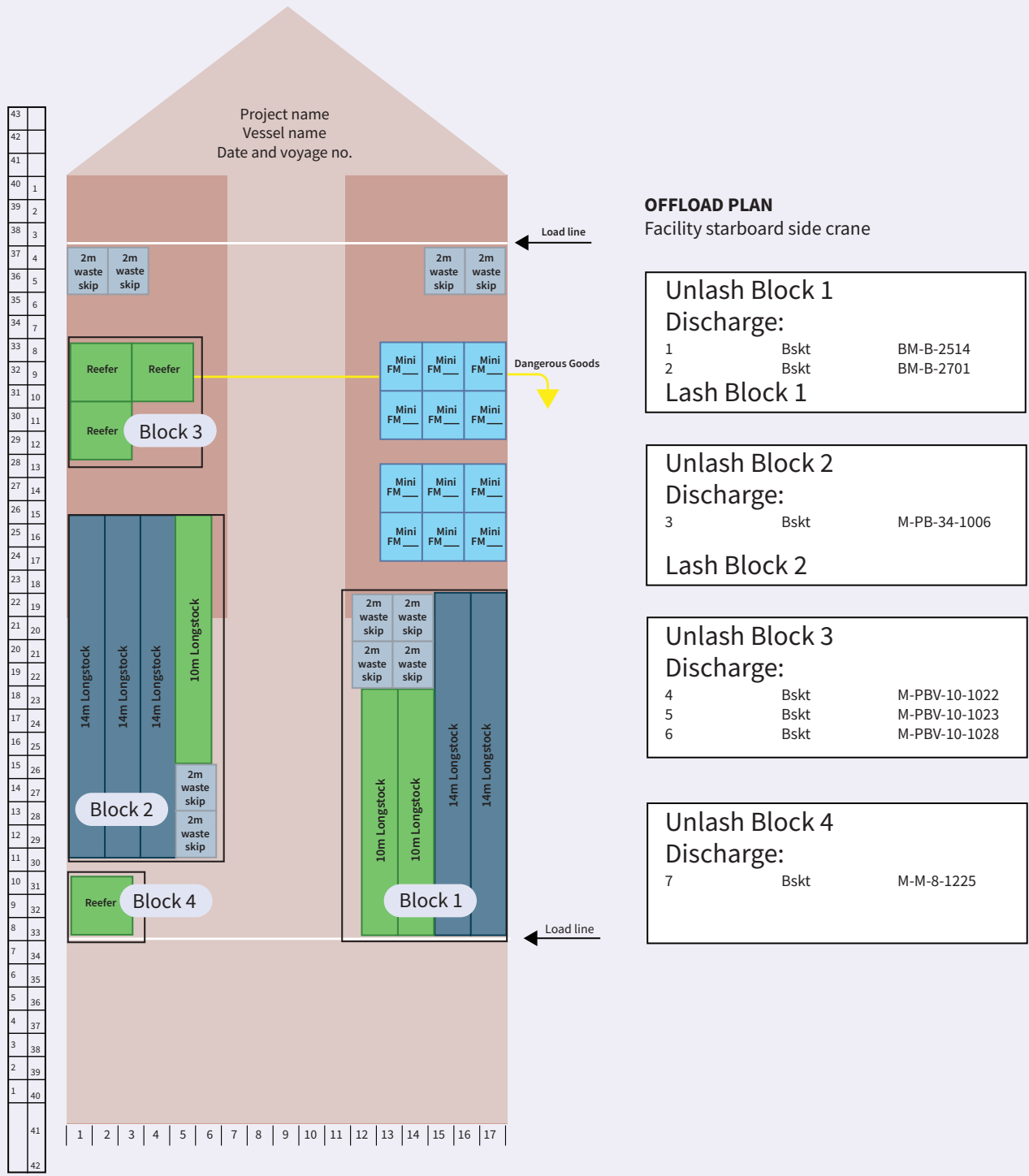


Figure 2.1: Example deck cargo stowage planning tool

#### **2.3.4 Load/backload deck cargo manifest**

The deck cargo manifest should clearly identify the cargo to be shipped, details of the contents, the destination, general dimensions, identification numbers, any dangerous goods and the verified mass. Vessels should be issued a draft deck cargo manifest before loading or backloading any cargo.

If any changes are made to the draft deck cargo manifest, the vessel Master should be given a revised cargo manifest for review and agreement.

It is the offshore MLC's responsibility to provide the vessel with accurate information on the deck cargo to be backloaded.

The offshore facility should prepare a backload deck cargo manifest that accurately identifies the cargo being backloaded, details of the contents, the destination, general dimensions, identification numbers, any dangerous goods and the verified mass. Once completed, this should be shared with the vessel Master for review and agreement.

Vessels should not depart a facility without a final deck cargo manifest of loaded/backloaded cargo.

Photographs should be taken of the deck cargo before or shortly after departure and forwarded to the destination, along with the deck cargo manifest, to help plan the discharge.

#### **2.3.5 Forward and reverse deck cargo handling process flowcharts**

The forward deck cargo handling process flowchart (figure 2.2) has been prepared to indicate the responsibilities of the personnel involved when the vessel is in a port and is loading cargo at a shore base which is to be transported to an offshore facility.

The reverse deck cargo handling process flowchart (figure 2.3) has been prepared to indicate the responsibilities of the personnel involved when the vessel is at an offshore facility and is backloading cargo to be returned to a shore base in a port.

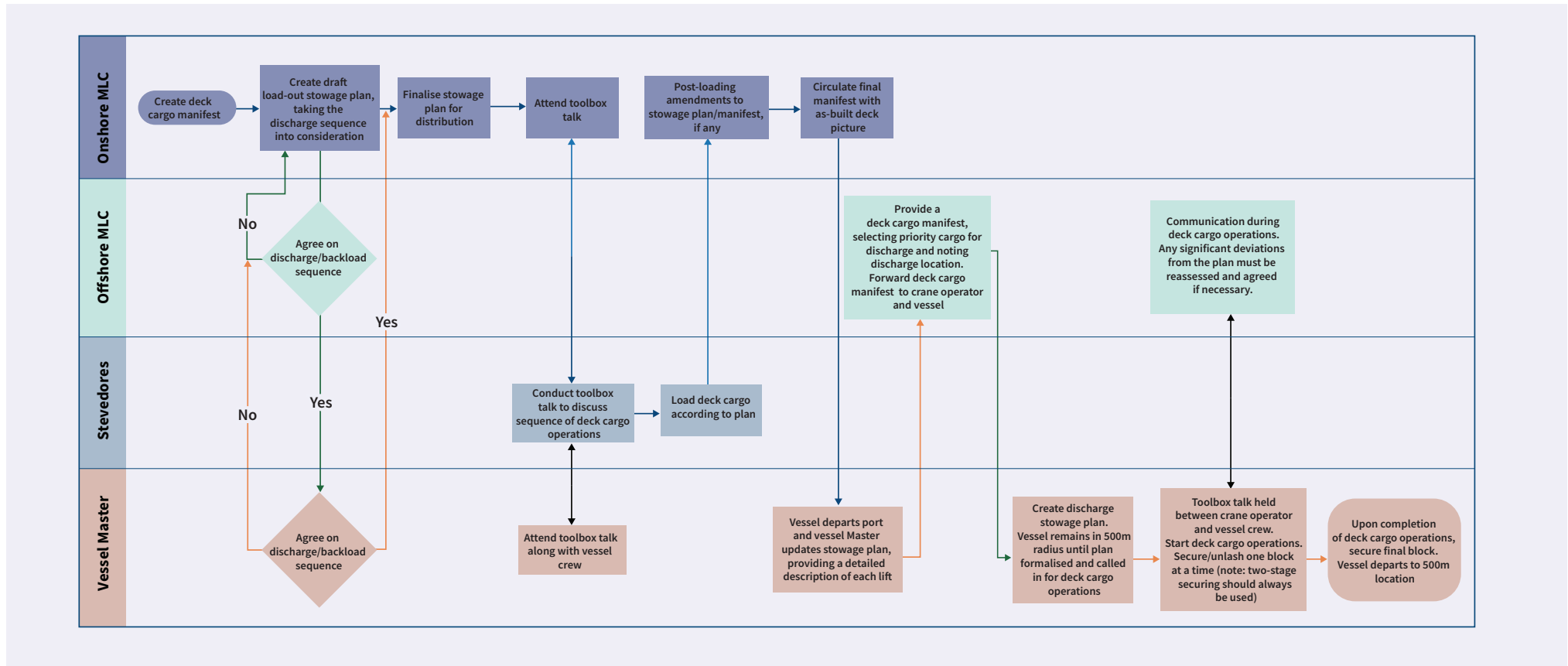


Figure 2.2: Forward deck cargo handling process flowchart

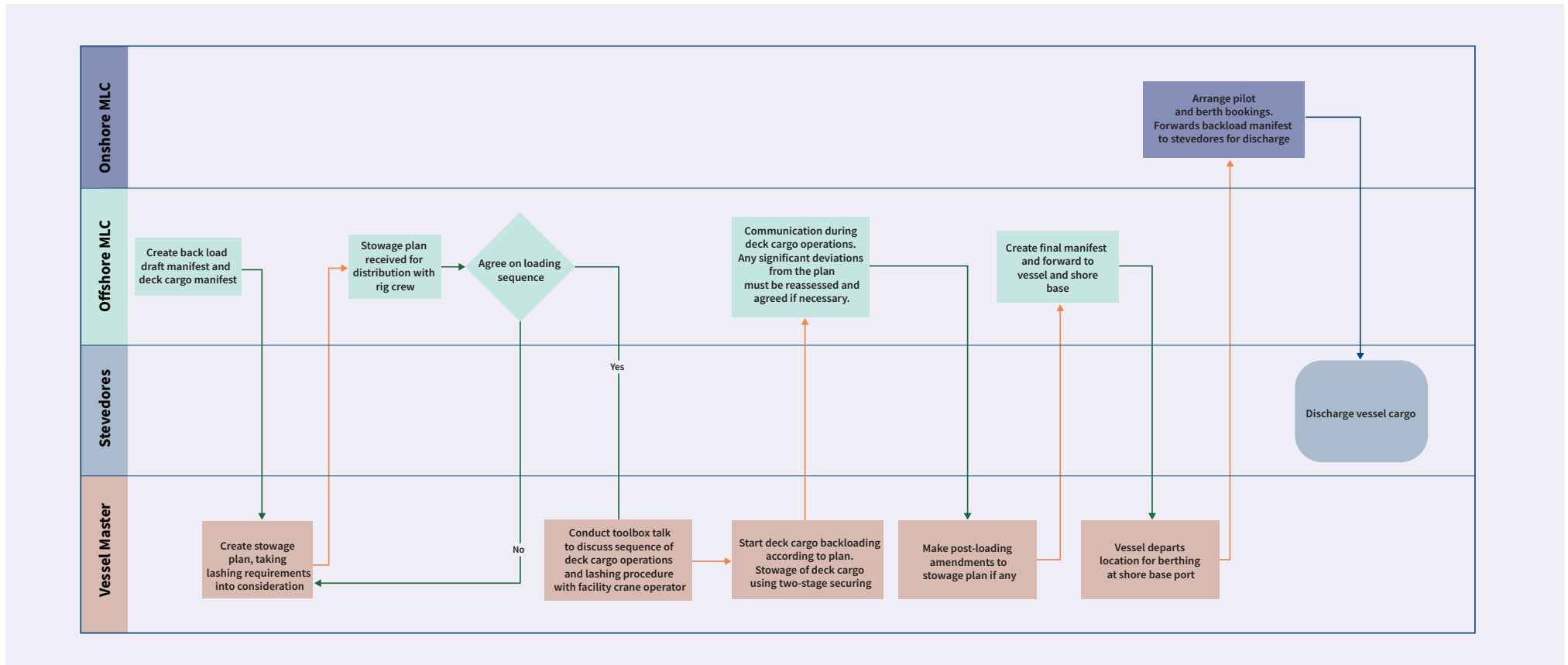


Figure 2.3: Reverse deck cargo handling process flowchart

## 2.4 Selective discharge of cargo

The selective discharge of cargo from within a block stow (also called cherry picking) is extremely dangerous and is not recommended. Selective discharge of cargo includes:

- Cargo lifting arrangements not being directly accessible from deck level.
- Breaking stow from an open location with no clear and secure access/escape routes to adjacent safe havens, e.g. when cargo is secured close to bulwarks.
- Any requirement for personnel to use unsecured ladders, to climb on top of other cargo or ship structure or to enter any container to connect lifting arrangements, e.g. CCU, boxes, tubulars, etc, is dangerous at all times and is not recommended.
- Relocating the CCU on the vessel deck to allow access to a selected CCU.

To eliminate the risk of selective discharge, determine which cargo items are high priority, if any, and identify these before cargo is loaded onto the vessel. Vessels should be advised accordingly, and cargo should be stowed so that any high priority items can be discharged directly on arrival at their destination.

## 2.5 Consideration of special cargoes

### 2.5.1 Tubulars and pipe cargo

Tubulars and pipe cargo should either be racked or pre-slung (double wrapped and moused) so that the lifting sling can be attached to the crane lifting hook with the vessel crew in a safe location. Appendix 9B in *Guidelines for Offshore Marine Operations (G-OMO)* provides further guidance on handling tubulars.

Recommendations for handling tubulars and pipe cargo include:

- Decks should be prepared using rope dunnage before loading tubulars.
- Vessel crew should not climb on tubulars.
- Deck pins/pipe posts should be used to secure tubulars, along with high visibility chocks.
- Where only a partial load discharge is completed, deck pins should be installed to restrain the remaining load if safe to do so.
- Tubulars should be supplied with end caps and caps should be checked to make sure they are secured.
- A single point lift is recommended for handling a tubular or pipe cargo.

### 2.5.2 Change in deck cargo mass

In case of an increase in deck cargo mass, the following factors should be considered:

- Open top units that may increase in mass due to water ingress, e.g. rain water, sea water, ice, etc.
- Any deck cargo that may absorb moisture, e.g. wooden planks/pallets.

## 2.6 Materials used on deck surfaces and landing areas

### 2.6.1 Increase friction area of vessel cargo deck

Avoid loading on steel decks when sheathed deck areas are available. Where vessels have areas of unshathed deck, i.e. exposed steel areas, the potential for reduced friction should be assessed if cargo is loaded in these areas. Wooden deck timbers, flaked out-of-service mooring lines or similar material are recommended for deck cargo operations.

Materials used for deck sheathing should be carefully considered, because some products provide limited friction, such as reconstituted plastic deck timbers.

## 3 Deck cargo operations: general

### 3.1 Key roles and responsibilities

#### 3.1.1 Crane operator

The crane operator is responsible for:

- Reviewing, inputting and agreeing on the lifting operation plan.
- Good communications and remaining available during operations.
- Ensuring a pre-operation planning discussion with the vessel is completed, in line with the lifting operation plan.
- Monitoring and executing the lift sequencing plan in accordance with the lifting operation plan (backload).

#### 3.1.2 Vessel bridge team

The vessel bridge team is responsible for:

- Reviewing, inputting and agreeing on the lifting operational plan.
- Holding a pre-operation planning discussion with the crane operator, in line with the lifting operation plan.
- Communicating and risk assessing the lifting operation plan with the designated vessel crew.
- Setting the vessel position and orientation to ensure a safe deck (see appendix A), and ensuring operations are carried out according to safe deck limitations and the MOPO (see appendix B).

#### 3.1.3 Designated vessel crew on deck

The vessel crew on deck is responsible for:

- Risk assessing the lifting operation plan with the bridge team.
- Monitoring and executing the lift sequencing plan (discharge).
- Monitoring the safe deck environment and ensuring operations are carried out according to safe deck limitations and the MOPO.
- Ensuring deck cargo is secured in accordance with appendix A.

### 3.2 Communications

Communications should be carried out in a way that ensures safe and efficient operations for all involved, i.e. the vessel, the facility and the port. During deck cargo operations, all personnel involved need to have complete and open communications, including:

- Facility control room.
- Crane operator and facility person in charge of the lift.
- Vessel officer in charge of the bridge.
- Designated vessel crew on deck.
- Designated stevedores, when in port.
- Onshore or offshore MLC for escalation or clarification.

The vessel Master should communicate with the facility and receive approval to enter the 500m safety exclusion zone before approaching a facility.

If the vessel is idle inside a facility's 500m safety exclusion zone and not working cargo for over 30 minutes, it should notify the facility that the vessel intends to secure its cargo and then move away until facility readiness is confirmed and operations can restart.



If either the vessel Master or the facility deem they are unable to clearly communicate with one another, the stop work authority should be used and, if needed, the vessel should move away until communications are satisfactory (see the MOPO in appendix B). A stop work authority gives everyone the authority and obligation to stop work when an unsafe condition, task or act could result in an incident or injury. It is everyone's responsibility to use the stop work authority to look after the safety of their colleagues and ensure incident-free operations.

Designated personnel working on the vessel's back deck should maintain dedicated radio communication between the deck and the crane operator/lifting supervisor at all times. Radio communication should use positive confirmation by asking the other person to repeat the instructions received to make sure they are understood.

Whenever possible, the bridge team should always have a line of sight to the vessel crew. This is not always possible due to different deck cargo, so installing CCTV is recommended. Vessel crew should not be on deck when cargo is handled other than to hook and unhook cargo.

Consideration should be made to using the vessel's whistle, general alarm and all available means of communications as a warning to vessel crew if there is a change in deck operation safety, e.g. if green water is shipped over the stern. An emergency shutdown signal should be an agreed part of the vessel's 500m zone entry checklist.

### 3.3 Training of vessel crew in deck cargo operations

Though all vessel crew involved in deck cargo operations should have the correct training, certification and experience before joining a vessel, specific onboard training and familiarisation should also be conducted. It is the vessel Master's responsibility to ensure that each new crewmember is given proper familiarisation and training to ensure personal safety and wellbeing before, during and after deck cargo operations. The vessel Master should designate a qualified person to conduct onboard familiarisation, which should include:

- Appendix A: Safe deck best practice.
- Cargo areas.
- Deck cargo operations during hours of darkness, e.g. deck lighting and shadowed areas.
- Vessel-specific deck cargo securing equipment.
- Clear deck cargo lifting and landing.
- Any standing orders related to deck cargo operations and compliance.
- Safe deck access approval and deck evacuation conditions.
- Vessel CSM.
- Specific supply base/installation deck cargo procedures.
- Installation data card with crane location and crane limits.
- Vessel communications and associated procedures for deck cargo operations.
- Safe areas/havens during deck cargo operations.
- Incident/emergency response plans and equipment, including Shipboard Oil Pollution Emergency Plan (SOPEP), location of hazardous materials, etc.

A record of the onboard familiarisation and training should be kept.

### 3.4 Assessing the likelihood of deck cargo shift and mitigation strategies

Adverse conditions offshore may result in longitudinal, vertical or transverse motions. Along with green water on deck, these forces cause the majority of deck cargo shifts. Vessel crew/personnel safety should always be the first priority, and therefore safe deck conditions should exist before work is undertaken.

The following factors, among others, should be considered when assessing the likelihood of deck cargo shift:

- Positioning of deck cargo.
- Vessel stability.
- Appraisal of the current and forecast weather and sea state for the planned voyage.
- Type, size and capacity of lashing available for securing deck cargo.
- Number of items for securement in a segregated block load.
- Use of block stowage to reduce the number of unsecured cargo items on deck.
- Whether the stow can be adequately re-secured if broken.
- Whether enough time has been allowed to safely secure unlash deck cargo.
- Whether deck cargo is adequately secured.
- Friction coefficient of the deck and placing additional friction factors on steel sections of the deck.

Boat-shaped skips are not recommended for loading on deck because they are likely to lift and move.

As a best practice, only one block of cargo should be worked at a time, and all other blocks of cargo should remain secured during deck cargo operations. Each block of cargo should be re-secured before starting the next block. The vessel Master or their delegate should enforce block segregation and securing deck cargo to reduce the risk of shifting and to best ensure the vessel crew's safety on deck.

Subject to safe deck conditions, all deck cargo items should be properly secured before leaving a facility, regardless of the voyage length or weather forecast.

### 3.5 Line of fire

The line of fire is the zone in a work area where there is risk of injury due to a release of energy from machinery, equipment or objects that are moving or under tension.

Line of fire risk should be continuously assessed and managed to ensure safe deck operations.

### 3.6 Push/pull poles and tag lines: hands-free operations

All deck cargo operations are recommended to be hands-free. Where operations cannot be hands-free, any alternative methods should be risk assessed. Examples include:

- Push/pull poles.
- Tag lines (see G-OMO section 9.14 and appendix 9C: Guidelines on Makeup and Use of Tag Lines).

### 3.7 Dropped objects and pre-drop inspections

All facilities should conduct pre-drop inspections of all loaded deck cargo items, including any backloaded cargo, to ensure that they are in a safe condition before any loading operations start. These should be conducted as part of the pre-task safety planning or permit system for load/backload operations and reviewed continuously during operations.

### **3.8 Clear deck policy**

Where a safe deck cannot be achieved, a defined clear deck policy should apply. The clear deck policy should apply to all persons near or involved with any deck operations at any port, shore base or offshore facility.

When defining a clear deck policy, key risks (as identified in appendix A) to consider include:

- Green water on deck.
- Unsecured cargo on deck.
- Whether vessel motion exceeds limits set for roll, pitch and heave.
- Line of fire.

## **4 Deck cargo operations: offshore**

Unless appropriately managed, deck cargo operations in a dynamic offshore environment pose a high risk to the vessel crew and facility.

To help manage risk in an offshore environment, vessel operators/vessel Masters should consider developing a vessel-specific MOPO such as in appendix B.

### **4.1 Triggers for deck cargo operations reassessment**

The MOPO should identify trigger points for reassessing changes to conditions and risk.

### **4.2 Defined parameters for stopping deck cargo operations**

The MOPO should define stop points to ensure there is a clear need to stop work when an unacceptable change of conditions and risk occurs.

### **4.3 Dynamic forces offshore**

Weather conditions and dynamic forces acting on the vessel should be continually monitored and assessed during the operation. Pay attention to significant wave height, wind and current and their effect on:

- Water ingress management (green water).
- Vessel motion.
- Vessel station keeping.
- Interaction between vessel and facility.

### **4.4 Working stern to the weather**

Open stern or low freeboard vessels are at a higher risk of water ingress and should avoid working stern into the weather. It is best practice to have the bow of the vessel into the weather before starting any deck operations. Where this is not possible, the vessel Master should perform a risk assessment to identify and mitigate hazards.

## 5 Deck cargo securing

### 5.1 Primary and secondary deck cargo securing

#### 5.1.1 Securing equipment

Methods for securing equipment and its correct use should be determined by the CSM. Only use certified and fit-for-purpose equipment.

#### 5.1.2 Two-stage securing

Two-stage securing of all deck cargo blocks is recommended to reduce the risk of deck cargo movement while the final cargo securing device is being placed. The following securing methodology is recommended:

- Stage 1: Use the vessel tugger winches, capstans or other mechanical means to temporarily restrain a cargo block or item(s) to a suitably rated lashing point. Restrain deck cargo in a tight stow until the block or item(s) is manually secured. The purpose is to mitigate risk to personnel during stage 2.
- Stage 2: Placement of permanent deck cargo securing. Upon final securement, the temporary securing is removed, to be used on the next stow. The result is a segregated block of cargo or item(s) secured between two or more suitably rated lashing points.

#### 5.1.3 Methods for deck cargo securing

Examples of certified securing arrangements include tugger wire; lashing chain; webbing; wire; pipe pins/stanchions; stretchers; ratchets or shackles, as shown in figures 5.1 to 5.4.



Figure 5.1: Tugger wire



Figure 5.2: Webbing and binder

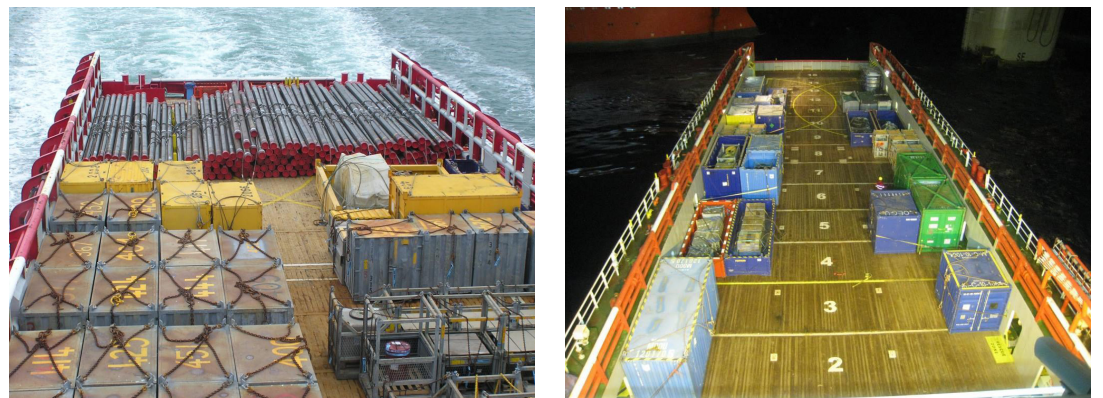


Figure 5.3: Block stow (in conjunction with cargo securing)



**Figure 5.4:** Friction deck/material

## 5.2 Management of personnel tending to deck cargo operations while underway or en route

Vessels should be guided by appendix A before any deck access.

## Appendix A Safe deck best practice

This appendix outlines best practices for a safe deck and can be used as a checklist for Masters. A safe deck is one on which, at a minimum, the following is met:

- Risk assessment completed.
- Safe vessel motion.
- Buddy system established.
- Adequate communications.
- Sufficient lighting.
- Deck cargo securing/escape route awareness.
- No green water on deck.
- Awareness of lines under tension.
- Safe atmosphere.
- Permission granted for operation.

A safe deck is relevant for any operation on the working deck of an OSV. It forms a consistent and minimum standard for a safe work environment, complementing risk assessment and toolbox talks, and must be reviewed before and continually during task execution. If a safe deck cannot be achieved or maintained, the operation should not proceed and the deck should remain clear of personnel until a safe deck exists. Maintaining a safe deck should take precedence over any other operational requirement and must not be compromised in any circumstance.

Furthermore, due to the offshore environment's dynamic nature, it is important that there is a mechanism to identify and manage change during an operational cycle.

### A1 Risk assessment completed

A risk assessment is recommended as a minimum in order to manage and control hazards and risk.

- Develop a task-specific risk assessment for the planned operation.
- Reference to the MOPO and analysis should form part of the risk assessment.
- Vessel crew should participate in and sign off on the task-based risk assessment, mitigations and controls.

### A2 Safe vessel motion

A safe deck provides a stable work platform for vessel crew when vessel motion results from dynamic environmental conditions. This reduces the likelihood of unsecured deck cargo or equipment (the group being tended to) from tipping or shifting. Consider the following when managing risk associated with vessel motion:

- Quantify roll, pitch and heave as in the MOPO.
- Use of instrumentation (inclinometer, Motion Reference Unit (MRU), etc.).
- Effect on vessel freeboard (increase in likelihood of water on deck).
- The vessel's efficiency in clearing the deck of sea water via deck freeing ports.
- Base friction: steel versus wooden or plastic deck coverings.
- Type and CoG of deck cargo or equipment carried.
- Stability management. This would involve moving ballast or fuel internally to reduce water on deck, e.g. taking on ballast in the forepeak to increase the stern freeboard.
- Manoeuvring/positioning in the seaway.



### **A3 Buddy system established**

A buddy system consists of a minimum of two experienced and qualified crewmembers working together to ensure each other's safety. In general, vessel crew should work closely so that they are aware of each other's activities and neither is unknowingly exposed to hazards. In the best case, crewmembers will be within sight of one another and in speaking distance. If they are neither in range of sight or speaking, the buddy system will be compromised and the safety of crewmembers on deck would need to be reassessed.

- The buddy system should have a minimum of two people, although resourcing should be based on the risk assessment outcome.
- A person responsible for a clear deck is assigned. The responsible person should be nominated during a risk assessment, taking into consideration deck team composition, operation, etc.
- If one crewmember leaves the deck, the other should follow, with the responsible person confirming the deck is clear.

### **A4 Adequate communications**

Those on the bridge can provide additional supervision to the buddy system. If the bridge team becomes aware of a hazardous event or change of conditions before the deck team, it is important that there is an uninterrupted communication line to allow immediate warning. Adequate communication is vital to notify the vessel crew of a hazardous event or change of conditions.

- Establish appropriate lines of communication and develop checks to ensure that these lines are effective.
- Identify and use all available communication methods for early warning of hazards.
- Lines of communications should be uninterrupted, i.e. free of disruption or radio traffic.
- As well as the buddy system, the bridge watch keeper, crane operator, etc. are valuable resources for early hazard detection.

### **A5 Sufficient lighting**

A safe deck has enough lighting that the deck area being worked is fully visible by all persons involved in an operation.

- There is enough facility lighting to assess conditions.
- Escape routes are well lit.
- Shadow areas are identified and alternative means of lighting are established.
- Environmental conditions affecting visibility are identified.

## A6 Deck cargo securing/escape route awareness

Deck cargo and equipment not tended to must be secured to ensure a safe deck. Only the block of cargo or the equipment being loaded or offloaded should be unsecured. This will minimise the number of items that can shift due to seawater or vessel movement, resulting in an unsafe deck.

Awareness of deck escape routes should be checked during risk assessments, bearing in mind that deck escape routes change during deck cargo operations.

- Deck cargo securing:
  - An agreed loading/discharge plan is in place before starting operations.
  - Selective discharge of deck cargo from within the stow. No cherry picking.
  - The deck cargo should be secured in discrete blocks (block stowed), normally consisting of no more than 10–15 items, depending on the nature or size of the units or vessel.
  - Only deck cargo being actively worked should have the securing removed. All other cargo blocks should remain secured.
- Escape route awareness:
  - Escape routes and a nominated safe area of refuge have been identified through the risk assessment.
  - Escape routes are free of obstruction at all times.
  - Escape routes have been considered during deck cargo planning/stowage.
  - All vessel crew are aware of this nominated escape route and safe area.

## A7 No green water on deck

Green water is a solid wave or body of water breaking over the deck. Green water is different from foam or spray in that it typically contains a mass of water that can sweep up and across the deck. The initial effect of this sweeping mass is the force of impact it exerts on obstructions to its path (including deck structures, deck cargo or personnel).

The secondary effect is the buoyant forces it exerts on bodies that it envelopes, potentially causing them to lift off the deck. Either alone or in combination, the impact and buoyancy forces of green water are a threat to safety on the deck, with potential consequences such as damage to structures, movement of deck cargo or personnel being washed off their feet.

- Avoid any amount of water that could cause deck cargo to move or float, which would then be a hazard to personnel and cause damage to the deck cargo itself.
- Free ports to allow drainage of water.
- Optimise vessel loading/trim/movement to maintain a safe deck.
- Manoeuvre or position the vessel in the seaway to eliminate or reduce green water on deck.

## A8 Awareness of lines under tension

Many securing devices currently in use on offshore vessels have fittings not designed for the intended purpose and could potentially fail when personnel are on deck. Unless secured in a designed securing device or made fast, wires, ropes, chains or stored energy sources under tension pose a safety risk and personnel should remain clear of the deck.

Examples include any line that is dynamic and under tension, any winch that is heaving/paying out or any holding wire, rope or chain under tension.

The term 'lines' can include:

- Tow/anchor handling/tugger wires.
- Heaving and messenger lines.
- Installation mooring ropes/wires/chain.
- Vessel mooring lines, where applicable.
- Lines associated with lifting operations and marine floating hose operations.

Controls or mitigations include:

- Snap-back zones/lines of fire should be assessed and identified during risk assessment. All areas on the deck are hazardous from a snap-back perspective, but some areas may be deemed as higher risk. A safe area of refuge from this hazard should be identified.
- Clear the deck when lines are under tension and not secured.
- Adopting a safety factor to enable safe work alongside lines under tension.
- Use deck line securing devices, e.g. chocks, fairleads, towing pins, to contain lines.

## **A9 Safe atmosphere**

At all times, a safe atmosphere, free of toxic fumes or dust, should be maintained for all personnel. An unsafe atmosphere may involve:

- Bulk venting from installation, either from product transfer or internal transfer.
- Hydrogen Sulphide (H<sub>2</sub>S), either from onboard venting or rig transfer.
- Installation/vessel exhaust/discharges when the vessel is alongside another vessel or facility.
- Hydrocarbon release from installation.
- Loss of containment from deck cargo.
- Planned breaking containment, e.g. marine floating hose maintenance.

## **A10 Permission granted for operation**

The final stage of the safe deck process is to collectively agree that all criteria have been satisfied and verify that the deck can be approached for operation.

- All safe deck checks confirmed.
- All vessel crew involved in task are aware of and satisfied a safe deck exists.
- A work management system is in use.
- A last-minute step-back risk assessment has been completed, to provide a last look at the worst possible outcome that could occur in the current conditions before the job is started. Ask the question: 'What is the worst thing that could happen?'. Reassess if there are any changes to conditions/work scope.
- The officer of the watch has granted final authorisation to enter the main deck and start the task.

## Appendix B Matrix of Permitted Operations

This appendix introduces the Matrix of Permitted Operations (MOPO) concept, which defines critical changes in conditions, operations or barriers and offers guidance on management of such change. Importantly, it identifies trigger points for reassessing deck conditions and cessation points to stop operations before an unsafe deck condition occurs.

An example MOPO is given on the next page. An editable template version is available on the OCIMF website: [www.ocimf.org/publications/information-papers.aspx](http://www.ocimf.org/publications/information-papers.aspx).

The rows on the left of the MOPO are the activity, and the columns on the top are the operations/conditions and barriers. The bottom boxes show traffic light (colour coded) conditions to apply before an activity can continue, to indicate there is a safe deck.

Activity	This MOPO does not override any person's decision to stop any operation they believe is unsafe																										
	Barriers/Conditions/Operations																										
Vessel Activities																											
Stop Work Authority	Anyone calls a stop	Safe Deck	Threat to safe deck	Unsafe deck	Communications	Loss of voice link to facility/vessel	Loss of voice link between bridge and deck	Environmental Conditions	Approaching line squall	Significant wave height/swell > ___ metres and < ___ metres	Significant wave height/Swell > ___ metres	Mean wind speed > ___ knots and < ___ knots	Mean wind speed > ___ knots	Visibility < ___ metres	Lightning in close proximity	Ambient air temperature	Night time operations	Facility Status	Gas alarm on facility/vessel (if fitted)	Well shut in/well control situation	Well testing/flaring on installation	Bulk venting from facility: toward vessel position	Vessel Motion	Pitch > ___ degrees	Roll > ___ degrees	Heave > ___ metres	Other
Offshore equipment/cargo handling	1		1	X		1	1		1	4	1	4	1	9	X	8	OK		9	1	6	1		1	1	1	
Vessel manoeuvring	1		1	X		1	1		1	4	1	4	1	9	X	8	OK		9	1	6	1		1	1	1	
Vessel operating on DP	1		1	X		1	1		1	3	1	3	1	9	X	8	OK		9	1	6	1		1	1	1	
Personnel transfer from facility to vessel via man riding crane	1		1	X		1	1		1	4	1	4	1	X	X	8	7		9	1	X	1		1	1	1	
Personnel transfer by FRC/crew boat between vessels	1		1	X		1	1		X	10	10	10	10	X	X	8	7		9	1	6	1		10	10	10	
Vessel on close stand-by with FRC/scramble nets	1		1	X		1	1		1	10	1	10	1	X	X	8	6		9	1	6	1		1	1	1	
Vessel handling anchors/buoys/line connections for barge/facility	1		1	X		1	1		1	4	1	4	1	9	X	8	OK		9	N/A	N/A	1		1	1	1	
Vessel towing facility/barge	1		1	X		2	1		2	5	5	5	5	6	2	8	OK		N/A	N/A	N/A	N/A		5	5	5	
Other																											

Key	
OK	Operation permitted
#	Conditions apply for operation to proceed
X	Operation not permitted/clear deck policy applies
N/A	Operation not applicable

Conditions that Apply Prior to Activity Continuing			
1	Stop work/make safe. All parties to review risk assessment and safe deck environment before continuing with operation.	6	Conduct risk assessment to evaluate requirement of additional controls.
2	Operation may continue if already started, otherwise it is not allowed to start.	7	Conduct risk assessment and refer to personnel transfer procedure.
3	Dependent on vessel's ability to maintain position, in accordance with FMEA/CAM/ASOG and safe deck environment	8	Take regular breaks, hydrate and refer to heat management process.
4	Dependent on vessel's ability to maintain position and safe deck environment.	9	Stop work/move and keep outside 500m zone, pending further evaluation with facility OIM and Vessel Master.
5	Depending on effects of prevailing weather: towards/away from installation/vessel or during tow.	10	FRC capability to safely launch and recover following risk assessment.

Safe Deck Policy
A safe deck is one on which, at a minimum, the following conditions are met:
✓ Risk assessment completed.
✓ Safe vessel motion.
✓ Buddy system established.
✓ Adequate communications.
✓ Sufficient lighting.
✓ Cargo securing/escape route awareness.
✓ No green water on deck.
✓ Awareness of lines under tension.
✓ Safe atmosphere.
✓ Permission granted for operation.

Table A.1: Example of a Matrix of Permitted Operations (MOPO)



A voice for safety

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