

## **INSTRUCTIONS FOR USING THE RISK ASSESSMENT FORM**

- 1.** Envisage the task in hand and identify the hazards associated with carrying out the task. These hazards are to be listed and addressed individually in the risk assessment form.
- 2.** Once the hazard has been identified, based on the combination of the likelihood and severity/consequence of the hazard, the risk evaluation score is to be assigned using the risk evaluation matrix on the last page. For example, a hazard which has a likelihood of 'unlikely' and a severity/consequence of "harmful", the risk evaluation score would be (moderate risk).
- 3.** With the determination of the risk evaluation score, using the recommended response table on the last page, appropriate action is to be planned and implemented.
- 4.** Using the above example of a risk evaluation score of 4 (moderate risk), appropriate controls must be applied to the risk and these must be listed out accordingly in the form along with the person responsible for applying the control and the completion date.
- 5.** Once the controls have been applied, the risk must be reassessed as a whole taking into account the applied controls and once again using the risk evaluation matrix on the last page, a residual score must be obtained.
- 6.** If the residual risk on reassessment is 'Trivial' or 'Tolerable' (scores 1 and 2), then no additional controls are required and only effective monitoring of the task to ensure compliance with procedures is necessary.
- 7.** However, if the reassessment of the risk again is 'Moderate', 'Substantial' or 'Intolerable' and yields a score higher than 2, it implies that the applied controls are not sufficient to address the associated hazards and therefore do not bring the risk to a safe level. This would require additional controls to be applied and steps 4 and 5 to be followed once again.
- 8.** This process would continue until the residual risk is eventually brought down to an acceptable level (scores 1 or 2).
- 9.** Effective supervision of the task to be carried out is necessary to ensure that there are no unauthorized and unsafe diversions which could effectively change the entire risk assessment therefore making it inappropriate for the current task.

This form is for guidance purposes only and does not replace any company procedures or applicable statutory regulations.

VESSEL NAME:			ACTIVITY: Oil tanker operations (aspects that may lead to disputes)	PERSONNEL INVOLVED IN THE TASK:		
HAZARD CATEGORY	POTENTIAL HAZARDS IDENTIFIED	RISK EVALUATION SCORE (Refer page 14)	POSSIBLE CONTROL MEASURES REQUIRED (including existing & proposed)	ACTION		RESIDUAL RISK SCORE (Refer page 14)
				PERSON RESPONSIBLE	DATE COMPLETED	
Cargo Contamination	Absence of or failure to follow prescribed procedures pertaining to cargo loading, carriage of cargo during the voyage and cargo discharge.	Likely (3) x Harmful (2) = 6 <b>Substantial (example only)</b>	<ul style="list-style-type: none"> <li>– Company operating procedures must cover all <a href="#">cargo/ballast/tank cleaning</a> operations to ensure appropriate guidance is available to the shipboard personnel</li> <li>– Continuous on board training must be imparted for familiarity on the company operating procedures to avoid deviations.</li> <li>– Senior shipboard officers associated with cargo operations must undergo enhanced training on the cargo operating procedures prior to joining on board.</li> <li>– Risk assessments/job safety analysis must be carried out for all operations to mitigate associated hazards with appropriate control measures.</li> <li>– Tool box meetings to be held involving all relevant personnel to discuss the details of the cargo operation to be undertaken.</li> <li>– Testing of cargo systems (pre-arrival checks) and associated equipment prior to arrival load/discharge port must be diligently carried out including but not limited to: <ul style="list-style-type: none"> <li>▪ Cargo tank atmosphere</li> <li>▪ On board calibration of portable gas detection meters</li> <li>▪ Cargo tank high level (95%) and high-high Level (98%) alarms</li> <li>▪ Cargo Pipeline pressure testing (to normal working pressure)</li> <li>▪ Cargo pump emergency stops/trips.</li> <li>▪ Hydraulic valve system including operation of cargo valves.</li> <li>▪ Visual condition of deck scupper plugs.</li> <li>▪ Pump room bilge high level alarm and pumping system.</li> </ul> </li> </ul>			Highly Unlikely (1) x Harmful (2) = 2 <b>Tolerable (example only)</b>

Cargo Contamination		(To be assessed and completed)	<ul style="list-style-type: none"> <li>– Pump room ventilation/gas monitoring and rescue equipment</li> <li>– Portable air driven emergency pump (for containing accumulated oil around aftermost main deck scupper in case of oil spills on deck. <ul style="list-style-type: none"> <li>▪ Inert gas system to be checked for operation (where fitted)</li> <li>▪ Operation of venting devices to be checked.</li> <li>▪ Tank cleaning system to be checked</li> <li>▪ Ballast Water Treatment System (where fitted) to be tested.</li> </ul> </li> <li>– Ship shore safety checklist to be agreed and signed between the ship and terminal containing pertinent information such as cargo grades, sequence of loading/ discharging and manifolds to be used</li> <li>– Cargo load/discharge plan to be prepared taking into consideration but not limited to: <ul style="list-style-type: none"> <li>▪ Sequence of cargo grades to load/ discharge (if more than one)</li> <li>▪ Sequence of tanks/groups to be loaded including manifolds and cargo pipelines to be used to ensure double valve segregation.</li> <li>▪ Maximum loading rates (usually based on venting capacity) and reduced loading rates for initial loading and topping off tanks.</li> <li>▪ Maximum discharging rate (based on cargo pump rated capacity and cargo pump performance curves).</li> <li>▪ Final notices for reduction/stoppage of loading as required by terminal (agreed and documented in the ship shore safety checklist too).</li> <li>▪ Intermediate sampling requirements if any.</li> </ul> </li> </ul>			
---------------------	--	--------------------------------	---	--	--	--

Cargo contamination			<ul style="list-style-type: none"> <li>– Cargo tanks and pipelines must be jointly gauged/ witnessed by ship staff and the cargo surveyor. Ullage reports/tank cleanliness certificates to be countersigned by all witnessing parties.</li> <li>– Cargo samples must be drawn as required to protect the vessel against spurious claims. Sampling to be witnessed and samples to be signed/sealed and stowed. Adequate samples to be drawn to ensure the ship has its own samples for retention.</li> <li>– Setting of cargo tank lines must be supervised by a responsible deck watch keeper and independently verified by the deck cargo officer. All other valves not in use to be confirmed shut, tagged and recorded in cargo operation logbook.</li> <li>– Double valve segregation between grades must always be maintained; no common sections of pipelines are to be used unless the grades are sequentially compatible and approved by the charterers.</li> <li>– Spectacle pieces correctly positioned to isolate pipelines where required</li> <li>– During loading, non-nominated tanks and spaces (cargo /ballast/void) to be checked and monitored throughout the operation.</li> <li>– After tanks have been topped off, same to be monitored regularly until final completion of loading to ensure no appreciable changes in ullage.</li> <li>– While Blending is prohibited, co-mingling and loading on top of cargoes should be avoided as this may prejudice P&amp;I Club cover however if commercially unavoidable, then Members should consult the Club prior to fixing such cargoes. The latest applicable statutory regulations such as the SOLAS convention and industry guidelines published by organisations e.g. the Oil Companies International Marine Forum (OCIMF) are to be consulted and adhered to.</li> </ul>			
---------------------	--	--	--	--	--	--

<p style="text-align: center;">Cargo Contamination</p>	<p>Failure/malfunction of equipment associated with cargo/ballast systems leading to cargo contamination.</p> <p>Poor maintenance of tank structural components, pipelines and valves associated with the cargo/ballast systems.</p>		<ul style="list-style-type: none"> <li>– Cargo monitoring during voyage to be carried out ensuring no migration of cargo between tanks.</li> <li>– Cargo equipment to be tested prior to arrival at port.</li> <li>– All planned maintenance, periodic testing and calibration to be done in line with the Original Equipment Manufacturer (OEM) recommendations.</li> <li>– Hydraulic oil level in the cargo valve electro-hydraulic system to be checked and quality tested periodically for impurities such as metal filings.</li> <li>– Hydraulic oil pressure to be monitored throughout the operations to ensure that the cargo hydraulic valves remain shut.</li> <li>– Tell-tale indicator of cargo hydraulic valves not in use on the cargo control room console to be routinely checked and confirmed as shut.</li> <li>– Cargo heating systems (heating coils or heat exchangers) must always be tested for leakages during ballast voyages to ensure they are not leaking water/ heat transfer</li> <li>– Cargo tank structural framework to be diligently checked for condition.</li> <li>– Pipelines, valves and other components of the cargo/ballast systems which are present within the cargo tanks and posing a risk to contamination must be checked diligently as part of the cargo tank inspection.</li> <li>– Cargo tank coatings must be checked for consistency of coverage so that cargo isn't contaminated by flakes of coating or rust particles from exposed breakages in tank coatings.</li> </ul>			
--	--	--	--	--	--	--

<p style="text-align: center;">Pollution and delays</p>	<p>Absence of or failure to follow prescribed procedures pertaining to cargo planning and/or cargo watch keeping.</p>	<p><b>Likely (3) x Harmful (2) = 6 Substantial (example only)</b></p>	<p>Taking into consideration the earlier control measures regarding company procedures, training, risk assessments, tool box meetings and cargo planning, additional control measures may be as follows:</p> <ul style="list-style-type: none"> <li>– All deck scupper plugs, and save-all tray drain plugs to be kept closed during the cargo operations.</li> <li>– Deck crew to be aware of the draining procedure of accumulated rain water at the aftermost main deck scupper. This must be done after checking that the accumulated water has no traces of oil. Crew must closely monitor the draining and plug the scupper once completed. Scuppers should not be left open and unattended at any time. Same procedure to be followed for drip trays. Accumulated rain water would reduce the deck containment capacity.</li> <li>– Portable air driven emergency pump to be rigged around the aftermost main deck scupper. Ideally the discharge hose must be connected to a slop tank and the deck air supply kept on. In the event of any oil spill on deck, only the deck air supply valve will have to be opened to operate this pump and the accumulated oil will be pumped into the slop tank with minimal delay.</li> <li>– All unnecessary openings to cargo spaces such as cargo/ballast tank lids, ullage ports, sampling ports, manholes etc to be confirmed firmly shut.</li> <li>– Cargo manifolds not in use to be firmly blanked utilising all nuts/bolts of appropriate length.</li> <li>– All unused valves to be confirmed shut.</li> <li>– Oil spill cleanup material to be readily available at manifold and at the after part of the main deck.</li> </ul>			<p>Highly Unlikely (1) x Harmful (2) = 2 <b>Tolerable (example only)</b></p>
---	---	---	---	--	--	--

Pollution and delays			<ul style="list-style-type: none"> <li>– Sufficient personnel on board at all times during to perform following tasks for safe cargo operation: <ul style="list-style-type: none"> <li>▪ Continuous watch in Cargo Control Room to tend to alarms, terminal communication and overall co-ordination of the cargo operations.</li> <li>▪ Continuous monitoring of cargo manifold.</li> <li>▪ Maintaining regular fire/ safety and security rounds.</li> <li>▪ Moorings to be tended to regularly to ensure manifold connections remain aligned with shore.</li> <li>▪ Regular monitoring of tanks being loaded/ discharged including physical gauging. Frequency of checks to be increased when close to crucial levels of topping off or stripping. Sole reliance on automatic level gauges must not be practiced.</li> <li>▪ Regular monitoring of pump room spaces.</li> </ul> </li> <li>– Established clear communication between the duty officer and the deck crew is to be encouraged so that they work as a team.</li> <li>– Cargo loading/discharging to be commenced at a slow pace and once receipt of cargo has been confirmed and no leakages detected, the loading/discharge rate can be gradually increased to the maximum agreed rate.</li> <li>– When discharging segregated/clean ballast, surface of the ballast water to be examined either visually or by other means immediately before discharge to ensure that no contamination with oil has taken place.</li> <li>– Non-nominated tanks and spaces (cargo / ballast/void) to be checked and verified empty throughout the operation.</li> <li>– During topping off cargo tanks, next tank to be loaded is tested by bleeding prior to completion of tank being topped off.</li> </ul>			
----------------------	--	--	---	--	--	--

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Pollution and delays</p>	<p>Failure/malfunction of equipment associated with cargo/ballast systems leading to pollution.</p>		<ul style="list-style-type: none"> <li>- Regular communication with terminal including notification of any rate change.</li> <li>- Ensure enough relevant tank valves are open during loading operation to safeguard against pressure surge.</li> <li>- Loading rate to be reduced as agreed while topping off to avoid pressure surges which can damage the entire cargo system</li> <li>- After tanks have been topped off, they need to be monitored regularly until final completion of cargo operations.</li> <li>- During loading or discharging, excessive trim should be avoided as other fully loaded tanks can overflow either through poorly sealing tank lids or via the vent lines.</li> <li>- Ensure cargo hoses are properly drained prior to hose disconnection.</li>   <li>- Planned maintenance of critical equipment such as valves, electro-hydraulic systems etc in the cargo system must be carried out without delay as far as practicable since opportunities to attend to these may not always be available.</li> <li>- Cargo tank level alarms must be tested regularly and included as part of the pre- arrival checks for the load port. It is imperative that the audible siren alarm outside the accommodation block is sufficiently loud and the visual flashing light is sufficiently bright.</li> <li>- Portable cargo hoses, if used, must be certified pressure tested, megger tested and inspected prior to use.</li> <li>- Cargo system pipelines must be tested regularly and definitely as part of the pre- arrival discharging port checks. Furthermore, annual pressure testing to be carried out up to 1.25 times the working pressure.</li> <li>- All lights and alarms on the cargo control room console must be tested as part of the pre-arrival port checks.</li> </ul>			
---	---	--	--	--	--	--

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Pollution and delays</p>	<p>Inadequate maintenance of tank structural components, pipelines and valves associated with the cargo/ballast systems.</p>		<ul style="list-style-type: none"> <li>– Sufficient spares of critical cargo equipment must be available and the use of non-original spare parts must be avoided (unless in case of emergencies). In this case a separate risk assessment is to be undertaken, the manufacturer, Flag and Class to be consulted and adequate control measures implemented.</li> <li>– Oil gaskets must be used between flanges of components in the cargo system including cargo pipelines and valves. Careless and frivolous practices of using cardboard sheets or condemned navigational charts as gaskets should not be permitted.</li> <li>– Cargo and ballast tanks must be inspected periodically as required by the company procedures and any critical repairs must be carried out as soon as practicable.</li> <li>– Any structural deficiencies involving the Flag / Classification society must be brought to their attention immediately and repairs must be carried out to the satisfaction of Class.</li> <li>– Hydro-testing of ballast tanks may be undertaken to check the integrity of the tanks however due care must be taken when pressing up the tanks as this may lead to further damages to the tank structure if not carried out properly.</li> <li>– As per vessel’s design, if ballast tank air vent pipes pass through the cargo tanks, these sections of penetration are critical and must be subjected to an enhanced inspection regime to ensure they are always maintained in good condition.</li> <li>– Overboard discharge valves must be blanked (spectacle blank) and the valve must be locked physically by a responsible officer. A prominent notice regarding the danger of operating this valve must be displayed on location.</li> </ul>			
---	--	--	--	--	--	--

Pollution and delays			<ul style="list-style-type: none"> <li>– Cargo pump seals should be periodically inspected as per the planned maintenance system and renewed as required. Adequate number of spare seals must be available on board.</li> <li>– Lubrication of cargo pump bearings should be done regularly, as required, as failure to do so will affect the performance of the pump, lead to increased temperatures and possible break down.</li> </ul>			
Cargo loss and delays	Improper cargo calculations leading to inaccurate cargo figures resulting in discrepancy and hypothetical losses.	<b>Likely (3) x Harmful (2) = 6 Substantial (example only)</b>	<ul style="list-style-type: none"> <li>– Cargo tank gauging must be carried out jointly and witnessed by the appointed cargo surveyors.</li> <li>– Ensure tank gauging equipment calibrated and certified</li> <li>– Although the tank calibration tables are available for varied trim and heel scenarios, best efforts must be taken to gauge the ship's tanks when the vessel is upright and at even keel.</li> <li>– In case of heated cargoes, cargo temperatures must be taken at three levels and averaged as due to the stratified nature of these cargoes owing to their viscosity, the temperature variations at different levels can lead to erroneous quantities.</li> <li>– Due considerations must be made to include pipe line content (especially that of the bottom cargo lines) in the ullage sheet as this can lead to a hypothetical cargo loss.</li> <li>– Cargo calculations must be carried out independently by the ship staff and the cargo surveyors and results compared to ensure no discrepancies.</li> <li>– The same American Society for Testing and Materials (ASTM) tables should be used for cargo calculations as in the B/L to avoid discrepancies between ship and shore figures.</li> <li>– Vessel's Experience Factor (VEF) should also be taken into consideration when arriving at the cargo figure as this variable can also give rise to hypothetical cargo loss.</li> </ul>			

Fire/Explosion	Failure to adhere to tanker safe practices during cargo/tank cleaning operations leading to fire/explosion.	<b>Likely (3) x Harmful (2) = 6 Substantial (example only)</b>	<ul style="list-style-type: none"> <li>– All equipment carried on deck including that by visitors must be certified intrinsically safe including but not restricted to cameras, mobile phones, laptops/tablet computers and other electronic devices.</li> <li>– Ensure gas detection equipment is calibrated and tested prior use.</li> <li>– There must be no unauthorised modifications made to the vessel's structure such as penetrations in bulkheads which give rise to breaches in gastight integrity between hazardous zones (areas exposed to cargo vapours and may have presence of hydrocarbons such as main deck, pump room etc) and safe zones (areas not exposed to cargo vapours and do not have the presence of hydrocarbons). All access doors leading from the cargo deck to the accommodation must be kept shut during cargo/tank cleaning operations and the central air conditioning must be put on recirculation mode with the fresh air uptakes closed.</li> <li>– The Material Safety Data Sheets (MSDS) for the cargo carried should be available on board as this would give valuable insight about the properties of the cargo in the event that fire-fighters would need to consult the same. The MSDS, along with the latest crew/muster lists and a copy of the Fire Control plan must be available in prominently marked weather tight enclosures outside the accommodation for assistance of shore side fire fighting system.</li> <li>– Unauthorised electrical connections are not permitted on deck, especially in the hazardous zone. Similar non-intrinsically safe electrical equipment should not be permitted for use on deck. All deck lighting should be fitted with intact explosion proof covers.</li> <li>– Bonding/ earthing to minimise electrostatic hazard (spark generation):</li> </ul>			
----------------	---	--	---	--	--	--

Fire/Explosion			<ul style="list-style-type: none"> <li>▪ Earthing/bonding of portable tank gauging/sampling devices, portable tank cleaning machines (if used) must be done prior to be used in the cargo space and must only be disconnected after the equipment has been removed from the tank and the valve closed. Care should be taken to ensure that the surface of the bonding contacts are maintained clean.</li> <li>▪ Pipeline flanges must be checked to ensure the bonding wire connection across the flanges is intact to ensure there is no possibility of a spark developing due to a potential difference generated by the movement of liquid inside the pipe line.</li> <li>▪ Although some national and local regulations may still require a bond wire to be connected between the vessel and the terminal, this is now discouraged by the IMO's '<i>Recommendations for the Safe Transport, Handling, and Storage of Dangerous Substances in Port Areas</i>' (MSC.1/Circ 1216) and urges terminal operators instead to adopt using an insulating flange or a single length of non-conducting hose for connecting to the vessel's manifold.</li> <li>▪ GMDSS equipment should be earthed once the vessel is made fast alongside.</li> </ul> <ul style="list-style-type: none"> <li>– Fire fighting equipment to be readily available at the manifold and main deck including fire hoses (jet/spray) rigged and ready and fire/foam monitors pointing towards the manifolds.</li> <li>– Cargo operation to start at slow rate to avoid static accumulation.</li> <li>– Discharging operation to be ceased in case of failure of inert gas plant (where being used)</li> </ul>			
----------------	--	--	---	--	--	--

Fire/Explosion			<ul style="list-style-type: none"> <li>– Ensure tank atmosphere doesn't fall inside flammable range while purging and gas freeing of the cargo tanks.</li> <li>– Soot blowing is to be carried out whilst at sea. Due care must be taken to ensure that the apparent wind direction is from ahead to ensure no sparks from the funnel blow onto the cargo deck. Similarly, there must be no combustible material such as mooring ropes left un-stowed on the poop deck whilst soot blowing.</li> </ul>			
Release of toxic gasses	Toxic gas release while loading, discharging or carriage of cargo	<b>Likely (3) x Harmful (2) = 6 Substantial (example only)</b>	<ul style="list-style-type: none"> <li>– MSDS of cargo to be obtained and hazards identified prior handling cargo</li> <li>– Suitable gas meters to be used on deck and pump room space.</li> <li>– Pump room safe entry procedures to be observed. Ensure fixed gas detection system (where fitted) is operational.</li> <li>– While handling highly toxic cargo, due care to be taken while connecting/ disconnecting cargo hoses. SCBA set may be used to avoid exposure to toxic fumes.</li> <li>– Venting equipment to be maintained and tested to ensure no leakage.</li> <li>– All doors and vents to be shut and accommodation air conditioning system on partial recirculation ensuring positive pressure being maintained inside accommodation during cargo operation.</li> </ul>			<b>Highly Unlikely (1) x Harmful (2) = 2 Tolerable (example only)</b>

## RISK EVALUATION MATRIX TO OBTAIN SCORE

		Severity/Consequence		
		Slightly Harmful (1)	Harmful (2)	Extremely harmful (3)
Likelihood	Highly Unlikely (1)	Trivial Risk (Score 1)	Tolerable risk (Score 2)	Moderate Risk (Score 3)
	Unlikely (2)	Tolerable Risk (Score 2)	Moderate Risk (Score 4)	Substantial Risk (Score 6)
	Likely (3)	Moderate Risk (Score 3)	Substantial Risk (Score 6)	Intolerable risk (Score 9)

THE TABLE BELOW INDICATES THE RECOMMENDED RESPONSE IN EACH CASE.

Trivial	No action is required.
Tolerable	No additional controls are required. Monitoring is required to ensure control is maintained.
Moderate	Efforts are required to reduce risk. Controls are to be implemented within a specified time.
Substantial	New work not to start until risk reduced. If work is in progress, urgent action to be taken. Considerable resources may be required.
Intolerable	Work shall not be started or continued until the risk has been reduced. If reduction is not possible, the activity shall be prohibited.

This form is for guidance purposes only and does not replace any company procedures or applicable statutory regulations.