**SHIP HANDLING AND MANEUVERING**

**IN CASE OF BAD WEATHER**

**HEAVY WEATHER**

Heavy weather can be described as any condition of wind and waves which is likely to cause a vessel to undergo severe motion or responses thereby increasing probability of damage to personnel, cargo and ship than normal.

**Understanding the vessel**

* Stiff ships-high GM, small angle & period of Roll, Eg: Bulkers, Ore carriers
* Violent rolling and irregular rolling,
* Severe stress on Hull and likelihood of general cargo breaking loose
* Short violent movement can lead to moisture migration in ores and subsequent shift of cargo
* Tender ships-Low GM, large angle and period of Roll
* Possibility of vessel becoming unstable due to Negative GM during passage owing to consumption of fuel and fresh water
* Period Of Roll : Time Taken for ship to Roll once completely, Viz, stbd to stbd. Can be visually observed using stop watch in calm weather, or obtained from stability booklets
* Period of Pitch: Time taken to complete one pitch cycle

**Heavy weather precautions (general cargo vessel) open water conditions**

***Stability***

* Improve the ‘GM’ of the vessel (if appropriate)
* Remove free surface elements if possible
* Ballast the vessel down
* Pump out any swimming pool
* Inspect and check the freeboard deck seal
* Close all watertight doors.

***Navigation***

* Consider re-routing
* Verify the vessel’s position
* Update weather reports
* Plot storm position on a regular basis
* Engage manual steering in ample time
* Reduce speed if required and revise ETA
* Secure the bridge against heavy rolling.

***Deck***

* Ensure life lines are rigged to give access fore and aft
* Tighten all cargo lashings, especially deck cargo securings
* Close up ventilation as necessary
* Check the securings on:
* Accommodation Ladder
* Survival Craft
* Anchors
* Derricks/Cranes
* Hatches
* Reduce manpower on deck and commence heavy weather work routine
* Close up all weather deck doors
* Clear decks of all surplus gear
* Slack off whistle and signal halyards
* Warn all heads of departments of impending heavy weather
* Note preparations in the deck logbook.

*When a ship has a large GM she will have a tendency to roll quickly and possibly violently (stiff ship). Raise ‘G’ to reduce GM. When the ship has a small GM she will be easier to incline and not easily returned to the initial position (tender ship). Increase GM by lowering ‘G’. Ideally, the ship should be kept not too tender and not too stiff.*

The Masters/Chief Officers of vessels other than cargo ships should take account of their cargo, e.g. containers, oil, bulk products, etc., and act accordingly to keep their vessels secure. Long vessels, like the large ore carriers or the VLCC, can expect torsional stresses through their length in addition to bending and shear force stresses.

Re-routing to avoid heavy weather should always be the preferred option whenever possible. If unavoidable, reduce speed in ample time to prevent pounding and structural damage to the vessel.

**Bad weather conditions – vessel in port**

The possibility of a vessel being in port, working cargo, and being threatened by incoming bad weather is of concern to every ship’s Masters. Where the weather conditions are of storm force as, say, with a tropical revolving storm (TRS), it would be prudent for a vessel to stop cargo operations, re-secure any remaining cargo parcels, and run for open water. Remaining alongside would leave the vessel vulnerable to quay damage. Provided the weather deck could be secured, the vessel would invariably fare better in open waters than in the restricted waters of an enclosed harbour.

In the event that the vessel cannot, for one reason or another, make the open sea,the vessel should be either moved to a ‘Storm Anchorage’, if available, or wellsecured alongside. It is pointed out that neither of these options is considered better than running for open waters.

**Storm anchorage** – if the ship is well sheltered from prevailing weather and has good holding ground, this may be a practical consideration with two anchors deployed and main engines retained on stand-by.

**Remaining alongside** – increase all moorings fore and aft to maximum availability. Lift gangway, and move shore side cranes away from positions overhanging the vessel. Carry out and lay anchors with a good scope on each cable, if tugs are available to assist. Ensure that engines and crew are on full stand-by, for the period when the storm affects the ship’s position.

In every case, cargo and weather decks should be secured and the vessel’s stability should be re-assessed to provide a positive GM. Free surface effects should be eliminated where ever possible. Statements of deck preparations should be entered in the logbook, weather reports should be monitored continuously and the shore side authorities should be informed of the ship’s intentions.

*Where the intention is to run for open waters, the decision should be made sooner rather than later; for a vessel to be caught in the narrows or similar channel by the oncoming storm, could prove to be a disastrous delay.*

**Abnormal waves**

The sea area off South Africa experiences abnormally large wave activity, and the shipping industry generally has been well aware of these conditions. However, more recent research from satellite imagery has shown that abnormal waves are not restricted to just this area, but can be experienced virtually anywhere in the world’s oceans.

These large waves, if encountered – especially by the longer and larger vessels like the VLCC or the long bulk carrier – pose a great threat. In the situation where a ship breaks the crest of such a wave, the danger experienced has been described as looking down into a ‘hole in the sea’. Violent movement of the vessel into the trough could expect to generate, at the very least, structural damage; while the worst-case scenario might be that the ship’s momentum in the downward direction is so steep that the ship lacks the power to recoup, to ride the next wave.

Good ‘Passage Planning’ to avoid areas with a reputation of abnormal waves is clearly a prudent action. While a reduction of speed in heavy weather is considered as general practice, may go some way to combat the effects of that rogue wave, if encountered unexpectedly.

**Synchronized rolling and pitching**

**Rolling**

Synchronized rolling is the reaction of the vessel at the surface interacting with the ‘period of encounter’ of the wave. This is to say that the period of the ship’s roll is matching the time period when the wave is passing over a fixed point (the position of the ship being at this fixed point). The clear danger here is that the ship’s roll angle will increase with each wave, generating a possible capsize of the vessel. The period of encounter and the increasing roll angle can be destroyed by altering the ship’s course – smartly.

This scenario is always caused by ‘beam seas’ generating the roll and the Office of the Watch would be expected to be mindful of any indication of the vessel adopting a synchronized motion. The Officer of the Watch would react by altering the course and informing the Master, even if the condition is only suspected.

**Pitching**

This condition is again caused by the ship interacting with the surface wave motion but when the direction of the ‘sea’ is ahead; the movement of the vessel being to ‘pitch’ through its length, when in head seas. The danger here is that the period of wave encounter matches the pitch movement and the angle of pitch is progressively increased. Such a condition could generate violent movement in the fore and aft direction, causing the bows to become deeply embedded into head seas.

The condition can be eliminated by adjusting the speed (reducing rpm) to change the period of wave encounter. It is not recommended to increase speed as this could generate another condition known as ‘pounding’. This is where the bow and forward section are caused to slam into the surface of the sea, such motion causing excessive vibration and shudder motions throughout the ship. This latter condition can cause structural damage as well as domestic damage to the well being of the vessel.

**Pooping**

A condition which occurs with a following sea when the surface wave motion is generally moving faster than the vessel and in the same direction. The action of pooping takes place when a wave from astern lands heavily on the after deck (poop deck). The size of the wave, if large, may expect to cause major structural damage and/or flooding to the ship’s aft part.

With the direction of the sea from astern, some pitching motion on the vessel can be expected and the following sea generally makes the vessel difficult to steer, with the stern section experiencing some oscillations either side of the track.

**Preparations for heavy weather**

**TIGHT SECURING**

* Anchor double lashed, bow stopper in place, spurling pipes cemented
* Checking, double checking of Cargo Lashing, Holds battening buckles, Booby hatches Ventilation - suspended during heavy weather and ventilators to be battened down to avoid water ingress
* Load Line life lines to be rigged on main deck and ensured tautness
* Ensure weather tightness of Focsle lockers, Focsle store to be electrically isolated
* Absolute securing of all moving parts of cranes, derricks and booms
* Ensuring no loose objects in Main deck and accommodation decks (Daily use tools, paint drums, lub oil drums)
* Double check on life boat lashing, life raft securing, though to ensure that they can be easily launched
* Ensuring maximum propeller immersion
* Managing of GM by ballasting, de-ballasting tanks
* Reduction of speed, to maintain Engine/Propeller/shaft load within safe parameters
* Enhanced Steering power

**ENGINE ROOM AND MACHINERY**

* Engine Over speeding issues; governor and load setting to be changed for heavy weather.
* Stern tube oil loss; check levels.
* Tanks could overflow during sloshing; conversely low levels could loose suction, check levels. Steering gear under load; check for oil losses from seals, lubrication of motors, tightness of foundation bolts.
* Loose gear, gantry hooks etc to be well secured.
* Lower sea suctions to be used.
* Check sounding pipes, vent heads on deck in advance. Higher probability of seawater ingress into tanks.
* Filters may get clogged quicker.
* Elevator to be stopped and secured.
* Turbo charging surging may be experienced. Higher exhaust temperature. Aux. scavenge blowers may need to be run on manual.
* Watertight doors and other openings to be secured to prevent ingress of seawater.

**Turning the vessel in heavy weather** requires careful observation of the sea condition and accuracy of judgment.

There is always a stretch of moderating sea in the wave development cycle

Turn commencement should start at the end of heavy seas cycle and should be completed before the moderating stretch is over. Use of full helm and engines power as available is to be used.

**Post Rough weather checks**

* All Round Sounding
* Check vulnerable areas of structural damages
* Lashing checks
* Cargo condition checks
* Check ME performance at first available opportunity.

**Bad weather checklist -example**

***The OOW shall:***

* Monitor and assess the situation by considering the following factors (but not limited to):
  + Atmospheric and oceanographic conditions;
  + Heading compared to the sea and the wind direction;
  + Vessel’s stability & lashing rules;
  + Ship’s speed;
  + Under keel Clearance;
  + Any limitation due to the design and size of the Vessel;
  + Proximity of dangers.
* Use the following information to assess the weather condition and to minimize consequences:
  + Weather forecast (Navtex, SafetyNet, VHF message).
  + Local observations (wind & sea condition, wave parameters, clouds, barometric pressure, air temperature).
  + Information received from shore-based services if available (facsimile
  + Advise received from FNSC, approved meteorological routing service or dedicated software.
  + Other relevant Nautical publications.
* Advise the Master of any significant or abnormal development in atmospheric and oceanographic conditions.

A close-up of a survey

Description automatically generated