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The Carriage of Methanol in Bulk Onboard Offshore Vessels

First edition 2020

Issued by the

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Marine Safety Forum
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Founded in 1970, the Oil Companies International Marine Forum (OCIMF) is a voluntary association of oil companies having an interest in the shipment and terminalling of crude oil, oil products, petrochemicals and gas, and includes companies engaged in offshore marine operations supporting oil and gas exploration, development and production.

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Our mission is to lead the global marine industry in the promotion of safe and environmentally responsible transportation of crude oil, oil products, petrochemicals and gas, and to drive the same values in the management of related offshore marine operations. We do this by developing best practices in the design, construction and safe operation of tankers, barges and offshore vessels and their interfaces with terminals and considering human factors in everything we do.

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Contents

Glossary

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

Explosive range The range between the LEL and UEL is the explosive range. If a source of ignition such as a flame, spark, or static electricity is present, an explosion may occur. This may also be referred to as the flammable range.

Guidance Provision of advice or information by OCIMF.

Lower explosive limit The minimum vapour concentration (by percent) in which a liquid can form an ignitable mixture in air is called the lower explosive limit. Below this limit, vapour concentration is too lean to support combustion.

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

Upper explosive limit The maximum vapour concentration (by percent) in which a liquid can form an ignitable mixture in air is called the upper explosive limit. Above this limit, vapour concentration is too rich to support combustion.

Abbreviations

AR-AFFF	Alcohol Resistant Aqueous Film Forming Foam
EEBD	Emergency Evacuation Breathing Device
EX	Explosive Proof Equipment
FSS Code	International Code for Fire Safety Systems
IBC Code	International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
IG	Inert Gas
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organisation
ISGOTT	The International Safety Guide for Oil Tankers and Terminals and the Tanker
ISO	International Organization for Standardization
ISM	International Safety Management
LEL	Lower Explosive Limit
MARPOL	International Convention for the Prevention of Pollution from Ships
MSDS	Material Safety Data Sheet
NLS or INLS	International Noxious Liquid Substance Certificate or Certificate of Fitness
OIM	Offshore Installation Manager
OSV Chemical Code	Guidelines for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk on Offshore Support Vessels
P&A Manual	Procedures and Arrangements Manual
P&ID	Piping and Instrumentation Diagram
PPE	Personal Protective Equipment
P/V	Pressure Vacuum
SCBA	Self-Contained Breathing Apparatus
SIMOPS	Simultaneous Operations
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea
UEL	Upper Explosive Limit
VTS	Vessel Traffic Service (Port Control)

Bibliography

Guidelines for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk on Offshore Support Vessels (OSV Chemical Code) (IMO)

International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, The (IBC Code) (IMO)

International Convention for the Prevention of Pollution from Ships (MARPOL)

International Safety Guide for Oil Tankers and Terminals, The (ISGOTT) (OCIMF, ICS, IAPH)

1 Introduction

This best practice document provides a guide for the safe loading, carriage and discharge of methanol by offshore support vessels.

The carriage of methanol in bulk is becoming common in the offshore oil and gas industry, and although there is technical documentation on methanol handling, guidance for offshore carriage by sea is limited.

The supply of bulk methanol to offshore locations is the responsibility of several stakeholders, including the supplier, transporter and user of the product.

Methanol (Methyl Alcohol, CH_3OH) is a wood alcohol used in oil and gas production to prevent hydrate formation, which often occurs in gas condensate fields. Injection of methanol into the well downhole zone of gas hydrate fields not only causes decomposition of gas hydrates in that downhole zone of the well but also improves downhole zone filtration characteristics.

Methanol is a hazardous chemical with significant toxic, flammable, and reactive properties that can adversely affect human health and the environment when not properly handled.

Methanol is highly flammable, burns with no visible flame in daylight conditions and is readily miscible in water. Special care should be exercised when loading and discharging this product, and instructions within a vessel's procedures or marine operation manuals should be followed.

Safety is the biggest consideration when carrying methanol in bulk.

To achieve safe carriage, all bulk methanol cargo should be maintained in an inert condition while onboard offshore support vessels. This should be in line with the IMO OSV Chemical Code which requires an oxygen content of 8% or less and clear areas around pressure/vacuum relief valves (P/V valves) and manifolds.

The assigned product tanks should be protected by cofferdams which should be inerted by means of water or nitrogen.

1.1 Scope

This document relates to the carriage of methanol in bulk on offshore support vessels and not its packaged transportation.

To ensure the safe handling and transportation of this product, offshore support vessel tanks and surrounding spaces should be inerted (see section 2).

In this document, the term 'best practice' refers to those methods and procedures that take place once the road tanker arrives at the quayside of the loading port (see figure 1).

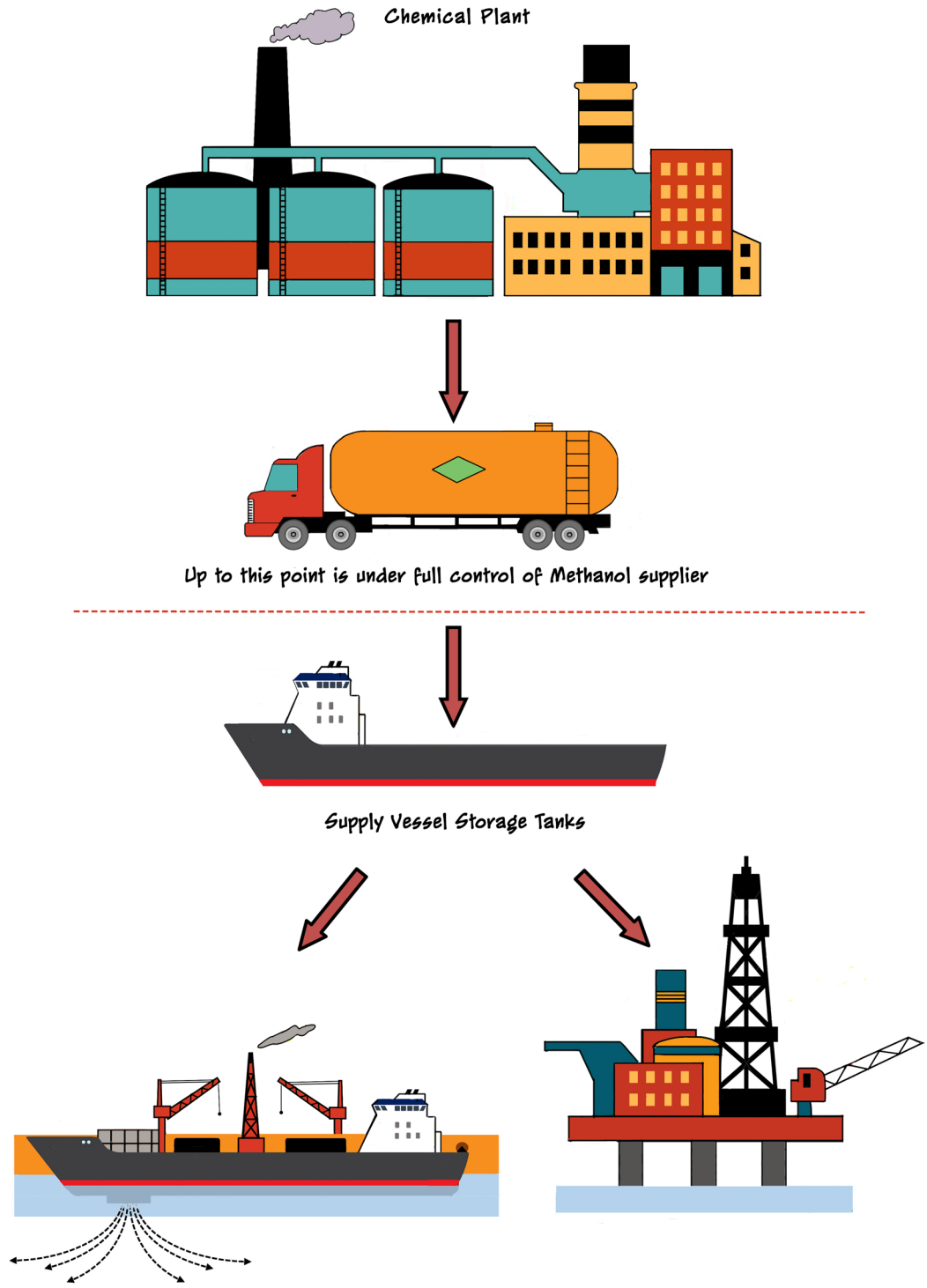

Figure 1: *Process overview of the supply chain for methanol in bulk*

2 Hazards and control measures for product and inert gas

Vapour from a flammable liquid will burn when ignited if it is mixed with certain proportions of air, or more specifically, when oxygen is present in the air. However, if the mixture is too lean (less vapour than air) or too rich (more vapour than air), the mixture will not burn. The limiting proportions, expressed as a percentage by volume of flammable vapour in air, are known as the Lower and Upper Explosive Limits (LEL and UEL). These terms are synonymous with Lower Flammable Limit (LFL) and Upper Flammable Limit (UFL). The zone between these two limits is known as the flammable range. The combustion of a vapour/air mixture results in a rapid expansion of gas which, if constricted in a confined space such as a cargo tank, will result in the pressure within the space being rapidly raised to the point of explosive rupture.

The fire-risk presented by a flammable liquid depends upon the oxygen content of the atmosphere above it. By filling the ullage space of a cargo tank that contains a flammable liquid with an inert gas (IG) such as nitrogen, the oxygen content can be reduced to a level where combustion is not supported. This process is known as inerting a tank.

While an inert atmosphere will not support combustion, it must never be assumed that it is without hazard. An inert atmosphere which is deficient in oxygen, will not support life and must not be entered until the tank has been suitably gas-freed.

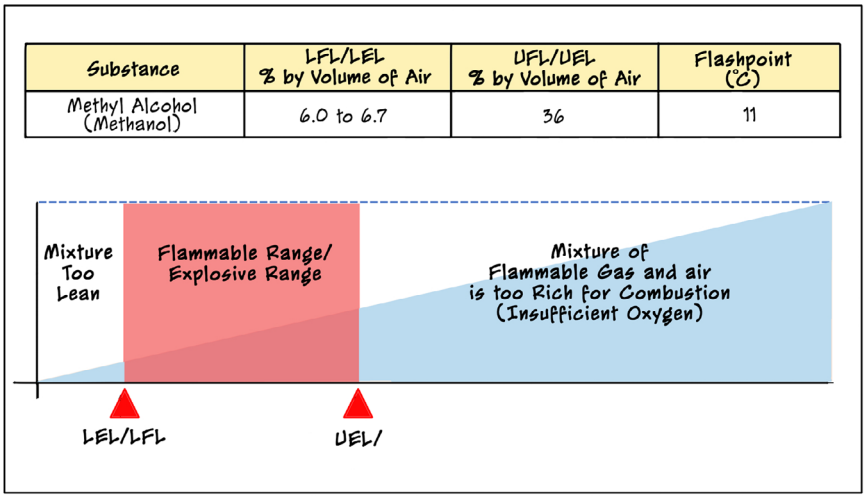

Figure 2: *Methanol graphic*

2.1 Methanol characteristics and associated hazards

Methanol is a clear, volatile, flammable liquid with a slightly alcoholic odour, and typically has a specific gravity of 0.79 at 20°C. Full details of the product's properties should be provided in a material safety data sheet (MSDS) that is available to users.

Methanol exposure primarily affects the nervous system, damaging the optic nerve.

Symptoms may include:

- Blurred or indistinct vision.
- Changes in colour perception.
- Eventually blindness.

Other symptoms of excessive exposure include:

- Headaches.
- Vertigo.
- Unsteady gait.
- Weakness.
- Nausea.
- Vomiting.
- Inebriation.

People who have been over-exposed may seem to improve but then get worse after up to 30 hours after exposure.

Methanol can be absorbed through the skin and produce toxic effects as described. It can also cause drying, cracking and inflammation of the skin as a result of its defatting action.

Methanol is slowly eliminated from the body once absorbed. Formaldehyde and formic acid, which are both toxic, are formed in the body when methanol is oxidised. Daily low exposure may accumulate in enough quantity to cause illness.

Main characteristics of methanol include:

- No visible flame when burning in daylight.
- Miscible in water.
- International Maritime Dangerous Goods (IMDG) Code Class 3 substance, with a noticeable odour.
- Highly flammable, with a flashpoint between 11°C and 23°C.
- Quick evaporation rate.
- Vapour heavier than air that may be invisible, and easily disperses over the ground.
- Explosive when mixed with air, particularly in empty, unclean offshore containers.
- Increased pressure when heated, with the risk of vessel rupture followed by explosion.

Fuel	Flash Point (°C)	Auto ignition (°C)	Lower Explosive Limit (LEL) (% vol.)	Upper Explosive Limit (UEL) (% vol.)
Liquefied Natural Gas (LNG)	-188	537	4.5	14
Petrol	-40	228-501	0.79	8.1
Methanol	11	385	6.7	36
Ethanol	12	363	3.3	19
Diesel	60	>=250	0.6	6.5

Figure 3: *Hydrocarbon products flammability comparison*

2.2 Nitrogen characteristics and associated hazards

Nitrogen (N_2) forms 78% of the atmosphere, with the remainder consisting of approximately 21% oxygen and 1% other gases. It is a non-toxic, non-flammable, colourless, odourless and tasteless gas, and is therefore impossible to detect using human senses.

Nitrogen is classified as a simple asphyxiate, meaning that it displaces oxygen in high concentrations and creates an oxygen deficient atmosphere without any significant physiological effects. Breathing is stimulated and controlled by carbon dioxide (CO_2) in the lungs. As the CO_2 level increases, the brain sends a signal to increase respiration which triggers inhalation. When the CO_2 level drops, the rate of respiration also decreases to maintain proper balance.

A single deep breath of 100% nitrogen will result in fatality.

Nitrogen related incidents have occurred on ships and ashore for many years. Many of these incidents have resulted in fatalities where personnel have entered spaces or worked too closely to spaces where oxygen had been displaced by nitrogen.

Some hazards related to nitrogen include:

- There is no warning when an atmosphere is oxygen deficient as a result of nitrogen displacement.
- Any inhalation of nitrogen can cause loss of consciousness and possible death. Even a small inhalation of nitrogen can result in a fatality. A 100% concentration of nitrogen will displace oxygen and CO_2 completely and, in the absence of a CO_2 triggered stimulus to breathe, 100% nitrogen will be fatal.
- Nitrogen is heavier than air. Therefore, when testing the atmosphere, consideration should be given to testing from the bottom up with multiple samples.

Spaces containing nitrogen and/or containing nitrogen pipe work/plant should be marked with an appropriate warning sign, e.g. Space Contains Nitrogen – Not Safe for Entry.

Personnel working in the vicinity of a tank being inerted by nitrogen or working in the nitrogen generator room must carry a personal oxygen detector which has been properly calibrated.

Entry to a space which contains, or which has contained nitrogen must be made under a Permit to Work and following a formal risk assessment. This requirement also applies to the nitrogen generator room.

2.3 Firefighting

Methanol presents fire-extinguishing challenges. Methanol vapour is heavier than air and can be ignited throughout a wide range of concentrations. Methanol flames are low temperature and non-luminous. When methanol ignites, it burns with an almost colourless or clear blue flame that is difficult to see in bright sunlight and produces little, if any smoke.

Response teams can walk into a pool of burning liquid without realising the hazard and should exercise extreme caution when approaching a methanol fire.

In the case of any spillage, it is recommended that the onboard firefighting team wash the product overboard using fire hoses.

Because of methanol's volatility and flammability, it is strongly recommended that the emergency response equipment be fully rigged and in place immediately before loading or discharging of methanol. This will help avoid unnecessary delays in the event of a spill or fire.

Small methanol fires can be extinguished with portable dry chemical or CO_2 extinguishers. Water spray, or alcohol resistant foam may be used if the volume of water is at least four times the volume of the methanol pool, because methanol concentrations of over 25% in water remain flammable.

Large methanol pool fires are best extinguished with water spray and/or Alcohol Resistant Aqueous Film Forming Foam (AR-AFFF) with foam-water proportioning equipment.

3 Chartering

When hiring a vessel to transport methanol, careful consideration should be given to the following:

- To provide adequate time for the chosen vessel to prepare for the planned cargo and test systems, prior notice should be given by the charterer.
- Vessel specification meets client requirements:
  - Location and number of manifolds and P/V valves including oxygen sampling points.
  - Hazard zones identified as per OSV Code.
  - Tank capacity.
  - Segregation of tanks and pipework, if applicable.
- Vessels should have the ability to inert methanol tanks to less than 8% oxygen.
- Vessel is Class approved to carry the product in bulk.
- Type of inerting system – use of quads or self-contained nitrogen generator.
- Vessel inerting system capable of meeting the required volumes for loading, discharging and maintaining an inert atmosphere throughout carriage.
- The Company Safety Management System (SMS) covers the safe carriage of methanol.
- Crew trained and competent in the safe carriage of methanol.
- Charterers should be aware that available cargo space will be reduced due to deck exclusion zones around the P/V valves and manifolds where deck cargo cannot be placed (see section 4.8).

4 Vessel carriage requirements

Cargo systems used for transporting methanol should be designed as per class requirements in line with the OSV Chemical Code. Where non-compliance with the current OSV Chemical code is evident, carriage of the product should be risk assessed.

4.1 Low Flashpoint Liquid cargo system

4.1.1 Methanol system

Because methanol has a flashpoint of approximately 11°C, it is categorised as Low Flashpoint Liquid (LFL) cargo. As such, these cargoes should be carried in LFL systems and not carried in normal product tanks (rated for product flashpoint above 60°C).

4.1.2 Product tanks

Product tanks should be designed as per class requirement for LFL cargo. Methanol storage tanks should be constructed with an appropriate grade of stainless steel, or by applying methanol-resistant coatings to the inside of the tank. These tanks should be capable of being inerted with nitrogen.

4.1.3 Cofferdams

Cofferdams should be wet-filled or dry (with methanol gas detection) and inerted with gas as per Class requirements. It is recommended that cofferdams be filled to 100% capacity with fresh water or nitrogen. Dry cofferdams should be fitted with P/V valves and approved by Class.

4.2 Documentation

Every ship certified to carry substances of IMO MARPOL Annex II Category X, Y or Z should have onboard a manual approved by the Administration and be certificated to carry that product. The manual should have a standard format in compliance with MARPOL that identifies the physical arrangements and all operational procedures, with respect to cargo handling, tank cleaning, slops handling, cargo tank ballasting and de-ballasting. It must be followed in order to comply with the requirements of MARPOL.

Minimum required documentation includes:

- Noxious Liquid Substance (NLS) Certificate or Certificate of Fitness.
- MARPOL Vessel-specific Procedures and Arrangements (P&A) Manual/LFL Handling Manual.

4.3 Maintenance of product tanks and associated systems

Maintenance requirements for methanol tanks and inerting systems should be in the vessel's planned maintenance system and audited under International Safety Management (ISM) Code requirements.

Methanol may contain acidic impurities that can damage coating systems. Periodic inspection of methanol tank coatings should be planned to identify any breakdown. Precautions should be taken to ensure that inspections do not damage coatings. The timely repair of defects will minimise the potential for accelerated pitting corrosion, iron pick-up and resultant contamination of methanol.

The planned maintenance system should cover the scheduling and scope of inspections, tank fabric maintenance and onboard cleaning routines.

Internal visual inspection of cargo tanks, and thorough cleaning (if required), should be carried out each year.

In addition, vessel owners/managers should undertake preventative maintenance including thorough cleaning and re-coating, where necessary, of all special product tankage within their dry-dock cycle.

If vessel tanks and system have not been used for product carriage within the last 12 months, it is strongly recommended that a wet trial be conducted before the next operation (see section 4.5.1).

4.4 Pipework/manifolds

4.4.1 Management

Pipework and manifolds should be treated in a similar way to tanks, with annual inspections to ensure cleanliness and integrity. Self-sealing couplings are to be used during offshore discharge/backload on either end of the hose assembly.

4.4.2 Maintenance

Manifolds and caps should be inspected before and after use. All valves are to be operational and kept closed when not in use.

4.4.3 Records

Planned maintenance routines and records should be kept up-to-date and include comprehensive details of the work carried out and any outcome. Consideration should be given to keeping photographic records to support the written report. These should be retained for three years.

4.5 Crew training and familiarisation

Crew should understand the characteristics and associated hazards of methanol carriage. Training can be carried out in-house with relevant materials and experience, or via third-party awareness courses.

The crew should also be familiar and proficient in the operation of the ship's methanol handling system. Proficiency in the operation of the methanol system can be verified via wet trial (see section 4.5.1).

4.5.1 Vessel system wet trials

Wet trials using fresh water are performed to prove the vessel's methanol handling system and crew familiarisation. Wet trials should be undertaken as follows:

- The vessel's crew are unfamiliar with the ship's methanol handling system.
- The vessel and/or crew has not carried methanol in the past 12 months.
- For crew familiarisation and training.

4.6 Fixed foam system

Offshore support vessels transporting methanol should be equipped with a fixed foam firefighting system as detailed in the Methanol Handling Manual. However, some vessels may operate with portable systems. All systems should use Alcohol Resistant Aqueous Film Forming Foam (AR-AFFF).

Firefighting systems including monitors, pumps and valves should be operated regularly as part of the planned maintenance system. Annual testing of the foam should be conducted by a third party to verify the suitability of the product. If it has not been replaced/renewed in the last three years or if the certificate cannot be provided, testing should be carried out, or the contents of the tank replaced. Foam stored in unopened drums should be considered to have an expiry date as per manufacturer's certificate/documentation.

4.7 Prevention of fire/explosion

Careful management of potential ignition sources is essential for the safe carriage of methanol. Rules and procedures should prohibit unauthorised activities within restricted zones which should remain in force throughout LFL operations, tank inspection and tank cleaning.

As a minimum the following should apply within this restricted zone:

- No smoking (including electronic cigarettes).
- No mobile phones.
- No smart watches.
- No hot work.

Only intrinsically safe equipment should be used. Non-intrinsically safe tools or equipment should not be used on deck.

Appropriate signage should be posted and visible on deck and from the gangway. A safe means of evacuation from the vessel should be agreed by all parties involved.

Restricted zones should be inspected for potential ignition sources.

Note: All electrical installations should be intrinsically safe, inspected and gas tight. When they are not considered intrinsically safe, or are showing signs of damage/deterioration, they should be switched off and isolated.

It is recommended that the deck be clear of cargo for loading operations. However, the minimum clearances (see section 4.8) should be followed at all times.

Note: In still air conditions it is possible for an oxygen-depleted zone to be created in the region of the P/V valves on deck when loading methanol and related products and when purging nitrogen from the system. Safe havens should be considered as confined spaces that may only be accessed by permit during such times. Non-essential personnel should not be on deck and personnel accessing the deck should carry personal oxygen analysers.

No hot work or use of non-intrinsically safe tools of any kind is allowed on deck during the carriage of cargo until instructed that the ban no longer applies. This ban is to remain in force throughout tank inspection and tank cleaning operations. No hot work on the quayside is permitted adjacent to the vessel during methanol loading or discharging operations.

When applicable, port authorities and vessels lying downwind of the methanol loading and discharging operations should be advised to stop hot work and prohibit smoking on deck and adjacent quayside until the methanol operation has completed.

Operations should be suspended if there is lightning within five nautical miles of the vessel.

4.8 Deck exclusion zones

A deck exclusion zone is a marked gas danger zone that identifies areas where there may be an asphyxiant, LFL vapour or liquid risk.

The following exclusions apply when carrying methanol:

1. When loading methanol product, there should be a 10m horizontal and vertical exclusion zone maintained from the P/V valve. This is due to the presence of large volumes of gas or vapour mixture vented during the loading process.
2. It is recommended that a 4.5m exclusion zone is maintained around the methanol manifold in case of leakage or failure of coupling/hose and for access/egress.
3. During the loading of methanol product, no deck cargo operations should take place.
4. Once the loading of methanol product is complete, the exclusion zone around the P/V valve can be reduced to 4.5m radius to allow for potential thermal variation.
5. It is further recommended that the 4.5m exclusion zone around the methanol manifold is maintained until the product is discharged.

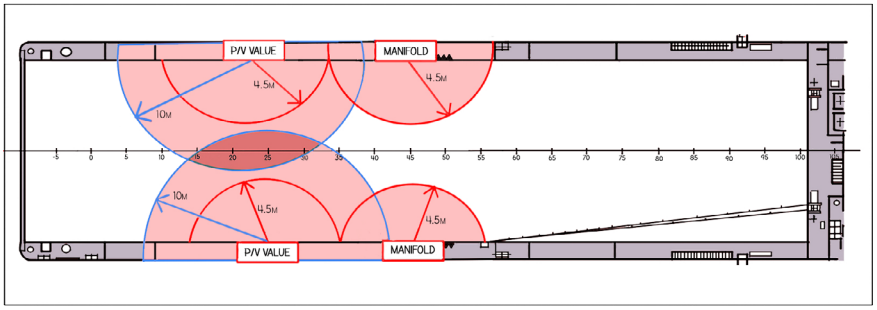

Figure 4: *The diagram above is not vessel specific and is shown for information only. The vessel specific MARPOL P&A Manual/Methanol Handling Manual contains relevant information for each vessel.*

5 Handling the product at an onshore supply base

5.1 Management and control of road transport

When bulk methanol cargo is required for transport offshore, it is usually ordered in advance from a chemical plant via an intermediary supplier. The product is then loaded into road tankers/ISO tanks and transported to the onshore supply base.

For security and safety, arrival times should be carefully coordinated to arrive within a few hours of the vessel's planned loadout. If required, a temporary approved offsite storage location can be used.

The onshore supply base has a duty of care to ensure safe operations at their worksite and the immediate surrounding area.

Because of the product's volatility, the following bodies should be notified by the onshore supply base at least 24 hours before loadout:

- Harbour authority.
- Police.
- Port entry security services.
- Fire Brigade/Spill Response.
- Vessel.
- Neighbours.
- Supplier of product.

The road transport provider has a duty of care to ensure safe carriage and delivery of the product.

Once the offshore support vessel is ready to receive the product, the road transport provider will be notified to transport to the site in time for the loadout so that product is on quayside for the minimum time only.

Upon completion, all parties should be notified that restrictions have been removed on site.

5.2 Road tankers/ISO tanks, delivery hoses

5.2.1 Road tankers/ISO tanks

Road transport operators should be trained to an acceptable government approved standard. They should be competent to carry out the operations and be included in the risk assessments and toolbox talks.

The road transport providers should provide approved certified roadworthy vehicles in line with United Nations Economic Commission for Europe (UNECE) requirements. Quayside bases may require evidence of fitness for purpose, which may be an Operations Essential Checklist.

5.2.2 Hoses/connections

Hoses and connections should be approved for the intended product. Before each use, hoses and connections as well as seals should be inspected and replaced when no longer fit for purpose.

Fittings should be clean, tight-fitting and leak-free.

Only uniquely identified hoses should be used for the transfer of product and should be pressure-tested and recertified every six months.

Hoses should be properly capped or covered to minimise contamination.

Connections should be as per *Guidelines for Offshore Marine Operations* (www.g-omo.info). There should be quick release self-sealing hose connections where possible but where conventional hoses are used, new seals should always be used when transferring product.

Road tanker/ISO tanks and vessel should be earthed together via bonding wire to prevent ignition sources from static electricity. The earth should be verified (see photos below).

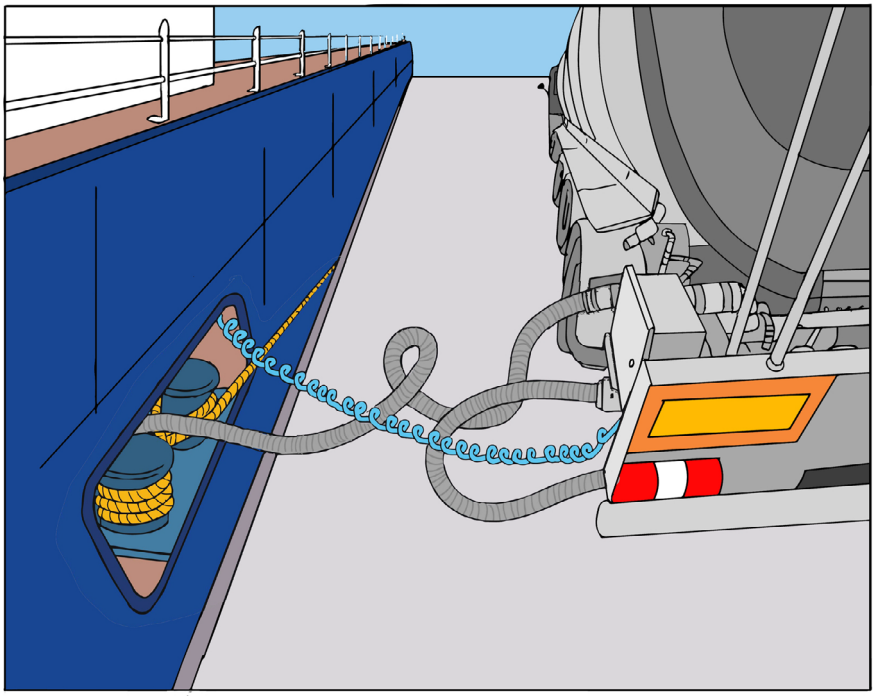

Figure 5: *Bonding wire between offshore support vessel and product road tanker*

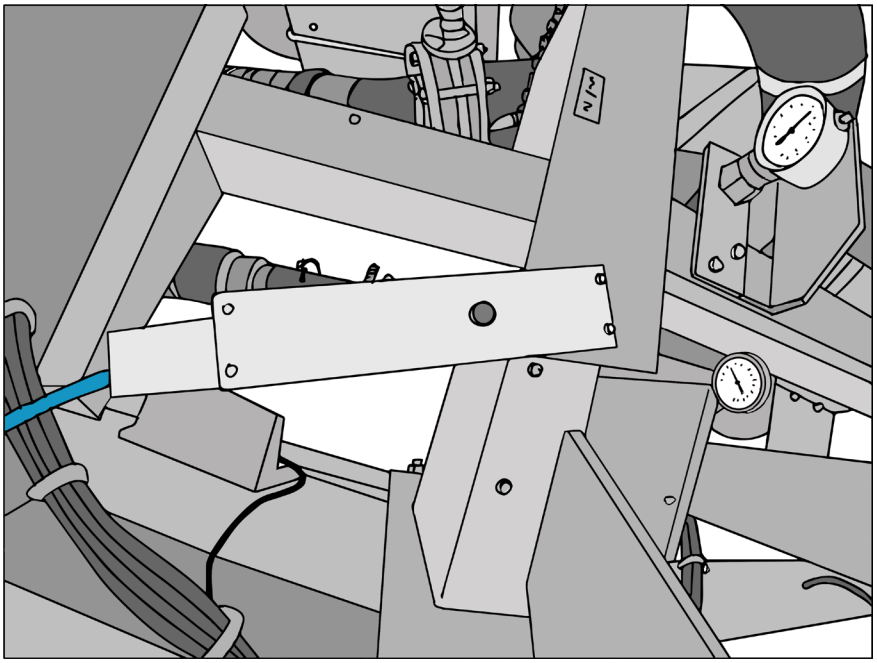

Figure 6: *The detector on the light on the bonding wire should flash indicating a true connection*

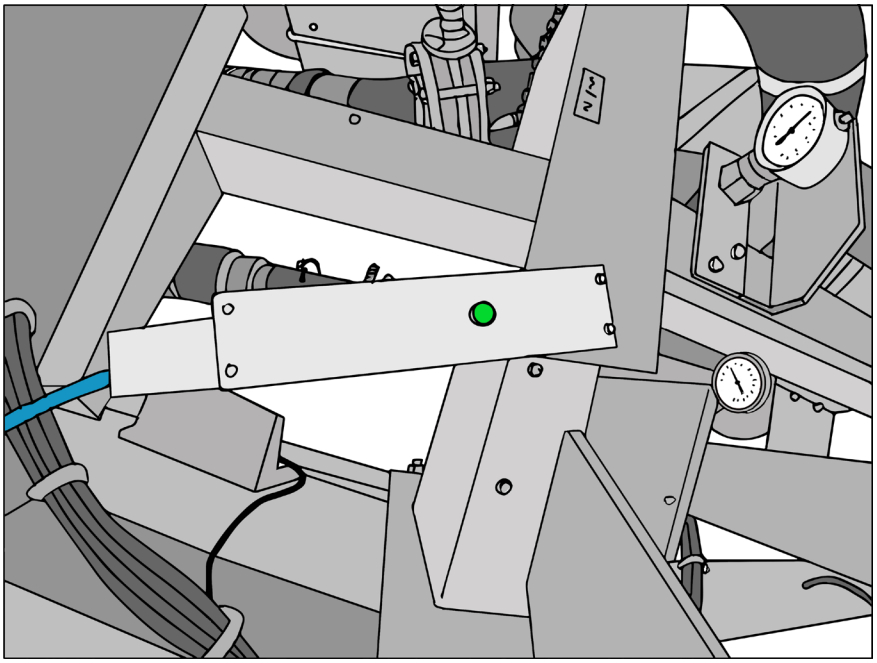

Figure 7: *The detector on the light on the bonding wire should flash indicating a true connection*

5.3 Transferring product from shore to vessel/vessel to shore

5.3.1 Onshore supply base

Pre-loading preparations

Supply bases should be approved by the local harbour authority and assessed by the emergency services for product loading.

Before planning product operations, the onshore supply base should assess:

- Weather conditions.
- Other operations on base.

Approved berths should have a plan for managing emergencies, and have the following requirements:

- 15m exclusion zone around the offshore support vessel.
- Access management.
- Suitable barriers and signage.
- Escape routes for all personnel including vehicles.
- Pre-designated muster points.
- Water supply with a charged hose to cover the full operation.
- Emergency shower and eye wash facilities.
- Spill response equipment, as per local requirements.

Any cargo on site, but outside the exclusion zone, should be assessed to ensure access/egress in the event of an emergency. When using ISO tanks, the power sources for pumping systems should be evaluated for ignition source and situated in a safe area. The vessel should be adequately moored, and hot work restrictions put in place.

Loading procedures
When loading, no simultaneous operations (SIMOPS) (deck cargo, etc.) should take place.

A competent person should be in control of operations, and it is recommended that a MARPOL surveyor be present for the operation:

- To attend and investigate when the unloading of category Y substances cannot be carried out in accordance with the ship's P&A Manual.
- To attend vessels, such as offshore supply vessels, and verify that cargo tanks which have contained noxious liquid substances of pollution category X, Y or Z have been cleaned and the residues and washings have been put ashore to port waste reception facilities in accordance with the P&A Manual.
- To endorse each ship's NLS Record Book accordingly.

Manning for the operation should be assessed to allow for a minimum of two surveyors, one on the quayside and another onboard the offshore support vessel, and to ensure a minimum of one road transport operator/equipment operator.

See appendix A for the approved shore-based product transfer checklist, pre-task toolbox talk (TBT) and risk assessment.

5.3.2 Offshore support vessel

The IG system should be charged and available for immediate use, including the backup storage tank/bottles.

Pre-loading preparations
The vessel should be secured at a safe berth where methanol operations are authorised by the operator and by the harbour authority, who are kept informed at all times. The vessel should not be berthed double-banked with another vessel or barge.

Wind direction should be assessed with regards to the release of cargo vapours. Personnel should be advised of the likely direction that the cargo vapours will go.

Toolbox talks should be held before each separate operation (e.g. tank inspection, loading, discharge, tank cleaning) and should include all personnel involved. This will include a risk assessment review for the intended operation. All personnel involved should sign a record of the toolbox talk.

Before initial loading, the following should be carried out:

- Tanks should be independently surveyed and proven serviceable for the loading of the product.
- If the product is to be loaded on top, the cargo surveyor needs to be informed of this and confirm that the cargo to be loaded is compatible for loading on top.

- Tanks should be inerted and the atmosphere tested to ensure the oxygen content is 8% or less.
- Quantities of the product to be loaded, designated tanks and tank capacity for loaded product should be agreed by all parties.
- Tank levels should be monitored throughout the operations.
- P/V valves should be confirmed in the automatic position (not locked open) and function tested before use.
- Tank high level alarms should be verified as operational as per planned maintenance system. Nitrogen pressures should be monitored throughout.
- Oxygen content should be tested at the sampling point on the P/V vent lines, and results recorded in the deck logbook.
- Cofferdams should be filled with 100% fresh water, or inerted to 8% or less oxygen content.
- Emergency stop ship/shore procedure should be agreed.
- Fixed foam firefighting system function should be tested and ready for use.
- Fire team should be prepared, briefed and charged fire hose nearby.
- Two firemen's suits complete with self-contained breathing apparatus (SCBA) should be prepared for immediate use, and competent personnel should be allocated to the fire team.
- Deck crew Personal Protective Equipment (PPE) should be prepared and checked.
- Scuppers and freeing ports should be cleared.
- All oxygen and explosive gas meters should be calibrated for methanol cargoes (not methane which may be the default set-up).
- In port, vessel should be ready to manoeuvre at immediate notice, in case of emergency.
- The water ballast/drill water pump should be tested and in instant readiness.
- During the day, the international code 'Flag Bravo' should be flown and at night an all-round red light displayed at the masthead.
- An emergency stop signal and procedure should be agreed by all parties.

Loading procedures
When loading product, follow deck exclusion zone procedures as per section 4.8.

See appendix A for the approved vessel-based product transfer checklist, TBT and risk assessment.

Additional precautions
A public address (PA) announcement should be made (if not available, all vessel personnel will be advised accordingly) immediately before all loading and discharge operations, to the effect that LFL operations are ongoing. Until further notice, there should be no smoking, hot work or use of mobile telephones throughout the ship (subject to risk assessment). Machinery should not be started, all external doors should remain closed, and only authorised personnel involved in the operation should be on deck.

All other cargo operations should be discontinued while LFL operations are in progress.

No unauthorised persons should be allowed onboard during methanol loading and discharging operations. Port security should be advised of methanol operations and all shore-side precautions put in place to prevent unauthorised access to quayside areas adjacent to the vessel.

Quantities and load/discharge sequence should be discussed and agreed between vessel and shore authority/installation, with referral to the appropriate Transfer Safety Checklist. Only one tank should be loaded or discharged at any one time. Vessel Traffic Services (VTS), shore authority, and downwind vessels should be advised of intended operations.

Note: When different grades of methanol or other similar low flashpoint product are carried, there should be two valve separation in the lines between them.

Tank hatches should not be opened for sampling or visual inspection purposes, except in extreme circumstance and subject to thorough risk assessment.

5.3.3 Recommended personal protective equipment

The primary protection against the toxic hazards of methanol is the provision and wearing of appropriate PPE. Reference should be made to guidance contained within the product's MSDS and to company-specific requirements. Typical requirements for PPE use when handling methanol, including hose connection and disconnection, may include, but should not be limited to, the following:

- Eye protection – chemical goggles and face shield. Portable or plumbed eyewash facilities should be located close to all locations where methanol is handled.
- Hand protection – butyl gloves to prevent skin contact when handling the product.
- Full body protection – appropriate chemical suit, as detailed in the supplier's appropriate MSDS.
- Rubber boots.
- Respiratory protection – air apparatus should be used if respiratory protection is required.
- One-piece, flame-resistant coveralls.
- Hard hat.

6 Product carriage and monitoring

While in transit to/from the offshore location, the tank atmospheres should be closely monitored and maintained to ensure the contents do not reach the flammable limit. This can be maintained using the IG plant as appropriate. Records of regular sampling should be maintained.

If the tank atmosphere cannot be maintained, the vessel should return immediately to port.

While the IG plant is running, any enclosed site through which the pipework passes, should be regarded as a dangerous space that is potentially deficient in oxygen content in the event of a leak.

This includes but is not limited to:

- The IG compartment.
- Safe havens.
- Engine room corridors.
- P/V valves.

Signs warning of potentially dangerous space should be posted and included in crew training and awareness. The IG plant compartment should be monitored by an oxygen analyser, with the reading available to check from outside of the compartment.

Crew should be reminded of IG venting without warning from P/V valves.

6.1 Discharging methanol offshore

Before discharging methanol to an offshore installation, the operation should be discussed and agreed between the Offshore Installation Manager (OIM), or their representative, and the Master. The quantities in the tank to be discharged should be confirmed.

The Master should ensure and confirm that all machinery necessary for propulsion, thrusters and steering are fully functional and without known defect. Effective communications should be tested between all parties:

- Vessel to installation.
- Vessel deck to bridge.
- Vessel deck/bridge to engine room.

The OIM or their nominated delegate should confirm all checklists and risk assessments are in place for the transfers of the product. Samples may be taken by the receiving location to ensure it meets the required specifications.

All couplings on the offshore hose should be self-sealing.

The correct methanol checklist should be used by the Officer in Charge of the operation, and all actions recorded in the logbook.

Bridge remote cargo pump stops should be tested before transfer.

The nitrogen plant should be confirmed as capable of maintaining the inert status of the tank with valves open. Nitrogen gas should be supplied at least at the rate of the pump transfer, i.e. to maintain a positive pressure in the tank.

Methanol hoses may be drained back into vessel tanks.

Under no circumstance should compressed air be used to blow methanol hoses clear.

On completion of transfer, the oxygen level should continue to be monitored and this should then be checked at regular intervals (weather permitting) at the sampling point on the P/V vent line. The results should be logged in the deck logbook.

Except in an emergency, the connection on the offshore support vessel should not be broken with a full hose.

6.2 Partial discharge

Partial discharge follows the same procedures as full discharge except that on completion of discharge, the quantity discharged should be cross-checked with the amount received by the installation.

6.3 Load on top

Before loading on top, the tank level should be determined and the available capacity calculated. Loading on top should not start until it is confirmed and noted in the logbook that the tank has the capacity to load the additional quantity.

The tank and cofferdam atmospheres should be verified and if necessary, the atmosphere should be re-purged to ensure the oxygen content is 8% or less.

All other actions should be identical to the procedures for loading.

6.4 Backloading

This follows the same procedures as for loading and load on top (section 6.3). If backloading ever occurs, the Master and OIM should ensure that the correct procedures and safety measures are in place.

6.5 Discharging product ashore

This is not recommended. If discharging the product ashore, it should be treated as a non-routine operation and should be risk assessed accordingly, with its own dedicated procedures and task-based risk assessments being completed by all parties involved.

7 Waste, tank entry and cleaning operations

The vessel specific MARPOL P&A Manual/Methanol Handling Manual and vessel specific SMS procedures must be followed at all times.

On confirmation from the operator that the methanol cargo/residues are no longer needed, planning should be carried out to ensure the safe disposal of any residues.

In accordance with IMO A1122 (30) chapter 12 para 12.2 (OSV Code):

> Discharge into the sea of residues of noxious liquid substances permitted for carriage under the present Code, tank washings, or other residues or mixtures containing such substances, is prohibited.
>
> Any discharges of residues and mixtures containing noxious liquid substances should be to port reception facilities. As a consequence of this prohibition, there are no requirements for efficient stripping and underwater discharge arrangements in MARPOL Annex II.

Discharge to port waste facility

Vessel tank level gauges should indicate the remaining quantities onboard (ROB). However, when the product liquid surface lies below a measurable level, the vessel specific class approved stripping report should be consulted to determine the estimated remaining volumes onboard. Once the volume of ROB is quantified the operator should be notified and a plan for dilution agreed.

Current best practice dictates that a minimum dilution of ten parts water to one part of methanol is required before consideration for safe discharge to an authorised waste reception facility. However, this may not always be a sufficient dilution factor to guarantee a non-flammable waste product. Samples should be taken to confirm the flashpoint is within a safe range, i.e. exceeding 60°C. Dilution should continue as required.

Some vessels' P&A Manuals may have more stringent requirements.

During the discharge of methanol-washings, the procedures in sections 6.1, 6.2, 6.3 and 6.5 (loading/discharging) should be followed, and a checklist to ensure suitable mitigations should be in place.

Tank cleaning and entry

Tank cleaning should not take place without prior approval from an authorised representative of the charterer along with the Master.

All tank cleaning and inspections should be carried out under controlled conditions in line with approved enclosed space procedures, and under Permit to Work conditions.

Methanol tanks should only be entered and cleaned by competent personnel.

Before starting operations, the risk assessment should be reviewed and discussed at a toolbox talk with all personnel.

Before opening the tanks for cleaning or inspection, the following should be verified:

- Tank atmosphere should be checked at a suitable sampling point:
  - The oxygen content of the tank should read 20.9% by volume.
  - LEL should be less than 1%.
  - Carbon monoxide (CO) content of the tank should read 0 PPM.
  - Hydrogen sulphide (H_2S) content of the tank should read 0.
- The gas monitor in use should be suitable for detecting methanol.
- Simultaneous operations (SIMOPS) should be suspended for the duration of inspection and/or cleaning operations.
- Dangerous goods cargo should not be stowed within the designated exclusion zone or near the tank hatches. Suitable access on deck should be provided for escape and access.

- Only essential personnel should remain on deck, with appropriate precautions in place.
- Before opening tank hatches, the IG supply to the cofferdam and tanks should be isolated:
  - Cofferdams that were inerted with nitrogen should have the nitrogen displaced with fresh air and be confirmed as gas-freed.
  - Before opening hatches, the tank should be verified at atmospheric pressure by manually opening the P/V valve. The deck crew should wear standard gas meters at all times as a precaution against the risk of an oxygen-deficient atmosphere or nitrogen release.
  - Once the tank hatch has been removed, the atmosphere in the tank should be analysed at all vertical levels of the tank and confirmed suitable for entry.

During tank entry:

- A competent rescue team should be present with SCBA and suitable personnel evacuation/ extraction equipment that has been tested and is ready for use.
- The risk assessment should take consideration of the likely duration of use of breathing apparatus.
- Forced ventilation should be considered.
- All personnel entering tanks should use a gas meter. Periodic and independent monitoring of the tank atmosphere should be carried out.
- All tools, equipment, radios, etc. used near a methanol tank should be intrinsically safe.

Tanks should be cleaned and dry in preparation for future cargos. Following inspection, the tanks should be certified as being cleaned to a satisfactory standard for the carriage of methanol. Photographs should be retained, and records updated.

Appendix A: Example of pre-loading/discharge checklists

A1 Loading/discharging of LFL product

A1.1 In Port

	In Port – General Precautions (Pre-loading)	Confirmed 'Yes'		
No.	**Description**	**Vessel**	**Shore**	**Comments**
1	Are moorings secured and the vessel able to move under its own power?	☐	☐	
2	Is there safe access between ship to shore?	☐	☐	
3	Have tanks to be used been identified, checked and agreed to be of adequate size and are suitable for the consignment including any topping off considerations?	☐	☐	
4	Are all other bunker and cargo tank lids closed?	☐	☐	
5	Are cargo system gauges and alarms correctly set and in good order? (State in comments)	☐	☐	
6	Is the manual sounding pipe cap closed?	☐	☐	
7	Have all tank hatches been verified closed tight?	☐	☐	
8	Are all methanol tanks, cofferdams and loading/discharge pipes inerted to 8% or less oxygen?	☐	☐	
9	Is the receiving tank working capacity suitable for the quantity being loaded or discharged?	☐	☐	
10	Have the tank high level alarms been tested?	☐	☐	
11	Are tanks and cofferdams fully inerted and is the nitrogen system in the correct mode?	☐	☐	
12	Is the nitrogen pressure monitoring being carried out?	☐	☐	
13	Is the pump rate compatible with the automatic shutdown system, if in use?	☐	☐	
14	Is the nitrogen plant and backup charged and ready?	☐	☐	
15	Are the P/V valves operating freely?	☐	☐	
16	Are adequate insulating means in place in ship/shore connection?	☐	☐	
17	Agreed acceptable working pressure: …..……..Bar/Psi	☐	☐	
18	Have all ignition sources been identified and isolated where applicable?	☐	☐	
19	Is portable radio equipment for external use intrinsically safe?	☐	☐	
20	Are all firefighting systems, foam and ballast/ drill water pump tested and ready for instant use? Foam monitors positioned to cover side where hose is taken and cargo deck? Scuppers and water freeing arrangements open and clear?	☐	☐	

	In Port – General Precautions (Pre-loading)	Confirmed 'Yes'		
No.	**Description**	**Vessel**	**Shore**	**Comments**
21	Are two firefighter suits ready with SCBA and ready for immediate use?	☐	☐	
22	Have all personnel involved in the operation been issued with appropriate PPE for the task, as per agreed risk assessment?	☐	☐	
23	Is information available for the safe handling of the cargo including MSDS?	☐	☐	
24	Has the toolbox talk been held, and the risk assessment reviewed and discussed? Do all parties understand their responsibilities/accountabilities throughout the operation and have they been encouraged to stop any job or take a time out for safety at any point?	☐	☐	
25	Is there an effective deck watch present onboard and adequate supervision on the shoreside and on the vessel?	☐	☐	
26	Are there enough personnel onboard and ashore in case of emergency?	☐	☐	
27	Have non-essential personnel been removed from the vessel the working deck cleared of non-essential personnel/a secure zone been put in place?	☐	☐	
28	Have all precautions been taken as per the appropriate manual to prevent ingress of methanol vapour into the vessel?	☐	☐	
29	Have emergency shutdown procedures been agreed and have emergency stops been tested?	☐	☐	
30	Has a no smoking on deck/hot work ban been put in place, and appropriate signage posted?	☐	☐	
31	Have all other cargo operations ceased and inspection proven for no dangerous goods or sources of possible ignition in the exclusion zones?	☐	☐	
32	Is the Flag Bravo flying and (at night) a red all round light been shown at the masthead?	☐	☐	
33	Has lightning been reported or forecast within five nautical miles of the area?	☐	☐	
34	Are decontamination stations available including eye wash and plunge shower?	☐	☐	
35	Are all requirements of the MARPOL P&A Manual/Vessel-specific Methanol Manual being met?	☐	☐	
36	Has the port authority been informed, and approval been given?	☐	☐	
37	Have all permits to work been cancelled?	☐	☐	
38	Is the earthing wire connected to earthing points ashore and on the vessel?	☐	☐	

Table A1

A1.2 Offshore Location

	Offshore – General Precautions (Discharge)	Confirmed 'Yes'		
No.	Description	Vessel	Shore	Comments
1	Are cargo system gauges and alarms correctly set and in good order? (State in comments)	☐	☐	
2	Is the manual sounding pipe cap closed?	☐	☐	
3	Have all tank hatches been verified closed tight?	☐	☐	
4	Are all methanol tanks, cofferdams and loading/discharge pipes inerted to less than 8% oxygen?	☐	☐	
5	Is the receiving tank working capacity suitable for the quantity being loaded or discharged?	☐	☐	
6	Have the tank high level alarms been tested?	☐	☐	
7	Are the tanks and cofferdams fully inerted and is the nitrogen system in the correct mode?	☐	☐	
8	Is the nitrogen pressure monitoring being carried out?	☐	☐	
9	Is the pump rate compatible with the automatic shutdown system, if in use?	☐	☐	
10	Is the nitrogen plant and backup charged and ready?	☐	☐	
11	Are the P/V valves operating freely?	☐	☐	
12	Are adequate insulating means in place in ship/shore connection?	☐	☐	
13	Agreed acceptable working pressure: …..……..Bar/Psi	☐	☐	
14	Have all ignition sources been identified and isolated where applicable?	☐	☐	
15	Is portable radio equipment for external use intrinsically safe?	☐	☐	
16	Are all firefighting systems, foam and ballast/ drill water pump tested and ready for instant use? Foam monitors positioned to cover side where hose is taken and cargo deck? Scuppers and water freeing arrangements open and clear?	☐	☐	
17	Are two firefighter suits ready with SCBA and ready for immediate use?	☐	☐	
18	Have all personnel involved in the operation issued with appropriate PPE for the task, as per agreed risk assessment?	☐	☐	
19	Is information available for the safe handling of the cargo including MSDS?	☐	☐	

	Offshore – General Precautions (Discharge)	Confirmed 'Yes'		
No.	**Description**	**Vessel**	**Shore**	**Comments**
20	Has the toolbox talk been held, and the risk assessment reviewed and discussed? Do all parties understand their responsibilities/accountabilities throughout the operation and are encouraged to stop any job or take a time out for safety at any point?	☐	☐	
21	Is there an effective deck watch present onboard and adequate supervision on the offshore facility and on the vessel?	☐	☐	
22	Are there enough personnel onboard and on the offshore facility in case of an emergency?	☐	☐	
23	Have non-essential personnel been removed from the vessel, the working deck cleared of non-essential personnel/a secure zone been put in place?	☐	☐	
24	Have all precautions been taken as per the appropriate manual to prevent ingress of methanol vapour into the vessel?	☐	☐	
25	Have emergency shutdown procedures been agreed and have emergency stops been tested?	☐	☐	
26	Has a no smoking on deck/hot work ban been put in place, and appropriate signage posted?	☐	☐	
27	Have all other cargo operations ceased and inspection proven for no dangerous goods or sources of possible ignition in the exclusion zones?	☐	☐	
28	Is the Flag Bravo flying and (at night) a red all round light been shown at the masthead?	☐	☐	
29	Has lightning been reported or forecast within five nautical miles of the area?	☐	☐	
30	Are decontamination stations available including eye wash and plunge shower?	☐	☐	
31	Are all requirements of the MARPOL P&A Manual/Vessel-specific Methanol Manual being met?	☐	☐	
32	Has the OIM been informed?	☐	☐	
33	Have all permits to work been cancelled?	☐	☐	

Table A2

A2 Toolbox Talk

Loading Methanol

Location
Date
Report no.
Charter

	Toolbox Talk		
Charter			
Date/time		**Type of work**	Deck – Cargo Operations
Title	Loading Methanol		
Description	Loading methanol in Aberdeen from road tanker		
Checkpoints	☐ Stop the work obligation promoted	☐ PPE for task confirmed	
	☐ Risk assessment for job/task performed and/or reviewed (attached under references)	☐ Emergency actions and exit routes from work site highlighted	
	☐ If applicable, any simultaneous operation clarified	☐ Tools, methods and procedures to be used agreed upon	
	☐ If applicable, lifting plan/ operations discussed with crane operator (external)	☐ Individual roles during the job/ task clarified	

Participants				
Name	**Role**	**Position**	**Company**	**Signature**
	Leader	Senior Officer		
	Attendee	AB		
	Attendee	AB		
	Leader	Surveyor		
	Attendee	Driver		
	Attendee	Driver		
	Attendee	Driver		

References		
Type	**Title**	**Number**
Attachment	HP 158 Loading bulk methanol.docx	N/A

A3 Toolbox Talk

Methanol Tank Cleaning

Location
Date
Report no.
Charter

	Toolbox Talk		
Charter			
Date/time		**Type of work**	Deck – Other
Title	Methanol Tank Cleaning		
Description	Methanol tank cleaning		
Checkpoints	☐ Stop the work obligation promoted	☐ PPE for task confirmed	
	☐ Risk assessment for job/task performed and/or reviewed (attached under references)	☐ Emergency actions and exit routes from work site highlighted	
	☐ If applicable, any simultaneous operation clarified	☐ Tools, methods and procedures to be used agreed upon	
	☐ If applicable, lifting plan/ operations discussed with crane operator (external)	☐ Individual roles during the job/ task clarified	

Participants				
Name	**Role**	**Position**	**Company**	**Signature**
	Leader	Senior Officer		
	Attendee	2nd Officer		
	Attendee	AB		
	Attendee	AB		
	Attendee	MARPOL Surveyor		
	Attendee	Driver		
	Attendee	Tank Cleaner		
	Attendee	Tank Cleaner		
	Attendee	Tank Cleaner		
	Attendee	Tank Cleaner		

A4 Risk Assessment

When using this example, individual risk assessments should be defined.

LIKELIHOOD x SEVERITY = RISK RATING (i.e. 3 x 2 = 6 = HIGH)

RISK RATING (R) (See explanation at right)			Highly Unlikely	Unlikely	Likely
			L = 1	L = 2	L = 3
HAZARD SEVERITY (S)	SLIGHTLY HARMFUL	1	Tolerable	Tolerable	Moderate
	HARMFUL	2	Tolerable	Moderate	High
	EXTREMELY HARMFUL	3	Moderate	High	High

Risk matrix key
L = Likelihood S = Severity R = Risk

M.V.X	**No.**	

TOLERABLE RISK	1 - 2	**Trivial/tolerable risk.** No immediate action required. Proceed with care.
MODERATE RISK	3 - 4	**Moderate risk.** Hazard to be investigated in conjunction with line manager/ supervisor with a view to reducing the risk.
HIGH RISK	6 - 9	**Substantial/intolerable risk.** Task must not be undertaken until the risk has been reduced. Immediate action must be taken to eliminate the risk or substantially reduce the risk. If it is not possible to reduce the risk, work has to be prohibited.

LOCATION: **JOB: Loading Bulk Methanol**

Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping

TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Connecting shoreside methanol hoses	1 Operation not conducted in safe manner	Shoreside loading team and deck crew	2	2	4	1 Operation to be controlled using permit to work, toolbox talks, checklists and procedures as per Methanol Manual and P&A Manual. A constant quayside and hose watch to be maintained.	1	2	2
	2 Unsafe working area ashore		2	3	6	2 Shoreside team to be monitored by ship staff for unsafe practices. Shoreside teams to be briefed and controlled by Surveyor and Supervisor.	1	3	3
	3 Escape routes for all parties blocked by congested quayside or deck		2	3	6	3 Quayside to be kept clear of vehicles and or traffic. No other cargo operations to take place during operation.	1	3	3
	4 Injury to personnel while handling hose		2	3	6	4 Enough people on board and ashore to handle hoses.	1	3	3
	5 Spillage of product due to lines not being clean and incorrect couplings being used		2	3	6	5 Lines are to be inspected before use. Hose connections are only to be those that are approved. Toolbox talk, plan ahead. Harbour informed.	1	3	3
	6 Unsafe management of the operation		2	3	6	6 Before operation all concerned parties to have a brief/ toolbox talk. Operation is to be planned ashore and correct risk assessments completed. Procedures will be followed.	1	3	3

LOCATION:		JOB: Loading Bulk Methanol								
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping										
TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Connecting shoreside methanol hoses (cont)	7 Unauthorised access by vehicles and personnel, which could cause ignition	Shoreside loading team and deck crew	2	3	6	7 Area to be roped off, signs posted, barriers erected. No unauthorised personnel allowed inside area. Shoreside to maintain quayside, deck crew to maintain ship security.	1	3	3
	8 Burst hose, from running across deck or ship movement		2	3	6	8 Vessel to be positioned correctly to ensure hoses are run correctly, mooring lines to be maintained throughout. Hose must not pass across the deck, vessel to be berthed stb side to. Harbour to be informed, correct lights and flags to be displayed.	1	3	3
	9 Injury to personnel from contact with methanol		2	3	6	9 Correct PPE to be worn, full chemical suits, goggles, face visor, chemical boots and gloves to be worn by ship staff in location. Oil spill gear to be available. Full body showers and eye wash station available capable of supplying 15 minutes of water should be positioned nearby as recommended in the Methanol Safe Handling Manual.	1	3	3
	10 Inhalation of fumes from methanol		2	3	6	10 Procedures to be maintained. All checklists to be checked by ship, shore and surveyor staff. Gas detectors to be in place, personnel O_2 meters to be worn. CABA sets to be available and EEBDs to be ready for use. Oxygen resuscitator to be ready.	1	3	3
	11 Fire or Explosion due to naked flames or spark potential		2	3	6	11 Only authorised personnel in area. All personnel to be trained in correct procedures. Toolbox talks, signs posted, bonding leads fitted, car exhausts to be fitted with spark arrestors. Intrinsically safe radios and phones only. No mobile phones.	1	3	3
	12 Environmental Impact of spilt methanol from hose		2	3	6	12 Hoses are to be pressure tested to 14 bar, pumping rate will be agreed. Oil spill gear ready, ships side plugs in place, spill trays clean and empty. SMPEP manual available.	1	3	3
	13 Trips and slips with the hose causing injury to hose handlers		2	2	4	13 Area to be well lit with intrinsically safe lights, if required. Deck and quay side to be clear of obstructions/rubbish and clean and free of any oil spills, etc. Trip hazards are to be clearly marked. Personnel involved to be suitably rested. Operation should be carried out in daylight.	1	2	2

LOCATION:		**JOB: Loading Bulk Methanol**							
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping									
TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Before loading commences vessel checks	1 Spillage of methanol, either on vessel or shoreside	Shoreside loading team and deck crew	2	3	6	1 Vessel fixed foam system has been tested and is ready for use at immediate notice.	1	3	3
	2 Split in hose once shore pump starts causing spillage		2	3	6	2 Emergency procedures to stop loading pump have been discussed and agreed upon; communications are established with intrinsically safe radios. Chief Officer at the loading point to supervise, bridge to be manned by Master, Duty Deck Officer to assist as required. Both deck crew available.	1	3	3
	3 Spillage results in fire or explosion		2	3	6	3 Entire ship has been informed of the operation taking place, and briefed on dangers and responses. Two firefighter suits, complete with CABA sets, are ready at the loading point area. All gas meters, LEL meters and personnel O_2 meters are checked before operation. Engine Control Room is to be manned for the period of loading.	1	3	3
	4 Other work interfering with operation		1	2	2	4 Any other operations on the vessel are to be stopped and entire ship is to be aware of start and stop times. All intake fans into the vessel are to be shut down.	1	2	2
	5 Entry into working area through other vessel openings		2	3	6	5 All escape hatches, stores and accommodation doors are to be shut before operation starts. All manholes on the Methanol and CD system are to be shut.	1	3	3
	6 Other ships in close proximity causing naked flames or sparks or operating equipment which may interfere with the operation		2	3	6	6 Other vessels in close proximity are to be made aware of the loading start and stop times. They are to ensure that any operation which could affect the methanol loading, such as hot work or grinding, is stopped, and that any operations that is in close proximity which could affect the loading is stopped.	1	3	3

LOCATION:		**JOB: Loading Bulk Methanol**								
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping										
TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Pumping methanol into tanks	1 Environmental Impact of spilt Methanol from overflowing tanks	Shoreside loading team and deck crew	2	3	6	1 SMPEP manual to be available, only correct procedures to be followed, checklists to be completed. Totals agreed upon before discharge begins, pumping rates agreed. Oil spill equipment in place, scupper plugs in, spill tray clean and empty.	1	3	3
	2 Methanol fumes effecting loading crew		2	3	6	2 CABA sets and EEBDs to be ready, gas detector in area and personnel O_2 meters worn.	1	3	3
	3 Methanol on exposed skin		2	2	4	3 Correct PPE to be worn, including full face visors, goggles, chemical suits, chemical boots and gloves.	1	2	2
	4 Inhalation of displaced N_2 gas		2	3	6	4 When purging and padding are taking place, vent areas are to be cleared of personnel, O_2 meters to be worn. All personnel involved to be briefed on N_2 dangers.	1	3	3
	5 Build up of fumes in pump		2	3	6	5 Pump to be under continual positive pressure while methanol is being discharged. Regular routines established to ensure gauges are monitored.	1	3	3
	6 Other substances reacting with methanol		2	3	6	6 All other chemicals to be removed from area as per IMDG Code.	1	3	3
Purging and padding of methanol lines and tanks	1 Injury to persons setting valves and lines	Purging/ padding crew	2	2	4	1 Area to be well lit, using intrinsically safe lights, free of obstacles. Trip hazards to be marked, PPE worn and operation should be conducted in daylight.	1	2	2
	2 Incorrect setting of valves		2	2	4	2 Methanol and P&A Manuals to be used with checklists and ship-specific forms. Schematic plans to be available. Training for all officers.	1	2	2
	3 Accidental release of N_2		2	3	6	3 Only authorised personnel to make connections to ensure correct procedure followed. Gas detectors and personal O_2 meters to be used.	1	3	3
	4 Inhalation of N_2		2	3	6	4 See 3 above, EEBDs to be available, oxygen resuscitator to be available.	1	3	3

LOCATION:	JOB: Loading Bulk Methanol
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping	

TASK (1)	HAZARD (2)	PERSONS AFFECTED (3)	RISK (4)			CONTROL MEASURES (5) List those provided and required	RESIDUAL RISK (6)		
			L	S	R		L	S	R
Disconnecting shoreside methanol Hoses	1 Operation not conducted in safe manner	Shoreside loading team and deck crew	2	2	4	1 Operation to be controlled using permit to work, toolbox talks, checklists and procedures as per Methanol Manual and P&A Manual. A constant quayside and hose watch to be maintained.	1	2	2
	2 Unsafe working area ashore		2	3	6	2 Shoreside team to be monitored by ship staff for unsafe practices. Shoreside teams to be briefed and controlled by Surveyor and Supervisor.	1	3	3
	3 Escape routes for all parties blocked by congested quayside or deck		2	3	6	3 Quayside to be kept clear of vehicles and or traffic. No other cargo operations to take place during operation.	1	3	3
	4 Injury to personnel while handling hose		2	3	6	4 Enough people on board and ashore to handle hoses.	1	3	3
	5 Spillage of product due to lines not being disconnected correctly		2	3	6	5 Lines are to be inspected before use. Hose connections are only to be those that are approved. Toolbox talk, plan ahead. Harbour informed.	1	3	3
	6 Unsafe management of the operation		2	3	6	6 Before operation all concerned parties to have a brief/ toolbox talk. Operation is to be planned ashore and correct risk assessments completed. Procedures will be followed.	1	3	3
On completion of loading	1 Unsafe practises	Shoreside loading team and deck crew	2	3	6	1 Methanol and P&A Manuals to be used with checklists and ship-specific forms. Schematic plans to be available. Training for all officers.	1	3	3
	2 Incorrect purging and padding of cargo		2	3	6	2 As above.	1	3	3

Assessors	Signature	Date Assessed		Reviewed By	Signature	Master's Signature
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Document	Title	Revision	Effective Date
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A5 Risk Assessment

When using this example, individual risk assessments should be defined.

LIKELIHOOD x SEVERITY = RISK RATING (i.e. 3 x 2 = 6 = HIGH)

RISK RATING (R) (See explanation at right)			Highly Unlikely	Unlikely	Likely
			L = 1	L = 2	L = 3
HAZARD SEVERITY (S)	SLIGHTLY HARMFUL	1	Tolerable	Tolerable	Moderate
	HARMFUL	2	Tolerable	Moderate	High
	EXTREMELY HARMFUL	3	Moderate	High	High

Risk matrix key
L = Likelihood S = Severity R = Risk

M.V.X	**No.**	

TOLERABLE RISK	1 - 2	**Trivial/tolerable risk.** No immediate action required. Proceed with care.
MODERATE RISK	3 - 4	**Moderate risk.** Hazard to be investigated in conjunction with line manager/ supervisor with a view to reducing the risk.
HIGH RISK	6 - 9	**Substantial/intolerable risk.** Task must not be undertaken until the risk has been reduced. Immediate action must be taken to eliminate the risk or substantially reduce the risk. If it is not possible to reduce the risk, work has to be prohibited.

LOCATION: **JOB: Discharging Bulk Methanol**

Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping

TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Connecting rig methanol hoses	1 Operation not conducted in safe manner	Rig team and deck crew	2	2	4	1 Operation to be controlled using permit to work, toolbox talks, checklists and procedures as per Methanol Manual and P&A Manual. A constant righose watch to be maintained.	1	2	2
	2 Unsafe working area ashore		2	3	6	2 Rig team to be monitored by ship staff for unsafe practises. Shoreside teams to be brief and controlled by rig supervisor.	1	3	3
	3 Escape routes for deck crew blocked by congested deck		2	3	6	3 No other cargo operations to take place during discharge of methanol operation.	1	3	3
	4 Injury to personnel while handling hose		2	3	6	4 Enough people at hose site on board to handle hoses safely.	1	3	3
	5 Spillage of product due to lines not being clean and incorrect couplings being used		2	3	6	5 Lines are to be inspected before use. Hose connections are only to be those that are approved. Toolbox talk, plan ahead.	1	3	3
	6 Unsafe management of the operation		2	3	6	6 Before operation, all concerned parties to have a brief/ toolbox talk. Operation is to be planned rig and correct risk assessments completed. Procedures will be followed. Danger areas on deck to be marked.	1	3	3

LOCATION:	JOB: Discharging Bulk Methanol								
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping									
TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Connecting rig methanol hoses (cont)	7 Unauthorised access of personnel, which could cause ignition	Rig team and deck crew	2	3	6	7 Area to be roped off, signs posted, barriers erected. No unauthorised personnel allowed inside area. Rig to maintain hose area, deck crew to maintain ship security.	1	3	3
	8 Burst hose, from ship movement		2	3	6	8 Vessel to be positioned correctly to ensure hoses are run correctly. The weather conditions must be suitable for safe position keeping of vessel. Engine settings to be at max 3 and min 3.	1	3	3
	9 Injury to personnel from contact with methanol		2	3	6	9 Correct PPE to be worn, full chemical suits, goggles, face visor, chemical boots and gloves to be worn by ship staff in location. Oil spill gear to be ready.	1	3	3
	10 Inhalation of fumes from methanol		2	3	6	10 Procedures to be maintained. All checklists to be checked by ship and rig staff. Gas detectors to be in place, personnel O_2 meters to be worn. CABA sets to be available, EEBDs to be ready for use. Oxygen resuscitator to be ready.	1	3	3
	11 Fire or explosion due to naked flames or spark potential		2	3	6	11 Only authorised personnel in area. All personnel to be trained in correct procedures. Toolbox talks, signs posted. Intrinsically safe radios and phones only. No mobile phones.	1	3	3
	12 Environmental Impact of spilt methanol from hose		2	3	6	12 Hoses are to be pressure tested to 14 bar, pumping rate will be agreed. Oil spill gear ready, ships side plugs in place, spill trays clean and empty. SMPEP manual available.	1	3	3
	13 Trips and slips with the hose causing injury to hose handlers		2	2	4	13 Area to be well lit with intrinsically safe lights, if required. Deck and quay side to be clear of obstructions/rubbish and clean and free of any oil spills, etc. Trip hazards are to be clearly marked. Personnel involved to be suitably rested. Operation should be carried out in daylight.	1	2	2

LOCATION:		**JOB: Discharging Bulk Methanol**							
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping									
TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Before discharge commences vessel checks	1 Spillage of methanol, either on vessel or Rig	Rig team and deck crew	2	3	6	1 Vessel fixed foam system has been tested and is ready for use at immediate notice.	1	3	3
	2 Split in hose once shore pump starts causing spillage		2	3	6	2 Emergency procedures to stop loading pump have been discussed and agreed upon; communications are established with intrinsically safe radios. Chief Officer at the loading point to supervise, bridge to be manned by Master, Duty Deck Officer to assist as required. Both deck crew available.	1	3	3
	3 Spillage results in fire or explosion		2	3	6	3 Entire ship has been informed of the operation taking place, and briefed on dangers and responses. Two firefighter suits, complete with CABA sets, are ready at the loading point area. All gas meters, LEL meters and personnel O_2 meters are checked before operation. Engine Control Room is to be manned for the period of loading.	1	3	3
	4 Other work interfering with operation		1	2	2	4 Any other operations on the vessel are to be stopped and entire ship is to be aware of start and stop times. All intake fans into the vessel are to be shut down.	1	2	2
	5 Entry into working area through other vessel openings		2	3	6	5 All escape hatches, stores and accommodation doors are to be shut before operation starts. All manholes on the Methanol and CD system are to be shut.	1	3	3
	6 Other ships in close proximity which may interfere with the operation		2	3	6	6 Other vessels in close proximity are to be made aware of the loading start and stop times. They are to ensure that any operation which could affect the methanol loading, such as hot work or grinding, is stopped, and that any operations that is in close proximity which could affect the loading is stopped.	1	3	3

LOCATION:		**JOB: Discharging Bulk Methanol**								
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping										
TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Pumping methanol to the installation	1 Environmental impact of spilt methanol from overflowing tanks	Rig team and deck crew	2	3	6	1 SMPEP manual to be available, only correct procedures to be followed, checklists to be completed. Totals agreed upon before discharge begins, pumping rates agreed. Oil spill equipment in place, scupper plugs in, spill tray clean and empty.	1	3	3
	2 Methanol fumes effecting discharge crew		2	3	6	2 CABA sets and EEBDs to be ready, gas detector in area and personnel O_2 meters worn.	1	3	3
	3 Methanol on exposed skin		2	2	4	3 Correct PPE to be worn, including full face visors, goggles, chemical suits, chemical boots and gloves.	1	2	2
	4 Inhalation of displaced N_2 gas		2	3	6	4 When purging and padding are taking place, vent areas are to be cleared of personnel, O_2 meters to be worn. All personnel involved to be briefed on N_2 dangers.	1	3	3
	5 Build up of fumes in pump		2	3	6	5 Pump to be under continual positive pressure while methanol is being discharged. Regular routines established to ensure gauges are monitored.	1	3	3
	6 Other substances reacting with methanol		2	3	6	6 All other chemicals to be removed from area as per IMDG Code.	1	3	3
Purging and padding of methanol lines and tanks	1 Injury to persons setting valves and lines	Purging/ padding crew	2	2	4	1 Area to be well lit, using intrinsically safe lights, free of obstacles. Trip hazards to be marked, PPE worn and operation should be conducted in daylight.	1	2	2
	2 Incorrect setting of valves.		2	2	4	2 Methanol and P&A Manuals to be used with checklists and ship-specific forms. Schematic plans to be available. Training for all officers.	1	2	2
	3 Accidental release of N_2		2	3	6	3 Only authorised personnel to make connections to ensure correct procedure followed. Gas detectors and personal O_2 meters to be used.	1	3	3
	4 Inhalation of N_2		2	3	6	4 See 3 above, EEBDs to be available, oxygen resuscitator to be available.	1	3	3

LOCATION:	JOB: Discharging Bulk Methanol
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping	

TASK (1)	HAZARD (2)	PERSONS AFFECTED (3)	RISK (4)			CONTROL MEASURES (5) List those provided and required	RESIDUAL RISK (6)		
			L	S	R		L	S	R
Disconnecting rig methanol Hoses	1 Operation not conducted in safe manner	Rig team and deck crew	2	2	4	1 Operation to be controlled using permit to work, toolbox talks, checklists and procedures as per Methanol Manual and P&A Manual. A constant righose watch to be maintained.	1	2	2
	2 Unsafe working area ashore		2	3	6	2 Rig team to be monitored by ship staff for unsafe practises. Shoreside teams to be brief and controlled by rig supervisor.	1	3	3
	3 Escape routes for all parties blocked by congested quayside or deck		2	3	6	3 No other cargo operations to take place during discharge of methanol operation.	1	3	3
	4 Injury to personnel while handling hose		2	3	6	4 Enough people at hose site on board to handle hoses safely.	1	3	3
	5 Spillage of product due to lines not being disconnected correctly		2	3	6	5 Lines are to be inspected before use. Hose connections are only to be those that are approved. Toolbox talk, plan ahead.	1	3	3
	6 Unsafe management of the operation		2	3	6	6 Before operation, all concerned parties to have a brief/ toolbox talk. Operation is to be planned rig and correct risk assessments completed. Procedures will be followed. Danger areas on deck to be marked.	1	3	3
On completion of discharge of methanol	1 Unsafe practises	Rig team and deck crew	2	3	6	1 P&A Manuals to be used with checklists and ship-specific forms. Schematic plans to be available. Training for all officers.	1	3	3
	2 Incorrect purging and padding of cargo		2	3	6	2 As above.	1	3	3

Assessors	Signature	Date Assessed		Reviewed By	Signature	Master's Signature
		Date Reviewed				
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Document	Title	Revision	Effective Date
	Risk Assessment		

A6 Risk Assessment

When using this example, individual risk assessments should be defined.

LIKELIHOOD x SEVERITY = RISK RATING (i.e. 3 x 2 = 6 = HIGH)

RISK RATING (R) (See explanation at right)			Highly Unlikely	Unlikely	Likely
			L = 1	L = 2	L = 3
HAZARD SEVERITY (S)	SLIGHTLY HARMFUL	1	Tolerable	Tolerable	Moderate
	HARMFUL	2	Tolerable	Moderate	High
	EXTREMELY HARMFUL	3	Moderate	High	High

Risk matrix key
L = Likelihood S = Severity R = Risk

M.V.X	**No.**	

TOLERABLE RISK	1 - 2	**Trivial/tolerable risk.** No immediate action required. Proceed with care.
MODERATE RISK	3 - 4	**Moderate risk.** Hazard to be investigated in conjunction with line manager/ supervisor with a view to reducing the risk.
HIGH RISK	6 - 9	**Substantial/intolerable risk.** Task must not be undertaken until the risk has been reduced. Immediate action must be taken to eliminate the risk or substantially reduce the risk. If it is not possible to reduce the risk, work has to be prohibited.

LOCATION: **JOB: Purging and Padding of Bulk Methanol system**

Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping

TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Loading Nitrogen Quads	1 Injury to deck crew while loading	Loading crew	2	3	6	1 Correct PPE to be worn, correct crane procedures and signals, toolbox talk and plan before operation. Keep clear of lifts until on deck.	1	3	3
	2 Damage to N_2 Quad causing release of N_2		2	3	6	2 Experienced crane driver, correct banking signals, N_2 correctly set up.	1	3	3
	3 Injury from inhalation of N_2		2	3	6	3 Procedures in place to evacuate area if accidental release happens. All staff to be briefed before about dangers of N_2 (see separate handout).	1	3	3

LOCATION:		**JOB: Purging and Padding of Bulk Methanol system**							
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping									
TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Connecting Nitrogen Quad	1 Injury to persons connecting couplings	Purging/ padding crew	2	3	6	1 Correct PPE to be worn (including gloves), correct tools to be used to make connections, toolbox talk and plan beforehand, use checklist.	1	3	3
	2 Accidental release of N_2		2	3	6	2 Only authorised personnel to make connections to ensure that procedure is followed. Methanol and P&A Manual to be available. Gas detectors at area.	1	3	3
	3 Inhalation of N_2		2	3	6	3 See 3 above, EEBDs to be available, oxygen resuscitator to be available. Operation should not be done in very calm conditions.	1	3	3
Working with flexible N_2 hose	1 Injury to persons handling hose	Purging/ padding crew	2	3	6	1 Correct PPE, correct handling/lifting procedures, toolbox talk. Hose to be check beforehand and only purpose hoses used.	1	3	3
	2 Accidental release of N_2		2	3	6	2 Follow procedures in manuals and ship-specific forms.	1	3	3
	3 Inhalation of N_2		2	3	6	3 See 3 above, EEBDs to be available, oxygen resuscitator to be available. Operation should not be done in very calm conditions.	1	3	3
Purging the lines and methanol tank	1 Injury to persons setting valves and lines	Purging/ padding crew	2	2	4	1 Area to be well lit, using intrinsically safe lights, free of obstacles. Trip hazards to be marked, PPE worn and operation should be conducted in daylight.	1	2	2
	2 Incorrect setting of valves.		2	2	4	2 Methanol and P&A Manuals to be used with checklists and ship-specific forms. Schematic plans to be available. Training for all officers.	1	2	2
	3 Accidental release of N_2		2	3	6	3 Only authorised personnel to make connections to ensure correct procedure followed. Gas detectors and personal O_2 meters to be used.	1	3	3
	4 Inhalation of N_2		2	3	6	4 See 3 above, EEBDs to be available, oxygen resuscitator to be available.	1	3	3

LOCATION:		JOB: Purging and Padding of Bulk Methanol system								
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping										
TASK (1)	**HAZARD (2)**	**PERSONS AFFECTED (3)**	**RISK (4)**			**CONTROL MEASURES (5) List those provided and required**	**RESIDUAL RISK (6)**		
			L	**S**	**R**		**L**	**S**	**R**
Padding the lines and methanol tank	1 Injury to persons setting valves and lines	Purging/ padding crew	2	2	4	1 Area to be well lit, using intrinsically safe lights, free of obstacles. Trip hazards to be marked, PPE worn and operation should be conducted in daylight.	1	2	2
	2 Incorrect setting of valves.		2	2	4	2 Methanol and P&A Manuals to be used with checklists and ship-specific forms. Schematic plans to be available. Training for all officers.	1	2	2
	3 Accidental release of N_2		2	3	6	3 Only authorised personnel to make connections to ensure correct procedure followed. Gas detectors and personal O_2 meters to be used.	1	3	3
	4 Inhalation of N_2		2	3	6	4 See 3 above, EEBDs to be available, oxygen resuscitator to be available. Operation should not be done in very calm conditions.	1	3	3
Maintaining padding on tanks	1 Injury to persons setting valves and lines	Purging/ padding crew	2	2	4	1 Area to be free of obstacles, trip hazards to be marked, PPE	1	2	2
	2 Incorrect setting of valves.		2	2	4	2 Methanol and P&A Manuals to be used in conjunction with checklists and ship specific forms. Schematic plans to be at hand. Training for all officers.	1	2	2
	3 Accidental release of N_2		2	3	6	3 Only authorised personnel to make connections to ensure correct procedure followed. Gas detectors and personal O_2 meters to be used.	1	3	3
	4 Inhalation of N_2		2	3	6	4 See 3 above, EEBD's to be available, oxygen resuscitator to be at hand.	1	3	3
	5 Insufficient N_2 onboard		2	3	6	5 Ensure adequate supply as per Meth Manual on board before sailing.	1	3	3
Disconnecting N_2 Quads	1 Injury to persons disconnecting couplings	Purging/ padding crew	2	3	6	1 Correct PPE to be worn (including gloves), correct tools to be used to make connections, toolbox talk and plan beforehand, use checklist.	1	3	3
	2 Accidental release of N_2		2	3	6	2 Only authorised personnel to make connections to ensure that procedure is followed. Methanol and P&A Manual to be available. Gas detectors at area.	1	3	3
	3 Inhalation of N_2		2	3	6	3 See 3 above, EEBDs to be available, oxygen resuscitator to be available. Operation should not be done in very calm conditions.	1	3	3

LOCATION:	JOB: Purging and Padding of Bulk Methanol system
Stbd Aft Manifold/Bulk Methanol Tanks/Cofferdam/Ancillary Piping	

TASK (1)	HAZARD (2)	PERSONS AFFECTED (3)	RISK (4)			CONTROL MEASURES (5) List those provided and required	RESIDUAL RISK (6)		
			L	S	R		L	S	R
Discharge N_2 Quads	1 Injury to deck crew while loading	Loading crew	2	3	6	1 Correct PPE to be worn, correct crane procedures and signals, toolbox talk and plan before operation. Keep clear of lifts until on deck.	1	3	3
	2 Damage to N_2 Quad causing release of N_2		2	3	6	2 Experienced crane driver, correct banking signals, N_2 correctly set up.	1	3	3
	3 Injury from inhalation of N_2		2	3	6	3 Procedures in place to evacuate area if accidental release happens. All staff to be briefed before about dangers of N_2 (see separate handout). Operation should not be done in very calm conditions.	1	3	3

Assessors	Signature	Date Assessed		Reviewed By	Signature	Master's Signature
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Appendix B: Wet test checklists

Example checklist 1

Vessel		Date	

Stage 1 – Verification and inspection before using water or nitrogen

Vessel Review
☐ Review and discuss the vessel NLS and LFL Manual
☐ Confirm LFL notation
☐ Review tank history for previous use – if used regular then wet test may not be required
☐ Confirm crew's experience with using the system and handling methanol
☐ Review onboard procedures, risk assessment and maintenance records for the system
☐ Confirm the provisions of AR-AFFF is sufficient and up-to-date
☐ Visually inspect all components in the system including dry break connections, weak links, earths and explosive proof equipment (EX) in designated zones
☐ Confirm that access/egress to/from tanks, manifolds and operations is sufficient
☐ Verify emergency preparedness through discussion onboard and with base.
☐ Confirm wet test of showers and water hydrants, and physically confirm escape routes on quayside

Tanks
☐ Confirm tank positions and figure on drawings and system piping and instrumentation diagram (P and IDs)
☐ Visually inspect all tanks before use and keep photographs for tank history
☐ Confirm all tank furniture is secure and tank is clean and dry

Tank	ID	Total volume (m^3)	Maximum working volume (%)	Maximum working volume (m^3)	Crossover (from/to)	Tank type (LFL/Cofferdam wet or dry)
1						
2						
3						
4						
5						
6						

Cofferdams
Approximate duration taken to fill/Inert tanks

☐ Discuss timescales, filling methods and effects on vessel draft

Tank ID	Duration	Method (wet/dry)	Tank ID	Duration	Method (wet/dry)

Nitrogen System

☐ Review and discuss equipment available onboard
☐ Confirm competency in use of equipment
☐ Sight planned maintenance records and general condition of equipment
☐ Sight analysis certificate and PM's/Independent reviews of equipment

Type		**Purity %**		**Delivery rate**	
Time to fill N_2 bank (where applicable) hrs				**0_2 sensor functional**	Y/N ☐

Pumps

☐ Review and discuss the equipment available onboard
☐ Confirm redundancy and plans for pump failure
☐ Sight planned maintenance records and general condition of equipment

Number		**Rate/SG**		**Location**		**Redundancy**	

Pipework/Connections

☐ Review and configuration and isolations
☐ Sight planned maintenance records and general condition of equipment

Connection type	**1**		**2**		**3**	
Connection location	**1**		**2**		**3**	
Manifold caps available	**1**	Y/N ☐	**2**	Y/N ☐	**3**	Y/N ☐
Bleed cocks caped	**1**	Y/N ☐	**2**	Y/N ☐	**3**	Y/N ☐
Gas measuring point	**1**	Y/N ☐	**2**	Y/N ☐	**3**	Y/N ☐

Pressure Vacuum Valves								
☐ Review and discuss the equipment available onboard ☐ Sight planned maintenance records and general condition of equipment ☐ Physically test P/V valves								
Type		**Number**		**Location**		**Test date**		
Max loading (per vent)		**Tanks per vent**			**Spare P/V available**			
O_2 Measuring point	**P/V 1**	Y/N ☐	**PV 2**	Y/N ☐	**P/V 3**	Y/N ☐	**P/V 4**	Y/N ☐

Atmosphere measuring equipment					
☐ Review and discuss the equipment available onboard ☐ Confirm competency in use of the equipment ☐ Verify calibration certificates					
Type		**Number of metres**		**Calibration date**	

Foam/Fixed firefighting					
☐ Review and discuss the equipment available onboard ☐ Sight planned maintenance records and general condition of equipment ☐ Sight foam analysis certificate					
Foam type		**Quantity**		**Expiry date**	
Last function test of monitor					

Stage 2 – Pre use checks

Pre-checks		
Once above equipment and procedures verified, confirm the below		
Check	**Initials**	**Comments**
Pipelines		
Visual inspection pumps		
Visual inspection P/V and actuators		
Function test valves		
Test high level alarms		
Check tank for cleanliness		
Inspect gaskets		
Plugs/bungs for cofferdams available		
Visual inspection of sounding system		

Stage 3 – Filling for wet test

Using suitable connection from a measured volume, begin filling tanks and cofferdams.

Fill				
• If vessel has auto shutdown, care should be taken when approaching high level to prevent damage to the tank/system • High level alarms should be proven				
Tank	**PV function check**	**Level comparison**	**High level alarm**	**System auto stop (where applicable)**

On completion, confirm the above and mark comparisons with vessel gauges and loaded volumes.

Stage 4 – Discharge water from tanks

Discharge		
• All pumps and manifolds should be tested • If gas quads in use, the timings should be verified for time to refill • Ensure inerted condition is maintained		
Check	**Initials**	**Comments**
Inert tank below 8% 0_2		
Prove flow at all common manifolds		
Check all connections for leaks		
Ensure IG keeps pace with pumps Max 0_2, 8%		
Function test all pumps		
Check cross over integrity		
Flush cross over		
Prove sounding system if applicable		
Blow lines with N_2 (post discharge)		
Check system maintains positive pressure		
Time to re-fill nitrogen quads		

Stage 5 – Gas-freeing and final inspection

Gas-free		
This is the final test to ensure the vessel can gas-free tanks, this will vary depending on system construction		
Check	**Initials**	**Comments**
Fill tanks		
Discharge tanks		
Confirm tank atmospheres are gas-free		
Perform any required tank cleaning		

Stage 6 – Wash up

Fit for purpose – Notes and recommendations
• This system is/is not found to be fit for purpose and operable after completion of the wet trials
• On completion, if tests were successful, this should be repeated with any unfamiliar crew to confirm that they understand the procedures • If safe to do so, a fire and/or spill drill should be carried out during or immediately after the wet tests

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