

E.1. An assessment of safety should be undertaken including, but not limited to:

- *Reviews undertaken during design or to assess effectiveness of the original design basis of mooring equipment and pattern.*
- *Operations interfaces and exposures for personnel in or around the mooring Workspace (also see E.4).*
- *Measures taken, or required to be taken, to eliminate risks or mitigate harm to personnel and/or damage to equipment.*

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Notes: Appendix E1 contain –

- *Copies of review documentation as undertaken during the design of the vessel, if available*
- *Following Risk assessments have been carried out as per company, MEG4 & INTELLIGENT*
 - *Mooring and unmooring at berth*
 - *Mooring at SPM & FPSO*
 - *Tandem mooring and unmooring*
 - *MBM buoy mooring and unmooring*
 - *SBM mooring unmooring*
 - *CBM mooring unmooring*
 - *Renewal and greasing of mooring wire*
 - *Brake holding capacity test*

The risk assessments are reviewed prior to every mooring operation and discussed during toolbox talks with all crew involved in the mooring operations.

The on-board risk assessment covers hazards such as but not limited to:

- Condition of the ship's mooring lines.
- Condition of the ship's mooring equipment.
- Expected weather conditions and Forces acting on the ship.
- Inadequate mooring configuration due to terminal/berth layout.

- Past mooring incident as shared in the fleet.
- Crew training/familiarization including possible human error evaluation.

Work area

Potential human failures which are included in the risk assessments are categorized as:

- Action errors, such as:
 - Operating the winch in the wrong direction.
 - Forgetting to engage the brake.
 - Checking errors, such as:
 - Failure to confirm that personnel are clear of mooring lines before heaving.
 - Failure to de-energise/shut down equipment at completion.
 - Communication errors, such as:
 - Signaling 'heave' instead of 'slack out'.
 - Radio does not work.
 - Selection errors, such as:
 - Selecting the wrong equipment or mooring line size.
 - Selecting the wrong switch.
 - Planning errors, such as:
 - Failing to plan the steps in order.
 - Not enough personnel.
 - Not following maintenance intervals.
 - Not identifying danger zones/risk areas.
 - Violations, such as:
 - Intentionally taking a short-cut
 - Walking over tensioned mooring lines.
 - Modifying or adjusting equipment or settings without approval as defined by a Management of Change process.
- The Master shall ensure that:
- The mooring operation is planned well in advance of berthing, and
 - The personnel in charge of mooring fully understand what will be required.
 - Routine Risk Assessments is carried out and discussed all anticipated mooring arrangements, equipment and the safety of the shipboard personnel.
 - The weather reports be carefully checked even when the vessel is at berth to ensure risks are

minimized by taking appropriate actions in case the weather deteriorates while the vessel is at berth or at anchorage.

- Tide and current changes be thoroughly monitored.
- These Risk Assessments are filed, and records kept on board.

Before starting operations, the officer assigned to mooring station will conduct an onsite Toolbox talk with the mooring crew to discuss mooring requirements and safety as advised by the Master at the pre-arrival meeting.

Local weather reports, tide conditions and any information of the concerned passing traffic while vessel is at berth (if provided), should be posted in the Cargo Control Room and the gangway.

When discussing the mooring requirements with the Pilot or Berthing Master, the following must be considered:

- The plan for approaching the berth, including turning locations, environmental limits, passing traffic and maximum speeds;
- Restriction imposed on the proposed mooring arrangement due to ship's design or mooring layout. In such cases, alternative arrangement should be agreed upon.
- The rate and direction of the tide at the anticipated time of berthing;
- Whether an anchor or anchors will be required. If so, the point at which it will be let go, and how many shackles will be paid out;
- The number of tugs to be used, point of make fast on ship, tugs line or ship's line, point of let go tug, Max. Bollard pull of tug to be used.
- The selection of moorings, and the sequence of deployment of the mooring lines;
- The limitations of the fendering system and of the maximum displacement, approach velocity and angle of approach, for which the berth and the fendering system have been designed;
- Details of any terminal berthing aids, such as Doppler radar or laser equipment;
- Any feature of the berth, including nearby shallow water or danger areas, or the proximity of other passing traffic;
- The anticipated weather conditions, and whether additional moorings will be required;
- Any other factors that might require mitigating action, additional precautions to be taken, or additional moorings to be deployed.

For STS transfer – Own and other vessel maneuver procedure for mooring and unmooring operations are as per STS Checklists.

Checks before mooring operations

Before mooring operations commence, the following checks must be made, as applicable:

All mooring equipment in good order-

- Winches free of oil leaks;
- Winch brake linings within acceptable limits;



KLNG Mooring System Management Plan (MSMP)

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- Clutches and pins in good order and operating satisfactorily;
- Winch foundations and connections to the deck are sound & intact;
- Rendering point setting clearly marked on winch brakes;
- Rollers free to turn.

Synthetic mooring lines and tails (As applicable)-

- Is adequate length of rope is properly laid on deck and checked for the condition, with no visible damage – specially the area where rope usually turns when passed through the chock;
- Ropes correctly spooled on the winch drums.
- Rope guards are in good condition and kept ready.
- No corrosion of mooring wires visible, particularly at the eye;
- Mandal/ Tonsberg shackles – If applicable, correctly connected.

Mooring areas-

- Clear of unnecessary obstructions;
- Mooring lines flaked out in such a way as to minimize tripping hazards;
- Adequate non-slip surface on decks within the working area.
- Spare mooring ropes and other associated mooring equipment are available;
- Anchors cleared and ready for immediate use (as applicable).

Any defects identified during the checks are to be immediately reported to the bridge and if necessary rectified prior to the mooring operation commencing. Personnel must be suitably dressed and wear the appropriate PPE in accordance with the company PPE matrix.