8.0 NAVIGATION AND BRIDGE PROCEDURES
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8.1 GENERAL

- An efficient bridge organization requires competent and vigilant bridge watch keeping officers and a strong and efficient team, which shall follow specified procedures and is fully familiar with the navigation equipment and its competent use.

- Analysis of casualties indicates that weakness in the organization coupled with failure of the individuals to carry out their duties "the right way the first time and every time" have contributed to a number of accidents. Navigating activities rarely allow time for taking corrective action at the last moment. All actions therefore need to be pre planned taking into account the relevant passage, associated nautical publications, weather, currents and the manoeuvring ability of the ship.

- The procedures specified herein are a required minimum by the company.
8.2 RECORDS

In addition to the deck log book, and engine logbook the following records relating to these procedures are maintained on board.

a) Passage Plan File - Present and Previous plans
b) Pilot information card and other Bridge check lists - Arrival, na departure, change of watch, coastal passage etc.
c) ECDIS / Paper charts and other nautical publication's corrections log.
d) Movement book
e) GMDSS logbook
f) Echo sounder records
g) Course Recorder log
h) Radar log book
i) GPS log / Anchor Log
j) Compass error log
k) Chronometer log
l) Sight register
m) Masters night orders book
n) Official log book

The location and the responsibility of maintaining all these records have been described in the form No 1.5 in the form manual.
8.3 Bridge Publications

8.3.1 The following navigation related publications will be maintained on board:

1. Chart Catalogue.
2. Navigational Charts as applicable.
4. Routing Charts or Pilot Charts as applicable.
5. Sailing Directions and Pilot Books as applicable.
6. Light Lists as applicable.
7. Tide Tables as applicable.
8. Tidal stream Atlases as applicable.
10. Distance Tables.
11. Load Line Chart
12. Mariner Publication:
   - Bridge Team Management - Nautical institute
   - Bridge Watch-keeping - Nautical Institute
   - Bridge Procedures Guides – International Chamber of Shipping

8.3.2 Other than publications mentioned above, publications mentioned in FORM 1.6 to be maintained on board as per vessel type. - Oil, Gas or Chemical Tanker
8.4 BRIDGE ORGANIZATION IN GENERAL

In order to achieve a sure and efficient bridge organization, procedures specified in this document shall be followed.

In addition, recommendation given in the following publications should be taken into account, while establishing Bridge organization:

- Bridge procedure Guide – *International Chamber of shipping*
- Bridge Team Management - *Nautical Institute*

All the procedures given in this manual are minimum necessary and the procedures described in the above publications are only the guidelines. Master of the vessel has the responsibility and the authority to establish a bridge organization which he may feel necessary for the safety of vessel, crew environment and cargo.

The composition of a navigational watch **must** be adequate to ensure a proper look-out and safe navigation can be maintained at all times. The watch system **must** be such that the efficiency of the bridge team is not impaired by fatigue or compromised during pilot (dis)embarkation operations.

When setting or changing the Watch Condition, every effort shall be made to anticipate the need for resources as the risk or workload increases rather than waiting until the situation is possibly beyond the capabilities of the original Bridge Team. When determining the composition of the watch the following factors **shall** be taken into account:

- Visibility, state of sea and weather
- Traffic density and other activities occurring in the vicinity
- Attention necessary when navigating in or near traffic separation schemes or routing measures
- Additional workload caused by the nature of the vessels operations
- Fitness for duty of any crewmembers with particular reference to fatigue
- Knowledge of and confidence in the professional competence of ships officers & crew
- Experience of each OOW and their familiarity with navigational equipment
- Operational status of bridge instrumentation and controls, including alarm systems
- Rudder and propeller control and ship maneuvering characteristics

All the deck officer must be familiar with the company’s Navigation procedures and instructions.
8.5 RESPONSIBILITY OF THE MASTER

- The Master shall be in overall command of the navigational operations and safety of the vessel, the crew and the property.

- The Master shall be responsible for the application of these procedures and have the authority to amend or improve upon them depending on the requirements of his ship, the area of operations and any other limitations.

- The Master shall ensure that the watch officers are fully familiar with these procedures and with the ship's navigational systems and other bridge instrumentation in their entirety.

- The Master is overall in charge of Bridge Team either on scene or the off scene. When he is not present on the bridge he delegates his responsibility and authority to the officer on the watch. Should the Master decide to delegate, suitable instructions must be recorded in the Deck Log book or in Bell-book. The Master shall make it clear to every officer that his/her presence on the bridge in no way relieves the Officer of the Watch of any of his responsibilities and duties as officer of the watch until the Master clearly states that he is taking over the conn of the vessel and the fact is duly logged.

- The Master has overriding authority and responsibility to make decision(s) with respect to safety and pollution prevention. The Master shall not be constrained in any way or by any party from taking any decision which, in his/her professional judgment, is necessary for safe navigation.

- The Master shall be responsible for checking that appropriate information is entered in the relevant records regularly and as soon as possible after the event. The use of the bridge movement book to record events as they happen shall be followed.
8.6 RESPONSIBILITY OF THE BRIDGE TEAM.

8.6.1 The primary responsibility and function of the Bridge team is the safety of navigation and associated communication. However the Bridge team shares the following secondary responsibilities and functions, which may be necessary:

- Safety of Life *(e.g. keeping a listening radio watch on crew working aloft)*
- Safety of vessel *(e.g. keeping watch if undue list developing)*
- Safety of cargo *(monitoring I.G. pressure alarms or cargo temperature alarms while at sea)*
- Safety of environment *(keeping a check on overboard discharge)*

8.6.2 For the conduct of it’s primary and secondary functions and responsibility, sufficient human resources are maintained as the part of navigation watch. The bridge team will conduct its primary functions, during the watch by ensuring the following:

- Maintaining proper lookout,
- Position fixing,
- Collision avoidance,
- Intelligent use of passage plan,
- Radio communications,
- Proper use of echo sounder, radar and other navigational aids,
- Monitoring of all the bridge equipment.

8.6.3 The Second Officer shall be the officer responsible for the upkeep of charts/ECDIS and other nautical publications, for preparation of the passage plan and in concert with the Electrical officer for the maintenance of navigational equipment.

8.6.4 The officer on deck watch shall be responsible for testing of controls as per relevant procedures at least two hours before scheduled departure time (form 2.3 and 2.17).

8.6.5 Master in command as a whole, along with his bridge team is responsible for the conduct of navigation. All the ships personnel who have bridge navigational watch duties form a team.

IMO Resolution 285 requires that the OOW ensures that an efficient lookout is maintained but concedes that ‘there may be circumstances in which the officer of the watch can safely be the sole lookout in daylight’.

However, ‘When officer of the watch is acting as the sole lookout he must not hesitate to summon assistance to the lookout such assistance must be immediately available’. It is
normal practice to have the certified rating watch-keeper working in the vicinity of the bridge where he can be called, should he be required. At night the lookout should be on the bridge carrying out his exclusive lookout duties.

Under certain conditions the OOW may be the only person actively engaged in the navigation of the ship. The steering may be in automatic and lookout engaged in duties around the bridge area. There is no apparent call for teamwork; the OOW will be personally responsible for all aspects of safe navigation. Nevertheless, he will be required to work within a framework of standing and specific orders so that the Master will be confident that the watch is being kept to his, and the company’s standards. The single watch keeper status may change at short notice. If the OOW becomes engaged in duties which require him to forgo his obligations as lookout then he will have to call his certified rating watch keeper to take that role. However we have the first basics of teamwork.

It is the responsibility of the OOW to ensure that the seaman assigned watch-keeping duties:

- Has been properly instructed in lookout duties as to what is expected of him.
- Knows how to report observations
- Is adequately clothed and protected from the weather
- Is relieved as frequently as necessary

The watch-keeping officer may require a man on the wheel in addition to the lookout. It is the responsibility of the OOW to see that the vessel is safely and efficiently steered.

It is the responsibility of the OOW that all members of the team are aware of their duties and they carry them out in manner which will enhance the standard of the watch. The watch officer still needs to ensure that orders are correctly followed – e.g. helm orders are complied with as required, not as the helmsman thinks fit.

Under certain circumstances the OOW may find it is necessary to call the Master to the bridge. This may be because the preplanning requires the presence of the Master on the bridge or the Master's standing or night orders have required him to be called under the developing circumstances or because the OOW has realized that the situation needs the experience and expertise of the Master.

Calling the Master to the bridge will not transfer the conn from the watch officer to the master. Until such time as the Master actually declares that he has the conn the OOW must still carry out his duties as he was prior to the Master’s arrival. Once the Master has taken the conn, and the event logged, then the watch officer moves into a support a supportive role, but is still responsible for the actions of his watch members.

It is now necessary to define the role of the individual team members. Quite obliviously this will to a large extent depend upon the individuals involved and the practice of the ship but unless each individual’s role is understood by all involved there will be overlapping or a possible ignoring of certain functions. Teamwork will depend upon the following role suggestions being carried out.
The Master controls movements of the vessels in accordance with the COLREGS and recommended traffic schemes, regulates the course and speed and supervises the safe navigation of the vessel and co-ordinates and supervises the overall watch organization.

The Watch officer continues to navigate the ship reporting relevant information to the Master, ensuring that such information is acknowledged. He will fix the vessels position and advice the conn of the position and other information. He will monitor the execution of helm and engine orders, co-ordinate all internal and external communications record all required entries in logbooks and perform other duties as required by the Master.

The lookout and helmsman will still be carrying out their duties respectively.

Under certain circumstances, when there is additional officer on the bridge, the senior among them will be the in charge of navigating watch and will be on collision avoidance, feeding the master with necessary information regarding CPAs and TCPAs of various targets and internal and external communications. The junior will be responsible for position plotting giving the master necessary information regarding waypoints, speeds and next course.

While navigating in open waters form 2.8, 2.18 must be complied with.

Master of the vessel may deviate for the safety of navigation and may assign different duties than mentioned in this manual to the officers constituting the watch depending upon the officer’s abilities.
The coordination in Bridge Team Management

- **Human Error**: 80%
- **Equipment Failure**: 20%
- **Accidents**: 100%

**Human Error**: 80%

**Human Error Remaining**: 20%

**Error at design, manufacturing, Maintenance, operation or repairs stage**: cause

**Equipment Failure**: 20%
Flow chart No: 1, Cause of all accidents are human error.

Flow chart No: 2, to avoid human error avoid 1 man and team errors.

Flow chart No: 3,
To avoid team error, develop a system of checks and cross checks; and whenever the differences are seen the reasons should be understood.

These charts indicate that the basic causes of all accidents are human error and to avoid human error we have to avoid one man and team errors. This means we have to first built a team to avoid the one-man errors and than find ways to eliminate team errors. To avoid team error, we have to develop a system of checks and cross checks. And whenever the differences are seen the reasons during checks and cross check the reasons for those differences should be known and understood.
The composition of the bridge team or the watch-keeping composition will depend on the following factors:

- Day light hours (Sunrise to sunset)
- Dark hours (Sunset to Sunrise)
- Restricted visibility (Visibility less than 5 nautical Miles)
- Open sea (Navigable width more than 4 Nautical Miles)
- Deep seas with significant traffic (more than 6 targets within 12 Nautical miles or more than 3 targets within 6 NM range)
- Narrow channels (Navigable width less than 2 Nautical miles)

### 8.6.6. Bridge Team Meetings

The Master must conduct a bridge team meeting prior entering into congested locations, port arrival/departure, heavy weather etc. or whenever he deems necessary. This meeting should include all navigating officers and the chief engineer. Incase chief engineer is unable to attend the meeting; he should be duly informed of the requirements concerning the passage. Hazards to navigation as identified in the passage plan and their controls should be discussed during this meeting. This should include any follow up briefings when encountering or expecting to encounter any hazards during the voyage like heavy weather or restricted visibility etc.

Any restrictions on Main/Auxiliary engines including steering unit, imposed due to special circumstances of the situations should be discussed by the Chief Engineer. An entry shall be made in the deck log book regarding conduct of this meeting.

### 8.6.7. Watch arrangements / Fitness for Duty

#### 8.6.7.1. The Master is fully responsible at all times for ensuring that watch keeping arrangements are adequate for maintaining safe watches.

#### 8.6.7.2. The Master and the Chief Officer shall be responsible to ensure that all the personnel manning the bridge are adequately rested, in the best possible way under the prevailing circumstances of the trade of the vessel.

The port watches or the routine at sea prior arrival should be suitably adjusted, as far as practical, to provide adequate rest to the bridge personnel.

*Please note that the MLC’s rest hours requirements should be complied with at all times.*

#### 8.6.7.3. Special attention should be paid to ensure that members of the first watch at the commencement of the voyage are adequately rested.
8.6.7.4. **The factors to be taken into account to decide the number of personnel required on the bridge, at sea, should include, but not be limited to the following:**

- The Bridge should not be left unattended at ANY TIME.
- Visibility,
- Whether there is daylight or darkness.
- Traffic density, including the presence of fishing traffic, or expected fishing traffic based on sailing directions and other information, including past experiences.
- Proximity of navigation hazards e.g. Shallow waters, islands, oil rigs, unlit small craft etc.
- Whether the vessel is on automatic steering or manual steering.
- Weather conditions.
- Passage through traffic separation schemes.
- Any unusual circumstances affecting the watch, e.g. breakdown of any equipment affecting the safe navigation of the ship.
- Whether any GMDSS duties have to be performed.
- Unmanned machinery spaces (UMS) controls, alarms and indicators provided on the bridge, procedures for their use and limitations.
- Knowledge of and confidence in the professional competence of the officers and crew.

8.6.7.5. **Bridge Manning**

It shall be the Master's responsibility to increase the manning level on the bridge, according to the level of the caution and alertness required for the safe navigation of the ship.

The safe navigation of the ship MUST take precedence over maintenance of the vessel or any other considerations.

Based on the above parameters there is a guideline of the schedule made and described here under. The following watch keeping schedule should be filled up and displayed for every month.
## Day Light Hours

<table>
<thead>
<tr>
<th></th>
<th>Watch Level 1</th>
<th>Watch Level 3</th>
<th>Watch Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open sea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Deep seas but significant traffic</strong></td>
<td>Duty Officer</td>
<td>Duty Officer</td>
<td>Master</td>
</tr>
<tr>
<td><strong>Narrow channel</strong></td>
<td>Duty A. B. (may not be posted on the bridge but at all times in communication with the duty officer and immediately available)</td>
<td>Duty A. B. (as helmsman / look out available on the bridge)</td>
<td>Duty Officer</td>
</tr>
<tr>
<td><strong>Watch Level 1</strong></td>
<td>Look out</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Watch Level 3</strong></td>
<td></td>
<td>Look out</td>
<td></td>
</tr>
</tbody>
</table>

## Dark Hours

<table>
<thead>
<tr>
<th></th>
<th>Watch Level 2</th>
<th>Watch Level 4</th>
<th>Watch Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open sea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Deep seas but significant traffic</strong></td>
<td>Master</td>
<td>Master</td>
<td>Master</td>
</tr>
<tr>
<td><strong>Narrow channel</strong></td>
<td>Duty Officer</td>
<td>Duty Officer</td>
<td>Duty Officer</td>
</tr>
<tr>
<td><strong>Watch Level 2</strong></td>
<td>Duty A. B. (as helmsman / look out available on the bridge)</td>
<td>Duty A. B. (as helmsman / look out available on the bridge)</td>
<td>Duty A. B. (as helmsman / look out available on the bridge)</td>
</tr>
<tr>
<td><strong>Watch Level 4</strong></td>
<td>Look out</td>
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<td></td>
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</table>

## Restricted Visibility

<table>
<thead>
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<th></th>
<th>Watch Level 4</th>
<th>Watch Level 5</th>
<th>Watch Level 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open sea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Deep seas but significant traffic</strong></td>
<td>Master</td>
<td>Master</td>
<td>Master</td>
</tr>
<tr>
<td><strong>Narrow channel</strong></td>
<td>Duty Officer</td>
<td>Duty Officer</td>
<td>Duty Officer</td>
</tr>
<tr>
<td><strong>Watch Level 4</strong></td>
<td>Duty A. B. (as helmsman / look out available on the bridge)</td>
<td>Duty A. B. (as helmsman)</td>
<td>Additional officer</td>
</tr>
<tr>
<td><strong>Watch Level 5</strong></td>
<td>Look out</td>
<td></td>
<td></td>
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</tbody>
</table>

** Bridge watch level 4, level 5 and level 6 are to be considered as “Red” status of alertness

All efforts must be made through proactive planning to ensure that Master is not fatigued and is on the bridge in all areas of heavy traffic or where the navigational risks are very high, e.g. Singapore Straits, Dover Strait, etc. VISIBILITY, TRAFFIC DENSITY, AND DAYLIGHT/DARKNESS FACTORS WILL INCREASE THE RISKS IN EACH OF THE ABOVE.

### 8.6.7.7 Distractions on Bridge

The aim at all times should be that Bridge Team members are not distracted by tasks other than those connected with watch keeping. At any time if the OOW feels distracted due to any activity in or around the wheelhouse he shall have the authority to have same stopped.
Level 4, level 5 and level 6 require highest level of alertness and during such time Bridge shall be considered to be at “Red” state of alertness. The Passage Plan shall indicate the expected areas where Bridge will be at “Red” alert and same shall be highlighted during BTM meetings.

During such time it must be ensured that:

- The beginning and end of such state of alertness shall be informed to ER by phone and same recorded.
- Communication including internal telephone calls is strictly restricted to that concerned with general safety and safe navigation, moorings etc.
- Officers and Crew not connected with navigation are not allowed entry in or in immediate vicinity outside the wheelhouse unless required for some urgent work.
- If officers and/or crew not connected with navigation are required to be in the Wheelhouse or in immediate vicinity outside the Wheelhouse for any urgent work permission must be taken from Master.
- No repair work is allowed on any navigational or associated equipment except those requiring urgent and immediate attention. Such work shall be undertaken only after assessing the risks and with the permission of the master. The OOW must be kept in the loop for all such work being undertaken.
- No work including documentation etc. not connected directly with navigation and watch keeping is allowed
- No noisy work in and around the wheelhouse is allowed.
- No supernumeraries are allowed in or outside the wheelhouse on Bridge Deck.
8.7 RESPONSIBILITY OF THE ENGINE DEPARTMENT:

One thing must be kept always in mind that safety of navigation is the joint responsibility of bridge and Engine room team. Timely and sufficient response given on the Main engine may help greatly to eliminate a risk of collision.

The bridge team shall at all times maintain a close liaison with the duty and Chief Engineer and keep them appraised of any special situation, especially when use of main engine may be required such as in poor visibility, area of high traffic density, proximity to land among other.

Any restriction on the main engines should be informed to Bridge immediately so that required preventing action may be taken in time.
8.8 INSTRUCTIONS AND ORDERS

The various standing instructions and orders are issued to ensure that there is no ambiguity in lines of communication or in the chain of command. The Master shall see to it that every officer joining the ship reads the standing instructions and orders, understands them and is familiar with the operation and use of the navigational equipment. The Master shall have the authority to assess the officers understanding of the instruction as also operation of the navigational equipment.

Section 8.9 details companies standing instructions with respect to the Safety of Navigation. These standing instructions are on every ship supplemented by Masters Standing Instructions. Masters standing instructions will be ship specific in nature.

In the wheel house the following should be displayed:

- Company’s standing instructions.
- Master’s standing instructions.
- Duties of the officers of a navigational watch.
8.9 COMPANY’S STANDING INSTRUCTIONS

8.9.1. GENERAL

The following are Company’s standing instructions for keeping a safe navigational watch and these standing instructions applicable to all ships of FAREAST SHIPMANAGEMENT HONGKONG and shall be followed on board all its ships. The Master may issue additional ship - specific instructions, in Masters standing orders.

8.9.2 WATCH ARRANGEMENTS
   A. The composition of the watch shall at all times be adequate and appropriate to the prevailing circumstances and conditions and shall take into account the need for maintaining a proper look out.
   B. When deciding the composition of the watch on the bridge which may include appropriate deck ratings, the following facts, inter alia, shall be taken into account:
      i. at no time shall the bridge be left unattended;
      ii. weather conditions, visibility and whether there is daylight or darkness;
      iii. proximity of navigational hazards which may make it necessary for the officer in charge of the watch to carry cut additional navigational duties;
      iv. use and operational condition of navigational aids such as radar or electronic position indicating devices and any other equipment affecting the safe navigation of the ship;
      vi. whether the ship is fitted with automatic steering;
      vii. Any unusual demands on the navigational watch that may arise as a result of special operational circumstances.

8.9.3 FITNESS FOR DUTY

The watch systems shall be such that the efficiency of watch keeping officers and watch keeping ratings is not impaired by fatigue. Duties shall be so organised that the first watch at the commencement of a voyage and the subsequent relieving watches are sufficiency rested and otherwise fit for duty.

8.9.4. NAVIGATION DUTY

8.9.4.1 The officer in charge of the watch shall:

a) keep his watch on the bridge which he shall in no circumstances leave until properly relieved;

b) continue to be responsible for the safe navigation of the ship, despite the presence of the Master on the bridge, until the Master informs him specifically that he has assumed that responsibility and this is mutually understood;

c) notify the master when in any doubt as to what action to take in the interest of safety,

d) Not hand over the watch to the relieving officer if he has reason to believe that the latter is obviously not capable of carrying out his duties effectively, in which case he shall notify the master accordingly.
8.9.4.2 On taking over the watch the relieving officer shall satisfy himself as to the ship’s estimated or true position and confirm its intended track, course and speed and shall note any dangers to navigation expected to be encountered during his watch.

8.9.4.3. When using radar, the officer of the watch shall bear in mind the necessity to comply at all times with the provisions on the use of radar contained in the applicable regulations for preventing collisions at sea.

8.9.4.4 In cases of need the officer of the watch shall not hesitate to use the helm, engines and sound signalling apparatus.

8.9.4.5 A proper record shall be kept of the movements and activities during the watch relating to the navigation of the ship.

8.9.5 LOOK OUT

8.9.5.1 Look out shall be maintained at all times and a rating watch keeper will be posted with the OOW during period of darkness and in situation where so required such as poor visibility, proximity to land, heavy traffic and others. In addition to maintaining a proper look out for the purpose of full appraising the situation and the risk of collision, stranding and other dangers to navigation, the duties of the lookout shall include the detection of ships or aircraft in distress, shipwrecked persons, wrecks and debris.

8.9.5.2 In maintaining a look out the following shall be observed:

i. the lookout must be able to give full attention to the keeping of a proper look out and no other duties shall he undertook or assigned which could interfere with that task;

ii. The duties of the look out and helmsman are separate and the helmsman shall not be considered being the look out while steering.

8.9.5.3 The officer in charge of the watch may be the sole look out in daylight provided that on each such occasion:

(i) the situation has been carefully assessed and it has been established without doubt that it is safe to do so;

(ii) full account has been taken of all relevant factors including, but not limited to:

a) state of weather
b) visibility
c) traffic density
d) proximity of danger to navigation
e) the attention necessary when navigation in or near traffic separation schemes;

iii) Assistance is immediately available and can be summoned to the bridge when a change in the situation so requires.
8.9.6. NAVIGATION WITH PILOT ON BOARD

8.9.6.1 The presence of a pilot shall not relieve the Master or the OOW of their duties and obligations for the safety of the ship. Both should be prepared to exercise their obligation not to proceed past a point where the ship would not be able to manoeuvre or would be in any danger.

If the Master leaves the bridge the OOW must seek clarification from the pilot when in any doubt as to the pilot’s actions or intention. If satisfactory explanation is not given the OOW shall notify the master immediately and take whatever action is necessary before the master arrives to protect the safety of the ship.

8.9.6.2 The Master and the pilot shall exchange information regarding navigation procedures, local conditions and ship’s characteristics. The Master and officer of the watch shall cooperate closely with the Pilot and maintain an accurate check of the ship's position and movement. Forms 2.5, 2.15, 2.19 should be complied with.

8.9.7 BRIDGE DECK

The company has distributed the Company’s standing instruction on board and same are required to be posted on the bridge deck.

a. The officer of the watch is on no account to leave the navigating bridge when the vessel is under way unless properly relieved by the master or another certified officer. A proper watch shall be maintained by officers when the vessel is at anchor.

b. The officer taking over the watch must be sober, fully alert and when under way shall thoroughly familiarize himself as to:
   - the general weather conditions and forecast;
   - the prevailing visibility;
   - the progress of the vessel during the previous watch;
   - the present geographic position of the vessel,
   - the present course and speed,
   - any sea marks insight or shortly to be seen;
   - Navigational dangers or potential dangers the vessel is required to pass and alterations of course during his watch and including one hour thereafter.
   - The location of other vessels relative to his vessel's course and speed;
   - The orders of the master concerning the navigation of the vessel

Only when he is satisfied as to these points is he to accept the responsibility of taking over the watch and not until then is the officer being relieved permitted to leave the bridge;

c. The vessel is at all times to be navigated in strict compliance with the "international regulations for the prevention of collision at sea", and any local regulations relating to navigation. Any necessary action, such as altering course or reducing speed, especially if own vessel is the giving way vessel under such regulations, should be positive and taken in sufficient time. Officers of the watch must bear in mind the necessity of leaving other vessel in no possible doubt as to their intentions.
d. The position of the vessel when underway shall be frequently verified, when in sight of land, by shore bearing. The position obtained shall be checked where practicable by intelligent use of the navigational aids with which the vessel is equipped. The vessel's position when at anchor shall be fixed and thereafter checked at hourly intervals. Constant vigilance maintained prior, during and after change of tide.

Any discrepancy in the vessel's position or speed between positions shall be brought to the immediate attention of the master.

e. The course to steer will normally be given as a true gyro course unless otherwise stated. A close check is to be kept on the corresponding course by standard compass. The gyro steering repeater shall be checked against the master gyro at the commencement of each watch. The remaining gyro repeaters will then be checked against the gyro steering repeater. The error on both gyro and standard compass shall be ascertained during each watch, or if more than one course is steered, then an error for each course whenever conditions permit.

f. The officer on watch will observe the course and speed which have been approved by the master. This should not prevent the officer on watch from taking the most effective action which, in his judgment, may be necessary to avoid casualty to the vessel or its personnel. The master, of course, is to be notified as soon as possible of the circumstances and the action taken. It is particularly important to record time, dates and position against course alterations in reduced visibility or when faced with emergency conditions. In any case all course alterations to be logged down in GPS log and measure one in deck log book.

g. Steering shall be changed from automatic to manual in fog or other conditions of reduced visibility, in high density traffic zones, when at reduced speed, when navigating close to the shore or near shallow banks or when in shallow water. Helmsmen should be given ample opportunity for familiarizing themselves with the steering characteristics of the vessel, condition permitting. Entry to be made in deck log book or in bell book whenever is changing from auto to manual or vice versa along with time and position.

h. If fog or other conditions of reduced visibility are suspected ahead or close to the vessel on either side, the all radars must be switched on and immediate steps taken to navigate in strict compliance with the “international regulations for the prevention of collisions at sea”. The master shall be advised immediately of the action taken and to be called when visibility is reduced, or indications that visibility is deteriorating. When in reduced visibility, whether under way or at anchor, the appropriate sound signals are to be strictly complied with. Entries to be made in deck log book or in bell book for all steps taken.

i. The officer of the watch must maintain a good lookout. This implies intelligent anticipation of possible danger, and taking the appropriate action in time to prevent a dangerous situation developing. Officers must realise that undue reliance on navigation aids is no substitute for the keeping of a good lookout.

j. The master is to be advised immediately of any equipment failure OR defect such as steering gear, engine room, auto-pilot, gyro, radar, echo sounder, Decca navigator, satellite system, whistle etc. The master is to take action necessary to restore operability of the defective equipment and to notify office if assistance is required.
k. The rating employed as the lookout shall not be called upon to perform duties other than those associated with such a position.

Lookouts are to be posted:
- from sunset to sunrise
- during reduced visibility
- when entering or leaving port
- when traffic is heavy
- at other times specified by the master

l. A close check shall be kept on the depth of water under the keel by use of the aids provided. Echo sounder should be on all the time whenever depth is less than 50 metres. Echo Sounder alarm setting to be set as per company’s UKC policy.

m. Prior to the end of sea passage, officers shall familiarize themselves with the requirements of the local regulations relating to navigation contained in the applicable sailing directions or admiralty pilot or via local agents through Master.

n. At those times when the master takes over the handling of the vessel under way he shall clearly indicate this fact to the officer of the watch. Until such time as he does so the officer of the watch is to carry-out his responsibilities as if the master was not present. Handing over to Master must be logged down in bell book or in deck log book.

o. The presence of a pilot on the bridge in an advisory capacity in no way reduces the responsibilities of the officer of the watch to continue navigating.

p. The master is to assign “stations” to the deck officer to cover berthing and unberthing and such other movements as may occur within the port area.

q. The primary consideration in the mind of the officer of the watch must always be the safety of life and property at sea. Nothing contained in this orders shall substitute or cancel anything contained in the “international regulations for the prevention of collision at sea” and local regulations relating to navigation.

r. The use of the bridge radio telephones should be confined to the safe navigation of the vessel, port facilities, company official business and emergencies.

s. Persons not directly concerned with the immediate navigation of the vessel shall not be permitted on the bridge during any critical condition including reduced visibility without permission of the master.

t. These standing orders are to be signed by deck officers as having read and understood their meaning.

u. The master may add to these standing orders but no such orders shall change, alter or cancel in any way whatsoever these standing orders numbered a. to u.
8.9.8. ANCHORING

8.9.8.1. Prior Anchoring:
A detailed passage plan must be made for approaching anchorage areas. A certificated/licensed deck officer must supervise letting go or weighing the anchors, and should assign only experienced crew members to anchor work.
In addition to the factors usually taken into account in passage planning, the following factors must be taken into account for planning arrival and departure from anchorages:

- An assessment must be made prior to approaching the anchorage for the following:
  - Testing the M/E in the astern direction well in advance of the approaches to the anchorage area;
  - Reduction of speed appropriate for making the approach towards the anchorage area. If the approach speed is too fast, it is difficult to control the vessel, especially if the anchorage is too crowded.
  - The manoeuvrability of the vessel, especially of larger vessels at slow speed, which may restrict the vessel from making large or sudden alterations.
  - It is imperative that prior anchoring, the vessel has come to a **complete stop** i.e. the speed over ground is near zero. The ship’s speed should not exceed 0.3 knots over the ground when the anchor cable is being paid out.
  - Identify a suitable anchoring space of **appropriate depth**, at a safe distance from other anchored vessels and hazards to navigation;
  - Consider the combined effect of tide, current and the wind direction and strength, to plan the approach towards the anchoring position. If other ships are at anchor, the general direction of heading of the vessels provides a fair indication of the way own vessel will head after anchoring.
  - Traffic conditions, especially with respect to other vessels approaching or leaving the anchorage area, thereby restricting them in their ability to manoeuvre fully, due to their slow speeds.
  - Other vessels, approaching or leaving the anchorage area may also be unable to manoeuvre fully, due to their slow speeds.
  - The ship’s speed should be reduced or the vessel stopped, if required, to carry out further assessment when approaching a crowded anchorage.

- Basis the assessment on the above mentioned criteria, in case the conditions are found to be unfavourable for safe anchorage, the Master should avoid anchoring.

**Critical Wind velocity:**
Critical wind velocity is the wind speed at which the wind pressure exerted on the ship’s windage area is greater than the holding capacity of the anchor. The
following table gives an estimation of critical wind velocity for different types of vessels in reasonably good holding ground:

<table>
<thead>
<tr>
<th>Vessel Type</th>
<th>Critical wind velocity</th>
<th>Beaufort Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCC/ Container ships</td>
<td>Ave 10 m/s 10 knots</td>
<td>Force 5</td>
</tr>
<tr>
<td>VLCC, Cape Size Bulker (Ballast)</td>
<td>Ave 15 m/s 30 knots</td>
<td>Force 7</td>
</tr>
<tr>
<td>VLCC, Cape Size Bulker (Fully Loaded)</td>
<td>Ave 20 m/s 40 knots</td>
<td>Force 8</td>
</tr>
<tr>
<td>Others</td>
<td>Ave 15 m/s 30 knots</td>
<td>Force 7</td>
</tr>
</tbody>
</table>

It should be noted that critical wind velocity does not take into account the effect of swells and tidal stream.

### 8.9.8.2 Anchoring Equipment:-

The vessel's anchoring equipment is designed to hold the vessel in good holding ground in conditions such as to avoid dragging of the anchor, and in poor holding ground the holding power of the anchor will be significantly reduced.

The vessel’s anchoring equipment is not designed to hold a vessel in an exposed location in rough weather or to stop a vessel which is moving or drifting.

The vessel’s anchor and anchor cable are designed based on an assumed current speed of 2.5 m/sec (5 knots), wind speed of 25 m/sec (50 knots) and scope of chain (ratio between chain paid out and water depth) between 6 and 10.

The anchor windlass is typically designed to be capable of weighing the anchor and 3 shackles of chain hanging free in water.

### 8.9.8.3. **Deep Water Anchoring**:

The Company requires all vessels to walk back the anchor under power to the desired scope in depths over 50 metres, except in emergency. Vessels must not anchor in depths greater than 100 metres, except in emergency. If the vessel requires anchoring in depths greater than 100 meters during routine operations,
then office permission should be sought. To avoid damaging the windlass, the anchor cable should be kept up/down and paid out continuously under power till the entire scope is paid out. Engines and anchor brakes should be used as required to avoid over-speed and/or overload of the windlass motor.

8.9.8.4. When entering, manoeuvring within and leaving harbour, the Master must ensure that the anchors are clear and ready for letting go, however in certain cases, such as SBM work and on the approach to some berths, local regulations may require that the anchors be secured. The windlass(es) must be fully operational and the necessary members of the crew at stations, with a responsible Officer or duly trained and experienced crew member in charge of operations. On long protracted river or estuarial passages, mainly conducted at full speed, Masters should assess the necessity of keeping the forecastle manned, bearing in mind local regulations and whether steam to the windlass may be reduced to a warming-through supply.

8.9.8.5. Anchoring Procedure

When anchoring any vessel in depths less than 50 metres, other than in an emergency, there are two options:

1. The anchor should be lowered under power consistent with manufacturer's instructions; to 4-6 metres above sea-bed. It should then be taken out of gear and the operation completed by “letting go” maintaining full control by careful application of the brake.

2. The windlass should be kept in gear with the brake and cable stopper off, and the anchor lowered under power until the required amount of cable has been paid out. The brake and the cable stopper should then be applied and the windlass taken out of gear. This will ensure no damage to gear teeth in the event of sudden surge on the cable.

A pre anchoring meeting between officer in-charge of forward operations and Master should preferably be carried out prior anchoring. During the meeting the planned anchoring procedure and depth available at anchorage area should be discussed.

Close communication should be maintained between the Bridge and the forward station throughout the anchoring operation. Both parties should keep each other updated regarding the depth of water, ship’s speed over ground, visual check forward, engine motion, direction and strength of wind/current and direction and tension of the cable.

In no circumstances must the weight on the cable be such as to cause the windlass to “free wheel”; full power must be available and used at such times. The anchor brake may also have to be used in extreme cases to control the speed. If the lead and weight on the cable is incorrectly judged, then the first indication of there being too much stress in the system will be windlass damage.
The wear and tear on the clutch mechanism and windlass drive will require vigilance to prevent serious damage to the vessel's anchoring capability.

On completion of anchoring, the cable stopper is to be locked in position across the cable. The cable should be adjusted to rest close to but not touching the cable stopper and then the brake hardened up and the windlass taken out of gear. There should be no slack in the cable between the brake and the cable stopper.

If the cable cannot be secured as required above, then the office must be informed.

The use of an anchor flag and pole, positioned on the windlass, is discouraged. Should circumstances require their use, then they must be rigged with particular attention to the dangers of trapped fingers.

The person in charge of anchoring or mooring operations must notify the Master and the Chief Engineer of any defects, loss of performance or unusual symptoms noted in the deck machinery. The Chief Engineer is responsible for the prompt investigation of such reports and for rectifying defects.

### 8.9.8.6. Anchoring of Large Vessels

**Very large vessels (Capesize Bulk Carriers and VLCCs) must in general, use method 2 as described in sec 8.9.8.5 when anchoring, except in cases of an emergency or running moor.**

In shallow waters (depth less than twice the draft) option 1 as described in sec 8.9.8.5 can be exercised, however, when doing so extreme care must be taken.

It should be noted here that when lowering anchor under power, excessive load on the anchor cable could cause damage or wear of the windlass engine and gearing. Every effort should be made to maintain the brake system in fully operable condition.

We remind Masters, particularly of our larger vessels, that pilots are not always well experienced in this aspect. Pilot’s intentions should be established well in advance of anchoring, preferably during the Master-pilot information exchange.

On completion of anchoring, the cable stopper is to be locked in position across the cable. The cable adjusted to rest up against the stopper and then the brake engaged and windlass gear disengaged.

### 8.9.8.7. At Anchor

At least two schools of thought exist as to which is the best way to ride to the anchor. The alternatives are the cable stopper (or guillotine), or the windlass brake.

The cable stopper will certainly provide a secure fastening for the cable and will not slip. However, any requirement to pay out additional cable requires disengagement of the stopper.
On the other hand, a well maintained windlass brake acts as stress limiter and if the weight on the cable is excessive, the brake will render. Marking the cable so that it is visible from the bridge gives a good indication that, for instance, in increasing weather conditions it may well be time to heave up the anchor and proceed to sea. By waiting too long, weighing anchor in bad weather can become a hazardous operation for those on the forecastle head.

While at anchor, considerable dynamic stress on the anchor system may be induced due to the yawing of the ship under influence of wind and tide. This yawing motion can be moderated by lowering a second anchor on to the sea bed. In any case when at anchor in bad weather, stress on the cable can be eased by using the engines.

The best indicator of such stress is the behaviour of the anchor cable. Personnel should check this visually, looking for signs such as amount of change in the cable catenary or for unusual effects, such as shocks when the cable tightens.

### 8.9.8.8 Securing of Anchors at Sea

**8.9.8.8.1** It is extremely important that the anchors are stowed tightly against the shipside while at sea. It is not enough that the ground stopper is engaged whilst at sea. The anchor must make a ‘three point contact’ with the hull. Both flukes and the crown of the anchor should be in contact with the hull. If the chain is slack, the anchors will bang against the shipside, in heavy weather. This can easily cause a hole in the shipside.

**8.9.8.8.2** While the vessel is at sea, the Windlass brakes and lashing wires are the primary and secondary means respectively for anchor securing. Hence it must be ensured that both these arrangements are fully intact and reliable.

**8.9.8.8.3** The Windlass brakes are to be tightened as per the recommendation of makers. Please note extra tightening and insufficient tightening are both incorrect. It is to be ensured that brake linings are in satisfactory condition at all times and timely renewed if necessary. **A complete set of spare brake lining and screws to be always maintained on board.**

**8.9.8.8.4** In general anchor lashing arrangement should consist of at least 2 independent lashing wires of minimum 24 mm diameter, and the Turnbuckles used should be of 50 T BL, and their Test certificates safely maintained on board. The above lashing wires should be renewed every two years.

The Lashing wire eyes should have a thimble with pressed fitting at both ends. On no account should bulldog grips be used.

**8.9.8.8.5** On smaller vessels where usage of a 24mm diameter lashing wire is impracticable, a smaller diameter wire in, consultation with the Superintendent, can be used. It is recommended that wires, shackles and turnbuckles should have a breaking load of at least twice the weight of the anchor.
8.9.8.6 Spurling pipes must be covered by steel plates, canvas and cement to avoid any ingress of water into the chain lockers.

8.9.8.7 Chain locker doors / Man holes must be secured tightly to ensure that even if chain locker gets filled with water, it does not enter the Fore Peak Stores.

8.9.8.9 EMERGENCY ANCHORING

Existing anchoring systems, used conventionally, would be most unlikely to arrest the drift of a large ship unless its speed over the ground was less than half a knot. As kinetic energy is a function of ships mass and velocity, there is a lesser energy absorption problem on vessels of smaller size. Strength of components being a critical factor, it is apparent from collected data that vessels under 50,000 Dwt enjoy an advantage over larger tonnage.

However, bearing in mind that every available means must be used to prevent a ship from going aground, the use of anchors in such an emergency should be attempted. The objective is to bring the vessel to a halt off a lee shore or danger and some windlass damage is acceptable in the interests of the vessel, cargo and crew. In the absence of research data, the following guidance is offered. It must, however, be realised that the governing factors in all circumstances will be:

- the size of the vessel
- the speed over the ground
- the steepness of the seabed and proximity of shoals
- the nature of the seabed and anticipated holding power of the anchors
- the nature of the wind and sea
- the condition of the ship propulsion and steering system
- the condition of the anchoring equipment
- The availability (and power) of tugs.

Emergency Preparedness:

1. **heaving the anchor using the opposite side windlass or anchor winch:** Should the windlass motor fail, vessels shall have ready a contingency plan for heaving the anchor with mooring wires/ropes by turning the gypsy using the opposite side windlass or another winch.

2. **Opening the joining shackle or the bitter end:** All suitable gear i.e. shackle punch, spike, sledge hammer, hooks, marking buoy etc. shall be marked and kept separately in the fore peak store for immediate use.

3. **On ships with hydraulic winches, be aware of the changeover procedure in case one power unit is in-operational.**
4. **Compatibility of motors:**
Check the possibility of replacing the windlass motors/pumps with other winches.

**8.9.9 SAFE OVERHEAD CLEARANCE (SAFE AIR DRAFT)**

**AIR DRAFT**
The vertical distance between the highest points of the vessel to the water line is defined as the air draft of the vessel.

8.9.9.1 **Safe Overhead Clearance Under Power Cables**
High voltages in overhead power cables can sometimes possibly make dangerous electrical discharge between a cable and a ship passing under it.

8.9.9.2. Safe Overhead Clearance above High Water, as defined by the responsible authority, is given on the charts in magenta, where known; otherwise, the physical vertical clearance (formerly termed Headway) is shown in black.

8.9.9.3. For the methods of showing clearances on older charts, see Chart5011. The clearance is also given in Sailing Directions.

8.9.9.4. If the Safe Overhead Clearance is not specifically stated, nor obtainable from local authorities, it is recommended that a 2m (2 metres) vertical clearance from the highest point of the ship is allowed by ships passing under any cable.

**8.9.10 Safe Overhead Clearance under bridges**

8.9.10.1. Vertical clearance of the bridges can be obtained from the charts, from sailing directions or from local authorities. Usually the suspension bridges have a higher vertical clearance over a central width that decrease towards the ends of the bridges.

8.9.10.2. Before any entry into an area with bridges, the Master must consult Sailing Directions and Charts to obtain the vertical clearance of the bridges, informing the local authorities regarding vessels’ air draft.

8.9.10.3. If the Safe Overhead Clearance is not specifically stated, nor is obtainable from local authorities, it is **recommended to keep at least 2 metres** as vertical clearance from the highest point of the ship, while passing under any bridge.
8.10 MASTER’S STANDING INSTRUCTIONS

As soon as possible after taking over command, the Master shall issue a typed copy of his Standing Orders. In these Standing Orders, the Master must make known his general requirements over and above the company requirements, regarding bridge watch keeping, navigation and navigational discipline, shipboard discipline and other individual duties, as necessary.

The Master shall record ship specific instructions in writing, hereinafter called MASTERS STANDING INSTRUCTIONS. All such instructions shall be read and in acknowledgement of having understood the same, every navigating officer shall sign these on joining the ship before taking over any navigational watch. When an amendment, addition or deletion is recorded by the Master the same shall be acknowledged by every navigating officer. Such instructions shall include at least the following aspects:

a. A clear directive that the Master can be called at any time when a watch keeping officer is in doubt about any aspect or at any time when a situation may affect or be suspected to affect safety of navigation, life on own ship, ships in the area or the environment.

b. Circumstances under which the speed shall be reduced such as poor visibility, heavy traffic conditions or proximity of coastal waters among other. Every such instruction shall also indicate the distances from such danger areas when the speed is to be reduced. Minimum visibility before calling the Master (The distance specified must not be less than 3nm)

c. Posting of lookouts in the hours of darkness and the specific circumstances when lookouts in addition to the helmsman shall be posted.

d. The circumstances in which auto pilot shall be changed over to hand steering and if the helmsman was keeping a lookout also, the process for calling a crew member to keep a lookout.

e. The process for updating the nautical publications including the charts/ECDIS and the records to be maintained by the second officer so that the status of such corrections can be monitored at all times.

f. Clear directives that the watch keeping officers can use any of the navigational aids at their discretion and specific circumstances wherein equipment such as echo sounder, radars ARPA, rate of turn indicators speed logs shall be used and the records that shall be entered in the bridge note books or the relevant log.
g. Procedures relating to changing over from automatic to manual steering, emergency steering or from hydraulic to electric steering and vice versa. Such procedures shall be posted near the steering position in easily understandable, step by step directions. Frequency of drills in this respect shall be specified.

h. The circumstances under which additional assistance for watch keeping shall be called e.g. poor visibility, heavy traffic or narrow passages.

i. Methods of checking information so as to reduce to a minimum the risk of one man error. Such errors are common in position fixing, radar related observations, taking reading from digital read outs or operation of equipments.

j. Correct use of VHF radio telephony or GMDSS equipment

k. Boarding arrangements for pilots and procedures for watch keeping with the pilot on board.

l. Correcting the charts for navigational warnings obtained from Navtex or the other sources.

m. Vessel security in potentially troubled areas

n. Anchor security

o. Rounds before/after each watch during dark hours.

p. General requirements for OOW to monitor safety of ship and personnel and the progress of any operations that may impact on safety and pollution prevention
8.11 NIGHT ORDERS

8.11.1 The Master shall, in addition to the standing instructions, write appropriate night orders to ensure that the watch keeping officers understand the action to be taken in the navigational process to be followed at night or his off hours.

The night orders will be issued daily for the purpose of safety of navigation and they should be made specific to conditions applicable. Instructions regarding the following will be included in the least:

- Areas where any special care needed to be taken
- The positions and / or situations, when to call the master
- Minimum CPA/TCPA to be maintained.

8.11.2 The Master’s night orders will also be handed over during changing of watch along with other navigational details.

8.11.3 The incoming officer will sign the Order book upon understanding the night orders and will ensure its compliance.
8.12 Duties of the officer of a navigational watch (OOW).

8.12.1 Overview.

8.12.1.1 Master’s representative.

Under the STCW Code, the OOW is the master’s representative and is primarily responsible at all times for the safe navigation of the ship and for complying with the COLREGS.

As the master’s representative, the OOW is in charge of the bridge and therefore in charge of the bridge team for that watch, until properly relieved. In compliance with shipboard operational procedures and master’s standing orders, the OOW should ensure that bridge watch manning levels are at all times safe for the prevailing circumstances and conditions.

8.12.1.2 Primary duties.

In order to maintain a safe navigational watch, the primary duties of the OOW will involve watch keeping, navigation and GMDSS radio watch keeping.

8.12.1.2.1 Watch-keeping.

The watch-keeping duties of the OOW include maintaining a lookout and general surveillance of the ship, collision avoidance in compliance with the COLREGS, recording bridge activities and making periodic checks on the navigational equipment in use. Procedures for handing over the watch and calling for support on the bridge should be in place and understood by the OOW. The OOW should not sit down when on watch due to the dangers of falling asleep and reduction in visibility.

8.12.1.2.2 Navigation.

The navigational duties of the OOW are based upon the need to execute the passage plan safely, and monitor the progress of the ship against that plan.

8.12.1.2.3 Radio communications.

OOW will be responsible for maintaining a continuous radio watch at sea. During distress incidents, one of the qualified radio personnel should be designated to have primary responsibility for radio communications.

8.12.1.3 In support of primary duties.

8.12.1.3.1 Controlling the speed and direction of the ship.

The OOW will need to be conversant with the means and best practices of the controlling the speed and direction of the ship, handing characteristics and stopping distance. The OOW should not hesitate to use helm, engines or sound signalling apparatus at any time.
8.12.1.3.2 Pollution prevention, reporting and emergency situations.
The OOW also needs to be fully conversant with shipboard obligations with regard to pollution prevention, reporting and emergency situations. The OOW should know the location of all the safety equipment on the bridge and how to operate that equipment.

8.12.1.4 Additional duties.
There may also be number of additional duties for the OOW to undertake while on watch. General communication, cargo monitoring and control of machinery and the supervision and control of ship safety systems are typical examples.

Additional duties should under no circumstances interfere with the exercise of primary duties.

8.12.1.5 Bridge attendance.
The OOW should not leave the bridge unattended. However, in a ship with a separate chartroom the OOW may visit that room for short periods of time to carry out necessary navigational duties first ensuring that it is safe to do so.

8.12.2 Watch keeping

8.12.2.1 Maintaining a look-out.
In compliance with the COLREGS, a proper look-out must be maintained at all times to serve the purposes of:-

- Maintaining a continuous state of vigilance by sight and hearing as well as by all other available means, with regard to any significant change in the operating environment;
- Fully appraising the situation and the risk of collision, stranding and other dangers to navigation;
- Detecting ships or aircraft in distress, shipwrecked persons, wrecks, debris and other hazards to safe navigation.

Full attention to look-out duties must be given by the bridge team on watch. A helmsman while steering, except in small ships with an unobstructed all-round view at the steering position, should not be considered to be the look-out.

On ships with fully enclosed bridges, sound reception equipment will need to be in operation continuously and correctly adjusted to ensure that all audible sounds on the open deck can be clearly heard on the bridge.

8.12.2.1.1 Sole look-out.
Under the STCW Code, the OOW may be the sole look-out in daylight provided that on each such occasion:

- The situation has been carefully assessed and it has been established without doubt that it is safe to operate with a sole look-out;
- Full account has been taken of all relevant factors, including, but not limited to:
  - State of weather
  - Visibility
  - Traffic density
8.12.2.2 General surveillance

The OOW needs to maintain a high level of general awareness about the ship and its day-to-day operations.

This may include maintaining a general watch over the ship’s decks to monitor, where possible, people working on deck, and any cargo or cargo handling equipment. Special watch-keeping arrangements may be appropriate in waters where there is thought to be a risk of piracy or armed attack.

Whenever work is being carried out on deck in the vicinity of radar antennae, radio aerials and sound signalling apparatus, the OOW should be particularly observant and should post appropriate warning notices on the equipment controls.

8.12.2.3 Watch-keeping and the COLREGS.

8.12.2.3.1 Lights, shapes and sound signals.

The OOW must always comply with the COLREGS. Compliance not only concerns the conduct of vessels under the steering and sailing rules, but displaying the correct lights and shapes and making the correct sound and light signals.

A vessel drifting off a port with her engines deliberately shut down is not, for example, a ‘vessel not under command’ as defined by rule 3(f) of the COLREGS.

Caution should always be observed when approaching other vessels. Vessels may not be displaying their correct light or shape signals, or indeed their signals could be badly positioned and obscured by the ship’s structure when approached from certain directions. In sea areas where traffic flow is regulated, such as port approaches and traffic separation schemes, it may be possible to anticipate movements from certain ship types. In these circumstances it is prudent to allow extra sea room, as long as it is safe to do so.

8.12.2.3.2 Collision avoidance action

In general, early and positive action should always be taken when avoiding collisions, and once action has been taken, the OOW should always check to make sure that the action taken is having the desired effect.

VHF radio should not be used for collision avoidance purposes. Valuable time can be wasted attempting to make contact, since positive identification may be difficult, and once contact has been made misunderstanding may arise.

In clear weather, the risk of collision can be detected early by taking frequent compass bearings of an approaching vessel to ascertain whether or not the bearing is steady and the vessel is on a collision course. Care however must be taken when approaching very
large ships, ships under tow or ships at close range. An appreciable bearing change
may be evident under these circumstances but in fact a risk of collision may still remain.
In restricted visibility, conduct of vessels is specifically covered by the COLREGS. In
these conditions, radar and in particular electronic radar plotting can be effectively used
for assessing risk of collision.

8.12.2.4 Recording bridge activities.

It is important that a proper, formal record of navigational activities and incidents, which
are of importance to safety of navigation, is kept in appropriate logbooks.

Paper records from course records, echo sounders, NAVTEX receivers etc. should also
be retained as per company archives requirements, suitably date and time marked.

Course Recorder paper to be signed every noon. Also Echo Sounder, Course recorder,
telegraph printer to be signed and dated at all important events such as RFA, SBE,
anchored or made fast.

In order to allow the ship’s actual track to be reconstructed at a later stage, sufficient
information concerning position, course and speed should be recorded in the bridge
logbook or using approved electronic means. All positions marked on the navigational
charts also need to be retained until the end of the voyage.

Passing of any navigational mark, entering or leaving break water should also be
recorded with all relevant information such as heading, speed, UKC and if possible
range and bearing of the mark.

However there is no requirement to record in the logbook information that is already
being recorded by echo sounders, course recorders and engine telegraphs recorders.

At sea, the Deck Log/ Bell book will contain the voyage record, which should be
maintained chronologically, with every line completed. It shall be the responsibility of the
Officer of the Watch to ensure that the book is signed at the end of each watch. Writing
notes on a slip of paper and writing the log later is not acceptable. The record must be
written at the time as it happens. The Master must sign each completed page. There
shall be no break at End of Passage, with the record continuing with the recording of
port activities (unless a cargo operations logbook is in use). Similarly at the end of port
operations, the record shall continue directly into the sea passage.

Associated checklists shall be filed in on the bridge. The printouts should be filed. Time
of completion of pre-departure and pre-arrival checks as per relevant checklist should
be mentioned in log book.

Charts should not normally be erased for at least 24 hours in port. Although they can be
erased after the Master has given his clearance if the stay is less than 24 hrs. or 2/Off
requires time to prepare passage plan by using same set of charts, unless there has
been an incident, in which case the original charts must be kept for possible evidence.

For vessel trading in US waters, log entries must be made as required by CFR Title 33
Section
8.12.2.5 Periodic checks on navigational equipment.

8.12.2.5.1 Operational checks.

Operations checks on navigational equipment should be undertaken when preparation for sea and prior to port entry or any time when it seem necessary.

After lengthy ocean passages and before entering restricted coastal waters, it is important also to check that full engine and steering manoeuvrability.

8.12.2.5.2 Routine tests and checks.

The OOW should undertake daily tests and checks on the bridge equipment, including the following:

- Manual steering should be tests at least once a watch when the automatic pilot is in use;
- Gyro and magnetic compass errors should be checked once a watch, where possible, and after any major course alteration;
- Compass repeaters should be synchronized, including repeaters mounted off the bridge, such as in the engine control room and at the emergency steering position.
- General Alarms and Fog Horns once in a day- noon time.
- Ship’s Clock synchronisation once in a day- Noon time.
- Critical alarms setting on all Navigational equipment such as Ecdis, Echo Sounder to be checked every watch.

Proper entry of all the above should be made in log book.

8.12.2.5.3 Checks on electronic equipment.

Checks on electronic equipment should both confirm that the piece of equipment is functioning properly and that it is successfully communicating to any bridge system to which it is connected.

Built-in test facilities provide a useful health check on the functional state of the piece of equipment and should be used frequently.

Electronic equipment systems should be checked to ensure that configuration settings – important for correct interfacing between pieces of equipment – have not changed.

To ensure adequate performance, information from electronic equipment should always be compared and verified against information from electronic equipment should always be compared and verified against information from different independent sources.

8.12.2.5.4 Checking orders.

Good practice also requires the OOW to check that orders are being correctly followed. Rudder angle and engine rpm indicators, for example, provide the OOW with an immediate check on whether helm and engine movement orders are being followed.

8.12.2.6 Changing over the watch

The handover of the Bridge watch shall be treated as an opportunity for a thorough two-person check on the vessel’s situation. The relieving Officer shall be on the Bridge a minimum of ten minutes prior to the change of watch. More time should be allowed for
watch Officers of less experience, during unusual situations and for high workload and/or risk situations.

The handover shall be postponed when the vessel is about to be, or is already, engaged in a collision avoidance manoeuvre or a navigational alteration of course.

To reduce the risk of errors occurring during handovers, short term reliefs, such as those for meals, should be avoided.

The OOW should not hand over the watch if there is any reason to believe that the relieving officer is unfit, or is temporarily unable to, carry out his duties effectively. If in any doubt, the OOW should call the master.

Illness or the effect of drink, drugs or fatigue could be reasons why the relieving officer is unfit for duty.

Before taking over the watch, the relieving officer must be satisfied as to the ship’s position and confirm its intended track, course and speed, and engine controls as appropriate, as well as noting any dangers to navigation expected to be encountered during his watch.

The relieving officer should also be satisfied that all other members of the bridge team for the new watch are fit for duty, particularly as regards their adjustment to night vision.

If a manoeuvre or other action to avoid a hazard is taking place at the moment the OOW is being relieved, handover should be deferred until such action has been completed.

The checks are listed in form no 2.13, checklist and same to signed for every change of watch.

8.12.2.7 Calling the master.

The OOW should notify the master, in accordance with standing orders or special instructions, when in any doubt as to what action to take in the interest of safety.

- Guidance on specific circumstances for calling the master or other back-up support should be given in the shipboard operational procedures, supported by standing and bridge orders, as appropriate. Situations where the master should always be called are as follows:
  - If restricted visibility is encountered or expected. The company describes restricted visibility as when the horizontal visibility is lowered to below 3 nautical miles.
  - If the traffic conditions or the movement of other vessels is causing concern.
  - If difficulties are experienced in maintaining course.
  - On failure to sight land, a navigation mark or obtain soundings by expected time.
  - If unexpected, land or a navigational mark is sighted or a change in soundings occurs.
  - On breakdown of engines, propulsion machinery remote control, steering gear or any essential navigational equipment, alarm or indicator.
  - If any navigational or communication equipment malfunctions.
  - In heavy weather, if in any doubt about possibility of weather damage.
  - If ship meets any hazard to navigation such as ice or a derelict...
• In any other emergency or if in any doubt.

The OOW will continue to be responsible for the watch, despite the presence of the master on the bridge, until informed specifically that the master has assumed that responsibility, and this is mutually understood. The fact that the master has taken command on the bridge should be recorded in the log book.

8.12.3 Navigation

8.12.3.1 General principles

It is important that the OOW executes the passage plan as prepared and monitors the progress of the ship relative to that plan.

8.12.3.1.1 Deviating from or leaving the passage plan

If the OOW has to make a temporary deviation from the passage plan for any reason, the OOW should return to the plan as soon as it is safe to do so.

If the OOW has to leave the passage plan – a reporting of ice may, for example, require an alteration of course – the OOW should prepare and proceed along a new temporary track clear of any danger. At the first opportunity, the OOW should advise the master of the actions taken. The plan will need to be formally amended and a briefing made to the other members of the bridge team. Entry to be made in deck log book in this regard.

8.12.3.1.2 Monitoring the progress of the ship

Good navigational practice demands that the OOW:

• Understands the capabilities and limitations of the navigational aids and systems being used and continually monitors their performance;
• Uses the echo sounder to monitor changes in water depth;
• Uses dead reckoning techniques to check position fixes;
• Cross checks position fixes using independent sources of information. This is particularly important when electronic position-fixing systems such as GPS is used as the primary means of fixing the position of the ship;
• Uses visual navigation aids to support electronic position-fixing methods i.e. landmarks in coastal areas and celestial navigation in open waters;
• Does not become over reliant on automated navigational equipment, including electronic chart systems, thereby failing to make proper navigational use of visual information.

8.12.3.1.3 Plotting positions from electronic position-fixing systems.

Care should also be exercised when taking geographical positions from electronic position-fixing systems like GPS, and plotting these onto charts or in ECDIS. The OOW should bear in mind that:

• If the chart datum differs from the datum (usually WGS84) used by the electronic position-fixing system, a datum shift will have to be applied to the position co-ordinates before they are plotted on the chart. It should be noted that where an appreciable datum shift does exist for a particular chart, a ‘satellite-derived position’ note providing latitude and longitude datum shift values will appear on the chart;
8.12.3.2 Navigation in coastal or restricted waters.

As a general rule, navigation should be carried out on the most suitable large-scale charts on board, and the position of the ship should be fixed at frequent intervals. All relevant navigation marks should be positively identified by the OOW before they are used. Visual and radar position fixing and monitoring techniques should be used whenever possible.

In coastal waters, the OOW should be aware that ships' routing schemes and ship reporting systems requiring report to be made to coast radio and vessel traffic stations may exist.

Knowledge of the ship's draught, stability conditions and manoeuvring characteristics is also important. As the ship enters shallow water, squat may have a critical effect on the manoeuvrability of the ship and cause an increase in draught. Squat effect varies in proportion to the square of the ship's speed, and will therefore reduce as speed is reduced.

The importance of all the bridge team fully understanding the coastal waters phase of the passage plan, as well as understanding their individual roles and those of their colleagues, cannot be stressed too strongly. Form 2.7.2.18 should be complied with.

8.12.3.3 Navigation with a pilot on board.

All the navigation duties otherwise followed without pilot must be carried out. The Pilot on board does not relieve ship staff's responsibility for monitoring the conduct of navigation.

8.12.3.3.1 Responsibilities.

Once the pilot has embarked and has arrived on the bridge. The pilot will join the bridge team. The pilot has a specialized knowledge of navigation in local waters. Depending on local pilot age laws the master may delegate the conduct of the ship to the pilot who directs the navigation of the ship in close co-operation with the master and / or the OOW it is important that the responsibilities of the pilot and the master are agreed and clearly understood.

The presence of a pilot does not relieve the master or the OOW of their duties and obligations for the safety of the ship. Both should be prepared to exercise their right.

8.12.3.3.2 Pilot embarkation/disembarkation.

Prior boarding procedure should be complied as per form 2.19.

The rigging of the pilot transfer arrangements and the embarkation and disembarkation of a pilot shall be supervised by a responsible officer having means of communication with the navigation bridge who shall also arrange for the escort of the pilot by a safe route to and from the navigation bridge. Personnel engaged in rigging the pilot transfer arrangements shall be instructed in the safe procedures to be adopted and the equipment shall be tested prior to use.
The use of Mechanical Pilot hoists is prohibited on all ships on or after 1st July 2012.
The integrity of the bridge team should not be compromised during the embarkation or disembarkation of the pilot and therefore the OOW should remain on the Bridge.

8.12.3.3.3 Master/pilot information exchange on boarding.
The preliminary pilotage passage plan prepared in advance by the ship should be immediately discussed and agreed with the pilot after boarding. There should be sufficient time and sea room to allow this to happen safely.

Where lack of time or sea room does not allow the plan to be discussed fully, the bare essentials should be covered immediately and the rest of the discussion held as soon as it is safe to do so.

Indeed, on a long pilotage passage, it may be appropriate to review and update the plan in stages. Please refer form no: 2.5 and 2.15 for master Pilot exchange.

Details of pilotage passage plan meeting with Pilot such as timing, minimum UKC during pilotage, Mooring arrangement, Tug Arrival time and position, name and number of Pilots, any navigational constraint, expected weather condition, tidal data and ME status should be noted down in bell book.

8.12.3.3.4 Monitoring the Pilotage.
The safe progress of the ship along the planned tracks should be closely monitored at all times. This will include regularly fixing the position of the ship, particularly after each course alteration, and monitoring under keel clearance and vessel speed.

Verbal orders from the pilot also need to be checked to confirm that they have been correctly carried out. This will include monitoring both the rudder angle and rpm indicators when helm and engine orders are given.

It is recommended that communication between the pilot and the bridge team is conducted in the English language.

If the master leaves the bridge, the OOW should always seek clarification from the pilot when in any doubt as to the pilot's actions or intentions. If a satisfactory explanation is not given, the OOW should notify the master arrives. Whenever there is any disagreement with decisions of the pilot, the cause of concern should always be made clear to the pilot and an explanation sought.

The OOW should bear in mind that during pilotage, the ship will need to be properly secured for sea. Excessive use of deck lighting at night may cause visibility interference.

8.12.3.3.5 Conduct of passage in pilotage waters
It is essential that a face to face master/pilot exchange results in a clear and effective communication and the willingness of the pilot master and Bridge team to work together as part of a bridge management team.

The Master and Bridge team shall:
- Within the Bridge team, interact with the pilot providing confirmation of his/her directions and feedback when they have been complied with
DUTIES OF THE OFFICERS OF A NAVIGATIONAL WATCH

- Monitor at all times the ship's speed, position as well as dynamic factors affecting the ship (e.g. weather conditions, manoeuvring responses and density of traffic)
- Confirm on the chart at appropriate intervals the ship's position and positions of navigational aids, alerting the pilot to any perceived inconsistencies

The pilot should:

- Ensure that the Master is able to participate in any discussions when one pilot relinquishes his/her duty to another pilot
- Report to the relevant authority any irregularity within the passage, including deficiencies concerning the operation, manning, or equipment of the ship

8.12.3.4 At anchor

On anchoring, a fix on the anchor drop position should be made and the ship’s swinging circle ascertained, based upon the length of cable in use. Landmark and transits should be selected for ease of monitoring the position of the ship as it lies at anchor and appropriate light and shape signals should be exhibited according to the COLREGS and any local regulations.

While at anchor, the OOW should maintain a check on the ship’s position to monitor that the ship does not drag its anchor or move too close to any other anchored ship.

A proper look-out must be maintained and ship inspection rounds periodically made, particularly if the ship is anchored in waters which might present a risk of attach by pirates or armed robbers.

The master should be immediately notified if the ship drags her anchor, and if sea conditions or visibility deteriorate.

Please follow form no 2.9,2.18 for checks to be conducted while proceeding to anchorage and while at anchor.

8.12.3.5 Upon Anchoring / Anchor Watch

- Immediately upon anchoring, a fix on the anchor drop position should be made and the ship’s swinging circle ascertained, based upon the length of cable in use.

At sufficiently frequent intervals, check this position by taking bearings of fixed navigational marks and/or marks monitored by automatic radar plotting aids or readily identifiable shore objects.

- Other than visual means, positions should also be checked using all other available means on board, including Radars, GPS and ECDIS, at regular intervals. In built "anchor watch" features should be utilised (where available) and alarm limits set as per the swing circle. The swing circle radius should be calculated by adding the length of the chain paid out and the ship’s length.

- Ensure that the vessel exhibits the appropriate lights and shapes and that in restricted visibility the appropriate sound signals are sounded.
• Ensure that an efficient lookout is maintained. In case of restricted visibility, it is recommended to have a look out in addition to the OOW.

• Ensure that the state of readiness of the main engines and other machinery is in accordance with the Master’s instructions.

• Unless the anchorage is considered very safe and the vessel is going to be anchored for a long period of time, vessel must keep her engines at immediate notice or short notice.

• Observe weather, tidal, sea, current and ice conditions and obtain weather forecasts every 6 hours. In case the weather is expected to deteriorate, engines must be kept ready at all times. Generally in wind condition above Beaufort force 6 and swell height over 2 metres, engines must be kept ready. In case of wind force greater than force 6/7 or swell over 2 metres, an assessment must be made well in time whether the vessel must remain at anchor or drift out at sea.

• Notify the Master if the vessel drags its anchor and undertake all necessary remedial measures.

• Notify the Master if any other vessel is dragging anchor.

• Notify the Master if the visibility deteriorates.

• Notify the Master if any vessel anchors too close to own vessel.

• Ensure periodic rounds on deck, where required, maintain anti piracy precautions.

• Maintain a listening watch on the VHF on the channels prescribed for the port, in addition to channel 16 / 70.

• Ensure the security of the vessel by keeping a vigilant look out for approaching boats.

• Call out additional stand by crew if the situation demands

• Monitor the safety of cargo deck operations from the wheel house, if applicable, and assist the Chief Officer with information as necessary.

**8.12.3.6** Records shall be maintained in the Deck Log Book showing the bearings and distances being checked, the ships heading, and bearings and distances of vessels anchored around own vessel. These checks shall be recorded at intervals decided by the Master, but should be no greater than at hourly intervals.

**8.12.3.5** Action to take in case of anchor dragging:

1. Pay out extra length of anchor chain. It should be noted that by paying out additional three shackles of anchor chain, the critical wind velocity increases only by 1m/s.

2. Keep the ship’s head into the wind and ease the tension on the cable by using the main engine, rudder and bow thruster (if applicable).

3. Consider shifting anchorage or drifting offshore.
8.12.3.6 At anchorages which are exposed to heavy wind and swell conditions, all usual heavy weather precautions must be taken. Weather forecast reports must be taken such that decisions, if required, to heave up anchor and proceed to sea can be made well in advance and not wait till the situation becomes out of control. Long range weather forecast (4/5 days) must be taken daily and carefully reviewed by Master. Efforts should be made in receiving such long term weather reports through local VHF, Radio and television sources (as applicable).

8.12.3.7 In case the port allocates an anchorage position and the Master has justifiable reason to consider it unsafe, he should seek advice from the port authorities, explaining his concerns.

Once at anchor, if other vessel(s) come and anchor very close and which the Master deems unsafe considering the prevailing circumstances and conditions, this should be communicated to the vessel(s) concerned as well as to the port authority, with a request to the other vessel(s) to shift anchorage.

If however no action is taken by the other vessel(s) then the Master should use his judgment and discretion to shift the anchorage, bearing in mind that the final responsibility for the safety of the vessel remains with him.

8.12.3.8 Caution is required when picking up anchor in bad weather to avoid damage to windlass machinery. While heaving up the anchor, the cable should be kept as close as practicable to up and down. The vessels should consider use of main engines to manoeuvre vessel or bow thruster, if available, to relieve tension in the anchor chain before having up. Anchor station crew should closely monitor and report “lead” of cable. When required brakes can be tightened to avoid the load to continue on the motor and vessel can resume heaving once the weight is eased off.

8.12.4.0 Controlling the speed and direction of the ship.

8.12.4.1 Use of the engines.

In order not to jeopardize the safety of the ship, the OOW should not hesitate to use the engines to change speed on passage if the situation so requires.

Whenever possible, timely notice of intended changes to engine speed should be given to the engine room. If the ship is fitted with UMS engine controls, direct control of the engines will be possible from the bridge.
8.12.4.1.1 Safe Speed.
In compliance with the COLREGS, ships should at all times proceed at a safe speed. In restricted visibility safe speed may require a reduction in service speed to reduce the stopping distance of the ship. Near ice, ships are specifically required to proceed at moderate speeds. Speed changes may be required to avoid a collision in circumstances where the ship is unable to alter course.

8.12.4.1.2 Control and different engine types.
To control the main engines effectively, the OOW should be familiar with their operation from the bridge, as well as the operation of the propeller mechanism. The OOW should also be aware of any limitations the system may have, and appreciate that the type and configuration of the ship's engines could have implications when changing speed. Direct-drive diesel, diesel through gearbox/clutch, turbo-electric and gas turbine engines all have relatively quick responses to change, provided the engines are on standby. Geared turbines are less responsive.

8.12.4.2 Steering control.
Steering control of the ship will comprise manual steering, probably supplemented by an automatic pilot (autopilot) or other track control system.

In areas of high traffic density, in conditions of restricted visibility and in all other potentially hazardous situations a helmsman should be available on the bridge, ready at all times to take over steering control immediately.

When steering the ship under autopilot, it is highly dangerous to allow a situation to develop to a point where the OOW is without assistance and has to break the continuity of the look-out in order to take emergency action and engage manual steering.

Changing between automatic and manual steering should always be made in good time under the supervision of the OOW. Manual steering should be tested after prolonged use of autopilot.

8.12.4.2.1 Use of override control.
Manual steering override controls can be used on those occasions when the autopilot is engaged and the OOW needs to take immediate and direct control of the steering.

Override controls typically have a non follow-up type of operation and are likely to differ from the main steering control position where follow-up control is usual.

The OOW needs to be familiar with the operation of the steering control systems on the bridge, as well as the method of control at the emergency steering position.

8.12.4.2.2 Manoeuvring data.
Ship’s manoeuvring data is contained on the Pilot Card and Wheelhouse Poster. Some ships also have a manoeuvring booklet. The OOW needs to be familiar with this data.

It is important not only to record on the Pilot Card the ship's draught, but also any permanent or temporary ship idiosyncrasies that could affect the manoeuvrability of the ship. A ship may, for example, have a tendency to steer to port at full speed, but steer to starboard at slow speed.
8.13 PASSAGE PLANNING IN GENERAL

8.13.1 Before commencing any voyage, it is necessary to have a good idea of the risks involved and of viable alternatives such that risks are minimized and that the level of risk is balanced against economic considerations. Passage planning achieves this.

8.13.2 Efficient passage planning involves four distinct stages:

a. appraisal,
b. planning,
c. execution,
d. monitoring.

8.13.3 Appraisal is a process of gathering information relevant to proposed passage. Additional publications may be needed on certain passages and the Master shall identify the same and arrange for their supply.

8.13.4 Climatic data, current atlases, and guide to planning of passage through special areas shall be referred.

8.13.5 The relevant information shall provide clear and precise information of the areas of dangers and of navigational safety taxing into account the maximum draught and the planned underwater clearance.

8.13.6 While planning passage for Great Lakes FORM section 2.16 must be complied with.

8.13.7 While planning passage for using ECDIS as primary means of navigation FORM section 2.1 B must be complied with.

8.13.8 While planning passage for transiting Malacca/Singapore straits, FORM section 2.1C must be complied with.
8.14 PROCEDURE FOR PASSAGE PLANNING

8.14.1 Planning for the passage shall be carried out not only for the ocean route but also for coastal passage and pilotage waters. In effect the plan shall be made for the passage from berth to berth.

8.14.2 The process of planning shall be initially carried out by the second officer and checked and approved by the Master. The following information shall be marked on the largest scale chart applicable:

- No go areas, such as banks, shoals, wrecks, power cables among other, which may cause interaction near the intended track;
- Margins of safety as determined after taking into account direction of currents, tidal streams, accuracy of navigational systems in use, manoeuvring ability of the ship, weather conditions, draft, squat and other such factors;
- Primary and secondary methods of position fixing together with the maximum time interval between fixes (fix frequency);
- Courses to steer, distances to steam, parallel index distances, and clearing distance between way points or track and important navigational marks/danger areas;
- Wheel over positions, turn radio and/or turn centres;
- Available cross track margins;
- Bearing and radar range measurement check lines;
- Points at which accurate position fixing is critical and methods of fixing such positions when in otherwise difficult areas;
- Chart changes should be clearly indicated giving the next chart number that will be in use;
- Transfer of track/position from one chart to another should be done with due diligence and care so that no mistakes are made;
- Anchor lashing to be removed or taken.
- Watch level
- Steering status- Manual or hand. Number of Steering motors required.
- Cautions- Heavy traffic, heavy fishing traffic, strong currents etc.
- Call Master/ ER notices.
- Additionally, salient information such as reporting points, pilot boarding areas and such shall also be marked.

8.14.3 When planning for navigation in restricted water’s plan should take into account worst possible conditions of visibility, heavy radar clutter, adrift navigational marks and breakdown of the ship.

8.14.4 When using radar for parallel indexing, targets shall be:

a. safe and easy to identify,
b. radar conspicuous,
c. located outside the clutter field,
d. limited to a number sufficient for safe navigation

8.14.5 The plan shall be made and presented on a format as shown in passage planning register. The format shall indicate the page and para number of the appropriate sailing directions. Such format shall be available near the conning position.

8.14.6 The plan shall be assessed at each section to ensure that no errors have crept in same.

8.14.7 Execution of the plan shall be the responsibility of the officer on watch who shall take into account changes in weather, tides, visibility or other unacceptable hazards. Deviation from the plan shall be reported to the Master and any changes required shall be brought to the notice of the other navigating watch officers.

8.14.8 The passage plan shall be prepared in increasing detail for the following areas:

a. ocean passage,
b. landfall and coasting,
c. pilotage

Though at times, these three stages will merge and overlap.

(Proper use of available navigational equipments shall be the responsibility of the watch keeping officer).

Form No 2.1 A/B/C shall be used for preparation of passage plan as applicable.

8.14.9 Passage planning and vessel traffic services

Vessel traffic services (VTS) have been introduced, particularly in ports and their approaches, to monitor ship compliance with local regulations and to optimise traffic management. VTS can only be mandatory within the territorial seas of a coastal state.

VTS requirements shall form part of the passage plan and shall include references to the specific radio frequencies that must be monitored by the ship for navigational or other warnings, and advice on when to proceed in areas where traffic flow is regulated.
For vessels trading to the US, CFR Title 33 Section 161 gives full details of all Vessel Traffic Service systems that are required by statute in the United States.

8.14.10 Passage planning and ship reporting systems

Ship reporting has been introduced by a number of coastal states so that they can keep track, via radio, AIS, radar or transponder, of ships passing through their coastal waters. Ship reporting systems can be adopted internationally by IMO. Such systems will be required to be used by all ships, certain categories of ships or ships carrying certain cargoes.

The use of ship reporting systems shall form a part of the passage plan.

The bridge team shall comply with the requirements of ship reporting systems and report to the appropriate authority all information that is required.
8.15 Navigation Charts and Associated Procedures

8.15.1 Charts.
Collect together all the charts for the intended voyage, putting them into the correct order. Charts not absolutely necessary for the voyage but which are adjacent to the area to be traversed should be included, as should very large scale charts - e.g. port plans on the coastal part of the voyage. Although it may not be necessary actually to use such charts, they may include information which could prove of use during the voyage. Ensure that all charts and publications have been corrected to the latest Notice to Mariners available and that any authentic Nav-warnings, etc., received from any source are also included. Similar corrections may also have to be made during the voyage after the plan has been completed and the plan may have to be subsequently modified.

8.15.2 No-Go areas.
Coastal and estuarial charts should be examined and all areas where the ship cannot go carefully shown by highlighting or cross-hatching, taking care not to obliterate information - e.g. a navigation mark or a conspicuous object. Such areas are to be considered as no-go areas. In waters where the tidal range may not be very large, no-go areas will include all charted depths of less than the ship's draught.
In confined waters, where the tidal height may have a large influence, such no-go areas will vary according to the time of passage. Initially all areas and dangers showing charted depths of less than the draught plus a safety margin should be considered no-go, though such no-go areas may subsequently be amended when the actual time of passage is known.

8.15.3 Squat:

Squat depends on the relationship between Speed, Draft of vessel and the Depth and Width of a navigable channel. Squat is defined as the decrease in under keel clearance which occurs when a vessel is making way, or is stationary in moving water.

It is not an increase in draft. Rather it is the bodily sinkage of a vessel which places it closer to the sea floor.

The amount of squat is largely dependent on speed and any situation in which loss of under keel clearance due to squat may give cause for concern, can be resolved by slowing down, and subject to the manoeuvring limitations of the ship involved. The necessity to further reduce speed may also be signalled by:

- Increased helm requirements
- Increased or excessive vibration
- A sudden reduction in speed over the ground for the same RPM
- The formation of heavy bow and stern waves

Squat should be calculated using speed through the water rather than speed over the ground.
In calculating the effects of squat for the passage plan, consideration should be given to determining the maximum speed permissible that will avoid contravening the minimum UKC required, rather than simply determining the UKC for a proposed transit speed.

Unless more accurate squat data is available, the following formulae should be used to calculate SQUAT as recorded on Passage Planning form. The ship specific tables or chart for the calculation of squat should be used on board.

Squat in confined waters = Velocity in Knots squared x Block Coefficient

\[
\text{Squat in open waters} = \text{Velocity in Knots squared} \times \frac{\text{Block Coefficient}}{100}
\]

\[
\text{Cb=} \frac{\text{Under water volume at any draft}}{\text{LBP} \times \text{BM} \times \text{Mean Draft}}
\]

\[
\text{Note: Volume of Displacement} = \frac{\text{Displacement Weight (MT)}}{\text{Water Density}}
\]
While passage planning, the increase of vessel’s draft due to squat shall be considered and for the purpose of passage planning the squat allowance shall be added to the maximum draft.

For the purpose of above calculations, the vessel is considered to be in deep waters when the depth under keel is more than the maximum draft of the vessel. In the under keel clearance in less than the maximum draft of the vessel in that case the vessel shall be considered in shallow waters.

**Increase in Draft due to Heel/List:**

This should be calculated taking into account the effects of weather on the stability of the vessel as forecast by the Master and Navigator from received weather forecast information.

When in port or confined waters, the effect of weather may be minimal. However, the heel of the vessel caused by large course alterations should be predicted and allowed for.

Finally, when it is a requirement for the vessel to sail with a list, this angle should be taken into account when predicting the above heel.

The increase in draft due to heel/list can be calculated using the formula:

\[ \text{Increase in Draft} = \frac{\text{Beam} \times \text{Sine Angle of Heel}}{2} \]

**Air Draft**

Should the intended passage of a ship take it under bridges or power cables, the air draft of the ship must be accurately calculated. Working on the fundamental definition that air draft in this respect is the vertical height of the ship’s highest point above the waterline; the following considerations shall be taken into account:

- Distance of the highest point (usually the main mast) forward of the after draft marks.
- Position of the after draft marks relative to the after perpendicular;
- The effect of trim.

The effect on air draft due to these factors can be large, especially where the highest point is a significant proportion of the LOA forward of the after draft datum point (marks or perpendicular). The combined effect of squat and the reduction of vertical height of the mast due to its backward slope, or inclination, due to trim is small and will result in a slight decrease in air draft. The following simple formula is to be used which will give the increase of air draft due to trim.

\[ \text{Increase of air draft} = \frac{[\text{Trim} \times \text{L}]}{\text{L}} \]

Where: Trim: is the difference between draft forward and draft aft.
L: is the distance between draft datum points (draft-marks for read draft and perpendiculrals for calculated drafts)
I: is the horizontal distance from after datum point to highest point.
Using this formula, a simple table can be drawn up depicting the air draft constant and the calculated increase for a range of trims, say 0 to 6 m.

8.15.4 Consideration of Safe under keel clearance

8.15.4.1 from Beginning of Sea Passage to End of Sea passage
As a guideline:
Vessel's draught 3-6 metre, pass outside 10-metre contour;
Vessel's draught 6-10 metre, pass outside 20-metre contour;
Vessels with a draught of more than 10 metres must ensure that there is sufficient under keel clearance, exercising due caution.
Irrespective of the safe UKC, a ship in a situation where the nearest navigational danger is to starboard must allow manoeuvring space to allow alteration of course to starboard for traffic avoidance.

8.15.4.2 Coastal and Estuarial Tracks without pilot on board
Before tracks are marked on the chart the clearing distance from the no-go areas needs to be considered. When a fix is plotted on a chart it invariably represents the position of a certain part of the ship's bridge at the time of the fix. With large ships, although the plotted fix at a certain time may be outside a no-go area, it is possible that another part of the ship may already be in it - with disastrous results. A safety margin is required around the no-go areas so that, in the worst probable circumstances, no part of the ship Will pass through it.

Among the factors which need to be taken into account when deciding on the size of this 'Margin of Safety' are:

1. The dimensions of the ship.
2. The accuracy of the navigational systems to be used.
3. Tidal streams.
4. The manoeuvring characteristics of the ship.

The margins of safety should be chosen so that they can be readily monitored. The Margins of safety will show how far the ship can deviate from track, yet still remain in safe water (see below). As a general rule the margin of safety will ensure that the ship remains in waters of a depth greater than draught + 20%. It is stressed that this is only a general rule, circumstances may dictate that the 20% clearance will need to be considerably increased - e.g.

1. Where the survey is old or unreliable.
2. In situations where the ship is pitching or rolling.
3. When there is a possibility that the ship may be experiencing squat.

As a general rule there is nothing to be gained by closely approaching a danger other than to reduce passage distance and, consequently, steaming time. Even so, when it does become necessary to approach a danger there are general minimum rules that should be followed. The ship always has to remain in safe water (see below) and remain
sufficiently far off a danger to minimize the possibility of grounding in the event of a machinery breakdown or navigational error.

**8.15.4.3 UNDER KEEL CLEARANCE (U.K.C.)**

The Master is to ensure that the vessel has adequate under keel clearance at all stages of the voyage. The following are to be taken into account during voyage planning and prior to proceeding:

- Trim/List for all stages of the voyage;
- Squat varies with vessel’s speed;
- Sinkage due to Fresh Water /Dock Water allowances;
- Impact of previous weather conditions e.g. negative tides or decrease in salinity due to heavy rain in inland waters;
- Sea Conditions.

The minimum UKC after allowing for Squat, change of density, Heel and prevailing weather conditions shall be maintained as below:

<table>
<thead>
<tr>
<th>S.No</th>
<th>AREA</th>
<th>UKC Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Deep Sea / Open Passage Navigation</td>
<td>30 M or 5 times of vessels dynamic draft whichever is greater. Keep clear of localized shallow areas; in case above is not possible, minimum UKC as per 2 will apply.</td>
</tr>
<tr>
<td>2</td>
<td>Coastal Navigation (depth from 2-5 times of vessel's draft)</td>
<td>20% of dynamic draft.</td>
</tr>
<tr>
<td>3</td>
<td>Shallow waters (depth less than 2 times vessel's draft) E.g., making Approaches to port / pilotage.</td>
<td>10% of dynamic draft.</td>
</tr>
<tr>
<td>4</td>
<td>At Berth or at SBM / CBM Mooring for ships with extreme breadth upto 20 M.</td>
<td>0.30 M.</td>
</tr>
<tr>
<td>5</td>
<td>At Berth or at SBM / CBM Mooring for ships with extreme breadth over 20 M.</td>
<td>1.5% of ships beam.</td>
</tr>
</tbody>
</table>

In case where local UKC requirements are greater than those in this document, such requirements of local authorities take precedence over this policy. Master shall inform company in case of any difficulty in complying to the above requirement to discuss with the proposed plan and measures.

Some of the bulk and log carriers are required to carry out cargo transfer operation in anchorages. Similar to these, Single Buoy Moorings are located comparatively in open waters. Though these waters are safe, it is important to understand the factors that could influence the under keel clearance.
Under keel clearance should be estimated as the depth of water as charted on the navigational chart, corrected for all factors influencing the change in draft of the vessel and depth of the water. The correction value should be determined according to tide calculations (on tidal waters) or changes to the Mean Sea Level (areas with no tides).

The relevant data shall be obtained through common channels of information to mariners and local warnings i.e.: any pertinent information found in the Sailing Directions or Local Notice to Mariners and Navigational and Hydro-meteorological Warnings.

Master should ensure that UKC calculations for pilotage and operators policy for UKC has been exchanged in master pilot info through the pilot card

Following factors should additionally be accounted for when estimating UKC:

- The predicted height of the tide;
- Changes in the predicted tidal height, which are caused by wind speed and direction and high or low barometric pressure;
- Nature and stability of the bottom – i.e. sand waves, siltation etc.;
- Accuracy of hydrographic data, (References to reliability is often included on charts);
- Change of water density and the increase in draught due to fresh water allowance;
- The vessels size and handling characteristics and increase in draught due to heel;
- Wave response allowance, which is the vertical displacement of the hull due to heave, roll and pitch motions;
- The reliability of draft observations and calculations, including estimates of hogging and sagging;
- Reduced depths over pipelines and other obstructions.
- Vessels change in draft due to the cargo transfer/ballast operations.
  - Latest hydrographic information available from the charts and publications for the port and the accuracy of such data taking into consideration source diagrams/CATZOC
  - Incase of CATZOC level of C (3 star), D (2 star) or U; control measures may include but not be limited to:
    - Area to be avoided and an alternate route to be considered if available. If there is a significant change in passage distance, office to be consulted;
    - Contacting local authorities/agent for the minimum depth available;
    - Monitoring UKC closely. Keep echo sounder on and compare expected & observed UKC, maintain a record of this comparison;
    - Ensure that the depth alarm is set as per guidelines provided in section 5.4.4;
    - Previous experience, if applicable; should be discussed with the bridge team.

- If vessel is in any doubt about sufficient depths, a careful risk assessment should be drawn and submitted timely to the office for approval. Furthermore, agents/office should be contacted to seek clarifications and take appropriate action.

- Masters of deep draught vessels navigating in areas such as Malacca Straits, Dover straits, etc. must seek guidance on UKC from appropriate publications for such areas e.g. Guide to Planned Transits by Deep Draught Vessels (for Malacca Straits).
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| SAFETY AND QUALITY MANAGEMENT SYSTEM | Date 01/07/2017 | |
| FLEET OPERATION MANUAL | Section 8.15 | |
| NAVIGATION CHARTS & ASSOCIATED PROCEDURES | | |

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8.15.6 Ocean and Open Water.
Ocean and open-water tracks should first be drawn on the small-scale charts, according to the decisions made at the appraisal stage regarding the route to be taken. Great circle and composite great circle tracks will have to be calculated or obtained from the GPS computer or from great circle charts; rhumb lines may be drawn straight on to the Mercator chart, but all tracks will have to conform to the limits determined at the appraisal.

8.15.7 Coastal and Estuarial Tracks.
Coastal and estuarial tracks will also be constrained by the decisions made at the appraisal stage and should be first drawn on the small-scale charts covering large portions of the coastline preferably from the departure port to the arrival port. This will depend upon the proximity of the ports and the charts of the area and, in most cases more than one chart will have to be used. These first tracks will form the basis of the plan and from them may be obtained distances and steaming times. When the departure time is known, the ETA (Estimated Time of Arrival) at the various waypoints en route can be established. The true direction of the track should be shown in close proximity to the track. This will not necessarily be the course steered to make this track; it only indicates the direction to make good. The course to steer will depend upon various factors at the time of making the passage.

When completed, these tracks should be transferred to and drawn on the large-scale charts of the area to be traversed. Transfer of a track from one chart to another must be done with great care. To ensure that no mistake are made, it is good practice doubly to check this operation by using a range and bearing of the transfer position from a readily identifiable object - e.g. a light common to both charts - and confirming this position on both charts by the latitude and longitude of the point.

8.15.8 Chart Change.
It should be quite clearly shown on a chart the position where it is required to transfer to the next chart, giving the next chart's number.

8.15.9 Track Considerations.
As a general rule there is nothing to be gained by closely approaching a danger other than to reduce passage distance and, consequently, steaming time. Even so, when it does become necessary to approach a danger there are general minimum rules that should be followed. The ship always has to remain in safe water (see below) and remain sufficiently far off a danger to minimize the possibility of grounding in the event of a machinery breakdown or navigational error.

8.15.10. Regulations.
Both company and national regulations regarding offshore distance must also be observed.
8.15.11. Deviation from track.
Ideally, the ship will follow the planned track but under certain circumstances it may be necessary to deviate from such track - e.g., having to alter for another ship. Even so, such deviation from track should be limited so that the ship does not enter areas where it may be at risk or closely approaching the margins of safety.

8.15.12. Tidal Window.
In tidal areas, adequate UKC may only be attainable during the period that the tide has achieved a given height. Outside that period, the area must be considered no-go. Such safe periods, called the tidal window, must be clearly shown so that the OOW is in no doubt as to whether or not it is safe for the ship to proceed.

In open sea situations, track correction is often made after the ship has been set off track by the tidal stream and/or current. Such correction may be adequate in offshore situations, whether the ship is not close to danger, but as the planned track approaches the coast it is better to make tidal and current correction prior to its taking effect.

Current information, set and rate is often available on the chart though more detailed information is given in Ocean Passages for the World, routing charts and pilot books (see Appraisal sections 3, 4 & 5). Currents vary according to their location and the season and may be influenced by changes in meteorological conditions.

Tidal information is available from charts, tide tables and tidal atlases, further local information being available in pilot books. Tidal streams vary according to the time of high water and the phase of the moon (neaps and springs) and can be influenced by local meteorological conditions.

When the actual time of transit of a given area is known, the tidal heights and streams can be calculated and due allowances made for these streams in order to find the course to steer to achieve a planned track. As well as adjusting these allowances as the tidal stream varies according to location and time, the OOW must still carefully monitor the ship's position and adjust the course steered to maintain the planned track.

In the open sea and offshore coastal water when navigating on small-scale large-area charts, course alterations will usually coincide with the planned track intersections. This will not be the case in confined waters when navigating on large-scale charts and where the margins of safety may require the ship to commence altering course at the wheel-over position some distance before the track intersection in order to achieve the new planned track.

Often such wheel-over positions will be determined by the pilot using his own judgment, based upon experience.

Planned wheel-over positions should be determined from the ship's manoeuvring data and marked on the chart. Suitable visual and radar cues should then be chosen to determine when the ship is at the wheel-over position. The best cues for large alterations of course consist of parallel indexes or bearings parallel to the new track, whereas for small alterations a near beam bearing is often better.
Even when the pilot has the conn, the wheel-over position should be shown on the chart so that the OOW will be aware of its imminence and importance.

8.15.15. Parallel Indexing
The parallel index (PI) is a useful method of monitoring cross-track tendency in both poor and good visibility. It is a good practice to mark the planned PI on the chart inconspicuously at the planning stage. Like any radar technique, it is advisable to practice using PIs extensively in good visibility before placing total reliance on them when thick weather makes visual navigation methods impossible.
This simple and effective method of continuously monitoring a ship's progress is carried out by observing the movement of the echo of a radar-conspicuous navigation mark with respect to track lines previously prepared on the reflection plotter or by using ARPA index lines. It is most effective when the radar is in the north-up, relative motion mode.
A fixed radar target, such as a lighthouse or a headland, will apparently track past the own ship, depicted as being at the center of the screen, as a line parallel and opposite to the ship's ground track. Any cross track tendency, such as may be caused by a tidal stream, will become apparent by the target moving off the parallel line.
The parallel index may also be used to monitor other events - e.g., wheel-over position. In this case the range and bearing of the target at the wheel-over point is marked on the PI. This also allows for a distance countdown to be made.

8.15.16. ARPA Mapping
Many modern ARPAs have the facility to generate synthetic maps which can be stored in a retrieval system. In some instances, such maps may be stabilized through an electronic navigational system, but such facilities should be used in addition to and not to the exclusion of other systems.

8.15.17. Waypoint
A waypoint is a position, shown on the chart, where a planned change of status will occur. It will often be a change of course but may also be an event such as:

1. End or beginning of sea passage.
2. Change of speed.
3. Pilot embarkation point.
4. Anchor stations etc.
Waypoints may also be used as useful reference points to determine the ship's passage time and whether or not a schedule is being maintained, particularly when they have been included in the appropriate electronic navigational system. Where an electronic navigation aid which stores waypoint information is in use, care should be taken to ensure that waypoint designators remain uniform throughout the plan.

8.15.18. Aborts & Contingencies
No matter how well planned and conducted a passage may be, there may come the time when, due to a change in circumstances, the planned passage will have to be abandoned.
8.15.19. Aborts
When approaching constrained waters the ship may be in a position beyond which it will not be possible to do other than proceed. Termed the point of no return, it will be the position where the ship enters water so narrow that there is no room to return or where it is not possible to retrace the track due to a falling tide and insufficient UKC.
Whatever the reason, the plan must take into account the point of no return and the fact that thereafter the ship is committed. A position needs to be drawn on the chart showing the last point at which the passage can be aborted and the ships not commit herself. The position of the abort point will vary with the circumstances prevailing - e.g., water availability, speed, turning circle, etc. - but it must be clearly shown, as must a subsequent planned track to safe water.
The reasons for not proceeding and deciding to abort will vary according to the circumstances but may include:
1. Deviation from approach line.
2. Machinery failure or malfunction.
3. Instrument failure or malfunction.
4. Non availability of tugs or berth.
5. Dangerous situations ashore or in the harbour.
6. Any situation where it is deemed unsafe to proceed.

8.15.20. Contingencies
Having passed the abort position and point of no return, the bridge team still needs to be aware that events may not go as planned and that the ship may have to take emergency action. Contingency plans will have been made at the planning stage and clearly shown on the chart, so that the OOW does not have to spend time looking for and planning safe action when his duties require him to be elsewhere.

Contingency planning will include:
1. Alternative routes.
2. Safe anchorages.
3. Waiting areas.
4. Emergency berths.

It will be appreciated that emergency action may taken the ship into areas where it is constrained by draught, in which case speed will have to be reduced; or tidally constrained, whereby it can only enter such areas within the tidal windows. Such constraints must be clearly shown.
Having drawn no-go areas, the margins of safety and the track to be followed, the planning should now be concentrated on ensuring that the ship follows the planned track and that nothing will occur which is unexpected or cannot be corrected.
A variety of position fixing methods is now available but it must not be assumed that any one of these methods will suit all circumstances.

8.15.21. Primary and Secondary Position Fixing
In order that the position fixing process is smooth, uneventful and clearly understood by all concerned, the passage plan will include information as to which fixing methods are to be used, which one is to be considered the primary method and which one(s) are to be used as backup or secondary. For example, whilst the ship is out of sight of land it may well be that the GPS is the primary system with Loran C as the secondary or back-
up system. As the ship approaches the coast, the GPS will still be providing the primary fixing, the Loran C becoming less important and the radar fix confirming the GPS fix. Eventually the Loran C although running, will become redundant and more reliance placed on the radar fix with the GPS taking the secondary role. In enclosed waters the GPS position may become inappropriate and position fixing depend upon radar and visual methods. It is not possible to determine an invariable system; it depends upon the equipment available and the circumstances of the individual case. The important thing is that all concerned are aware that a system in operation and that it should be followed as far as is practicable.

8.15.22. Radar Conspicuous Objects & Visual Nav-aids.
In order to reduce the work load while navigating in coastal waters, the navigator will have determined and planned his primary and secondary methods of fixing. To reduce further the OOW's workload the navigator will have studied his chart at the planning stage and decided which radar conspicuous marks and visual aids are to be used at each stage of the passage.

8.15.23. Landfall Lights.
When making a landfall it should not be necessary for the OOW to have to examine the chart minutely to find which lights will be seen first. These should have been clearly shown on the chart so that the OOW can concentrate on actually looking for the light concerned, not looking on the chart trying to discover which lights should be visible. The same applies when passing along a coastline or through constrained waters. All rights shown on a chart look similar and need to be studied to determine their individual significance. This needs to be done at the planning stage, not the operational stage when the OOW concerned may be too busy to spend time behind the chart table.

Similarly with radar targets - a little time spent at the planning stage will soon determined which the targets to look for and use are; a steep-to islet is going to be more reliable than a rock awash.
Highlight on the chart Racons and other radar conspicuous object which will be used for position fixing. Highlight visual nav-aids as appropriate, differentiating between floating and fixed nav-aids and high-powered and low-powered lights.

8.15.25. Buoyage.
Whenever buoys or other floating nav-marks are being used as position fixing aids, their own position must be first checked and confirmed that they are as shown on the chart. In situations where buoy fixing is critical, such positions can be predetermined at the planning stage by noting their range and bearing from a known fixed object.

Irrespective of the method of fixing to be used, it is necessary to establish the required frequency of the fixing. Quite obviously, this is going to depend on the circumstances prevailing; a ship close to danger will need to be fixed much more frequency than one in the open sea.
8.15.27. Fix Regularity.
Having established the fix frequency, it is good practice to ensure that fixes are in fact made at that frequency, not as and when the OOW thinks fit. The only exception to this will be if the OOW has other priorities with which to contend - e.g., course alterations for traffic or approaching a critical wheel-over position. In this latter case, the ship's position should have been established immediately before the turn and again, as soon as possible, on completion.

8.15.28. Additional Information.
Although not essential to the safety of the ship, a lot of additional information can be shown on the plan which, by reminding the OOW of his obligations or reminding him to make certain preparations, will make the execution of the voyage simpler. Such information will include:

- **Reporting point**: Reporting to the relevant authority as and where required can only make the vessel's routing safer. Such reporting may also be compulsory.
- **Anchor Clearance**: Positions where anchor stations need to be called and the anchors cleared should be shown in order not to be over-looked.
- **Pilot Boarding Area**: Timely preparation of the pilot ladder and warning to involved personnel to stand by as required.
- **Tug Engagement**: Reminder to OOW to call the crew necessary to secure tugs.
- **Traffic Areas**: Areas where heavy traffic or where occasionally heavy traffic - e.g., ferries or fishing boats may be met.

Safe navigation of the ship does not only require fixing the position of the ship on the chart at regular intervals. The OOW needs to be constantly updating himself regarding the position of the ship relative to the required track and its tendency to increase or decrease its deviation from track. Although the regular fixing will give this information there are other, less obvious ways of obtaining such information, often requiring little input other than just observing natural features. Many of these can be planned in advance and marked on the chart:

8.15.29. Transits (Ranges).
Transits (known as ranges in the USA) - i.e., the line on the chart upon which an observer would see two identifiable objects in line - can be used to give the OOW a quick indication of his position. Although it is only a single position line its advantage is that it requires no use of instruments but can be seen by eye. For extreme accuracy the distance between the observer and the nearer object should be no more than 3 times the distance between the objects observed, though transits of greater than this distance can be used to advantage.

Transits are sometimes printed on charts of inshore waters, but good use can be made of natural and clearly identifiable transits found at the planning stage and drawn on the chart.

Transits can also be used as a cue for a pre-arranged action to be taken - e.g., wheel-over, - or as a reminder than an event is about to occur.

8.15.30. Compass Error.
Transits may be used to determine gyro and magnetic compass errors by comparing charted and observed bearings.
8.15.31. Leading Lines.
Leading lines are often shown on charts. In this case the transit printed on the chart is a track line to be followed to ensure that the ship passes clear of danger. By observing that the leads are in line the navigator is assured that his ship is on the planned track.

8.15.32. Clearing Marks.
Clearing marks can be used to ensure that a ship is remaining within a safe area of is not approaching a danger in Picture 2 the clearing mark is shown so that as long as the Damar Lt. Bn remains between 310T and 339T then the ship is making a safe approach with reference to that side of the channel.

8.15.33. Head Mark.
Often a ship is required to follow a track in narrow waters without the benefit of a leading line. In this case a suitable head marker should be selected. This should be a readily identifiable conspicuous object shown on the chart, which lies on the projection of the required track at that part of the passage. As long as the bearing of the head marker, corrected for errors and preferably taken with a center line repeater, remains constant (i.e., the same as the required track), the ship is remaining on track. It should be noted that the ship need not necessarily be heading directly at the object only that it is on the line of the required track. In most cases the ship's head will need to be offset to allow for tide or leeway.

8.15.34. Clearing Bearings.
In the event that no clearing marks are available a single identifiable charted object may be similarly used. In picture 178, as the ship makes the approach track of 3200 T it will remain safe as long as the Damar Lt. Bn remains within the range of bearings 3200 T - 3380 T. These clearing bearings should be shown on the chart as NLT 3200 T and NMT 3380 T (not less than / not more than).
Observe clearing bearings and clearing marks cannot be considered to be 'fixing' the ship but can assist the OOW in ensuring that his ship is not standing into danger. Similarly, using dipping distances, whilst not being considered to be an accurate fix, can make the OOW more aware that he is approaching danger.

8.15.35. Range of Lights.
The maximum range at which a navigational light can be seen depends upon three separate factors:
1. The combined heights of eye of the observer and the elevation of the light.
2. The intensity of the light.
3. The clarity of the atmosphere.

8.15.36. Geographical Range.
The greater the elevation of the light, the greater the distance at which it will be visible; equally, the greater the height of eye of the observer, the greater he will see the light. These two factors combined will give a maximum range of visibility called the geographical range and may be obtained from tables in the list of lights. In practice, this range will be severely reduced if the light observed is only low powered and therefore not capable of being seen at its geographical range.
8.15.37. Luminous Range.
This is the maximum distance at which the light can be seen and is dependent upon the intensity of the light and the atmospheric visibility prevailing. It takes no account of the height of the light nor that of the observer's eye. Obviously the more intense the light, the further it will be seen, whatever the state of the atmosphere, and the appropriate table will give a good indication of how far the light can be expected to be seen.

8.15.38. Nominal Range
The range shown on the chart, beside the light star, is usually the nominal range - i.e., the luminous range when meteorological visibility is 10 miles. This is not invariable, though. In some countries, such as Japan, chart the geographical range: some, such as Brazil, the geographical or nominal according to whichever is the greater. It is the navigator's responsibility to make himself aware of which range is shown and to ensure that the OOWs are also aware of this fact.

At the planning stage of the voyage, the navigator will have the opportunity to determine the maximum distance at which a landfall light should become visible. A comparison of the nominal and geographical ranges can be made and the lesser of the two selected as being the range at which the light should be seen, assuming meteorological visibility of at least 10 miles. It should be noted that only lights whose luminous range exceeds their geographical range can be considered as giving an approximate fix. In any case the arcs of maximum visibility should be drawn on the landfall chart so that the OOW is aware of the likelihood of seeing lights and which ones he should see first.

8.15.40. Extreme Range
Approaching the coast, lights will come into view according to their height, their intensity and the ambient visibility.
Sometimes the first indications of the proximity of the coast will be power lights which may be seen before the radar can detect them as targets. Whilst not pretending that sighting the lights can be an accurate fix, an observation of the compass bearing at the time of sighting and plotting this with the extreme range of the light at this time will give the OOW an awareness of the proximity of danger.
In the event that a light is not sighted as expected, then the OOW will be aware that the ship is not where he anticipated it to be or that the light is unlit or obscured in cloud or that there is poor visibility between the ship and the light. The actual cause must be determined by his own judgement. The fact is that there is something not quite as it should be.

8.15.41. Echo-Sounder.
Some ships leave an echo-sounder running at all times. On ships where this is not the case, it is good practice to switch the echo-sounder on prior to a landfall being made. As in the case of a light at maximum range, whilst not providing a fix, the actual decrease in soundings will make the OOW more aware that he is approaching danger.
8.15.42. Chart Overcrowding.
The information required to monitor the passage will, in many instances, be shown on the working charts. In some situations this may not be feasible, there may just be too much information needing to be shown, thus overcrowding the working area, or even blotting out certain chart details. In some cases this overcrowding can be reduced by writing the required information clear of the track - e.g., on the land and drawing attention to it by either a connecting line of a reference letter.

8.15.43. Planning Book.
In any case, certain information may be better written in a planning book - e.g., times of high and low water times of sunrise and sunset, VHF working frequencies. Where a ship uses a port regularly, the navigator may prefer to put the whole of his plan into a planning book in addition to the chart, so that it can be referred to at a later date.

8.15.44. Conning note book.
Depending upon the length and complexity of the passage, or certain parts of it, it is good practice for an abbreviated edition of the plan to be made into a notebook so that the person having the conn, other than a pilot, can update himself as and when require without having to leave the conning position to look at the chart.

8.15.47. Master’s Approval.
On completion the plan must be submitted to the Master for his approval.

8.15.48. Plan Changes.
All members of the bridge team will be aware that even the most thorough plan may be subject to change during the passage. It is the responsibility of the person instigating such change to ensure that changes are made with the agreement of the Master and that all other members of the team are advised of such changes.
One of the basic things which should be kept in mind is that the certificate of Safe Manning is issued under SOLAS chapter V, safety of navigation. The first and most important function of a vessel is to conduct of navigation.
Picture No: 1, marking of abort points and contingency anchorages
Picture No: 2, Head marks, transit bearings and clearing bearings
8.16 BRIDGE FAMILIARIZATION

8.16.1 GENERAL
Navigation from the bridge is a systemized process and it is therefore necessary that watch keeping officers understand the system as a whole and are familiar with the use and limitation of each of the equipment forming part of the system.

8.16.2 FAMILIARIZATION PROCEDURE

8.16.2.1 a new officer joining a ship, in order to familiarize himself with the equipment and the system shall make the following known to him.

A. list of the navigational equipment which shall be available on the bridge;
B. the officer being relieved shall ensure that each such equipment and its operation are known to the relieving officer,
C. the location of all nautical publications and loose equipment such as binoculars, azimuth mirrors, reflection plotters shall be indicated;
D. the process of changing echo sounder or course paper or other such equipment where print-outs are possible;
E. the location of compass deviation card,
F. the location of pyrotechnic signals, EPIRBs, SARTs and VHF telephony portable equipment and the process of using the same in an emergency, including process of charging their batteries, where needed;
G. location of equipment for actuating general alarms or muster signals and fog signals and the nature of such signals;
H. use of remote control switches for shutting down of main engines, ventilators or overboard discharges where provided;
I. process of using GMDSS equipment and use of same for transmission of urgency or distress messages;
J. procedures for testing controls prior to departure/arrival;
K. the details provided on the pilot card and manoeuvring information poster;
L. use of auto pilot and method of changing over to hand steering;
M. process of changing over to emergency steering, provision of heading indicator in the steering gear flat and the communication system between the bridge and the steering flat;
N. General communication system available on the ship;
O. study of company’s standing instructions.
P. study of duties of officer of a navigational watch
Q. study of Master’s standing instructions and signing the same.
8.17 CHECKS AND TESTS

8.17.1 Every Watch Checks:
- Auto to hand steering change-over (if vessel on auto steering).
- Radar PM tests
- Compass Error
- Course Recorder - to be signed by OOW.

8.17.2 DAILY CHECKS: Preferably at Noon Time
In order to keep in readiness the equipment required to be used in an emergency it is essential to check these systems on a daily basis under normal conditions. Such checks shall include:

- Bridge and engine room telegraphs (if possible) and other communications systems between the bridge and engine room;
- Internship communication systems;
- VHF Telephone system; MF/HF daily test
- Synchronization of ship’s clocks and chronometers;
- Trial of emergency alarm signals
- Synchronization of Gyro compasses.
- Testing of ship's whistle and horns (not to be tried in poor visibility or when other vessels are nearby);
- Testing/switch over of steering motors.
- Navigational lights.
- ALDIS lamp
- VDR must be checked for any operational error, or any sensor error in case of integrated navigation system.

All deck officer must be familiar with above test procedures and also the operation of all the equipments, including how to retain data in VDR in the event of an incident.

8.17.3 CHECKS AND TESTS PRIOR DEPARTURE

Before a vessel is ready to proceed to sea, systems as well as equipments and general readiness for voyage shall be checked by the officer on watch. On such checks being found satisfactory the Master shall be informed and the fact record in the log book.

Such checks shall be carried out within 12 hours of such departure port.

Such checks shall include but not be limited to the following (form 2.3):

1. Ensuring that the passage plan for the relevant passage is ready, approved by the Master (see passage plan procedures) and available to watch keeping officers. For vessels fitted with ECDIS, passage plan is loaded in all ECDIS with correct safety and alarms parameters.
2. Availability of to update charts (Paper or ENC's) and nautical publications for the intended passage;
3. readiness of the below mentioned equipment:
   i. anchors including the process of clearing them;
   ii. ancillary bridge equipment such as binoculars; portable VHF telephones, azimuth mirrors, communication with fore and aft stations etc.;
   iii. bridge movement book;
   iv. paper or recorders for equipments, where provided;
   v. power on deck for windlasses and mooring winch;
   vi. satisfactory operation of radars and other listed navigational equipment;
   vii. arrangement for embarkation and disembarkation of pilots;

4. Satisfactory operation of the bridge and engine room telegraphs system and communication system, both primary and secondary;
5. Other communication systems internal, external and portable;
6. Navigation lights including emergency arrangements,
7. Ship's whistle;
8. Signalling lamps;
9. Steering gear, including main and auxiliary steering, communications between the steering room and con position and change over process from main to emergency steering.
10. Clear visibility including no obstructions and operation of clear view screens;
11. Synchronization of the ship's clocks;
12. Confirm all crew on board and ship checked for stowaways.

8.17.4 CHECKS AND TESTS PRIOR ARRIVAL
The engine room shall be kept advised on the vessels ETA and sufficient notice shall be given to them for reducing speed and manoeuvring.
Before any likely reduction of speed and if on autopilot, the steering shall be changed to hand and the helm put to hard over to either side on the hydraulic as well as the electric system.
On engine room confirming readiness for manoeuvring, the main engine shall be tried out on reduced revolutions as well as on astern movement. In large ships reduction of speed has to be effected well in advance and the same should be taken in account when working out ETAs. The fact of trying out the engines and the steering shall be recorded in the log.
Additionally, the following checks shall be carried out and logged at least two hours prior to estimate arrival:
   a. synchronizing of clocks especially with the engine room;
   b. calling of additional rating on the bridge;
   c. changing over to hand steering and switching on both steering motors;
   d. lifting up the speed log where necessary;
   e. displaying the necessary house, signal and courtesy flags by day and the relevant light signals by night;
   f. trying out whistle and the ALDIS lamp on battery;
   g. ascertaining that power on deck is available;
h. calling the crew to clear out the anchor lashings and lifting up mooring ropes if required;
i. preparing and if required, rigging the pilot boarding equipment;
j. ensuring that the pilot information exchange card is properly filled (Annex 4);
k. checking availability of information relating to entry formalities such as quarantine, hazardous cargoes manifest etc.;
l. Ship specific checks as per Masters standing instructions.
m. Eco Sounder and its printer on

Additionally please follow the checks as per form No 2.4
8.18 PILOTAGE

8.18.1 GENERAL

It is emphasized that having a pilot on board does not relieve the Master or the navigating officers of their duties and responsibilities for the safe conduct of the ship.

Boarding of the pilot shall be under supervision of a licensed deck officer. The said officer shall maintain communication with the bridge and have sufficient crew at hand to ensure safe boarding.

After the pilot boards, all concerned personnel shall be informed about the requirements of the pilot relating to his passage plan, mooring, anchoring and tugs.

Ensure that all movements and all-important happenings are recorded in the bridge movement book as each such event takes places.

8.18.2 PILOT INFORMATION EXCHANGE

The following information shall be exchanged with the pilot on the prescribed format specified as in form No. 2.5 and 2.15

a. pilot card showing the actual deadweight, draught in the water, distance from bridge to stem and to the stern, distance from the waterline to the topmost point on the ship;

b. available power on the main engine with any notice period that may be required for additional power;

c. limitation if any, on steering gear, main engine or other deck equipment or machinery;

d. any equipment that will aid in ship handling such as thrusters;

e. any special manoeuvring characteristics of the ship.

The card shall be voyage specific and shall be available to the pilot throughout the pilotage. The receipt of the card shall be recorded on the card by the pilot and if the pilot so requires a copy of the same shall be furnished to him.

The pilotage plan ad the circumstances when deviation from plan may be required any amendments to the plan should be agreed and any changes in the individual bridge team responsibilities made before pilot commences ,and ecdis unit along with relevant alarm settings NP232 12.23

Inform the pilot on the location of the VHF communication system, radars and other available navigation systems, and if the equipment is not of a standard type the method of its operation.
Agree on the passage plan with the pilot taking into account the weather conditions, state of the tide, existing currents, berthing arrangements, availability of tugs and other external facilities and limitations known to the pilot.

**8.18.3 MONITORING OF SHIP’S PASSAGE WITH PILOT**

The navigating watch officer shall ensure that the progress of the ship is frequently monitored using the available navigation aids. Any deviations from the planned track shall be immediately brought to the notice of the pilot and the Master.

The advice of the pilot and the orders of the Master relating to changes in course or speed shall be recorded in the bridge notebook. Particular attention shall be given to the helmsman to ensure that helm orders are correctly executed.

Whenever an engine movement is noted contrary to the one ordered the watch officer shall first bring the telegraph to the STOP position and only after all are aware of the mistake he may repeat the order, if so ordered by the Master.

**Also refer to Sec- 8.12.3.3.2, 8.12.3.3.3, 8.12.3.3.4 and 8.12.3.3.5**
8.19 NAVIGATION IN UNFAVOURABLE WEATHER CONDITIONS

8.19.1 NAVIGATION IN HEAVY WEATHER

8.19.1.1 GENERAL
Onset of heavy weather can normally be forecast from the available weather reports. The officer on watch shall therefore ensure that such forecasts are studied and the readings of the barometer are recorded hourly in disturbed weather.

Any changes in weather shall be brought to the notice of the Master, Chief Engineer and the crew so that everybody is aware of the same.

8.19.1.2 PRECAUTIONS
Even though all movable objects shall normally be secured shall ensure that such objects are actually so secured on the deck, engine room and the galleys.

Following precautions shall also be taken:

- rig safety lines on deck;
- Warn the crew not to go on deck unless ordered and when so ordered the same shall be under the supervision of the bridge with safety precautions.

8.19.1.3 PROCEDURE
The Duty Officer shall obtain relevant weather reports for the area in which the vessel is presently navigating and for the areas that the vessel is likely to be in the next three days.

Where necessary, speed shall be reduced as required to avoid structural damage due to pounding, slamming and such.

Follow the checklist given in the form No 2.11. In case of heavy weather damage form 7.15 must be complied.

8.19.2 RESTRICTED VISIBILITY

8.19.2.1 GENERAL:
Navigation in restricted visibility shall always be under the direction of the Master.

8.19.2.2 PROCEDURES IN RESTRICTED VISIBILITY:
Vessels' conduct shall be in accordance with the International Regulations on preventing Collisions at Sea. All the relevant fog signal will be followed.

Main engine shall be kept ready for maneuvering.

Additional lookouts will be posted. If vessel is navigating where there is significant traffic movement the lookout shall be posted as forward as possible. The watch keeping arrangement as mentioned in the section 8.6.6 of this manual shall be followed.
Additionally, the following shall be followed:
i. All available navigational equipment shall be used;
ii. Lookouts shall be increased and suitably positioned.

In proximity of land and where ship’s position is in doubt the Master shall consider the possibility of anchoring.

Follow the checklist given in the form No 2.10

8.19.3 NAVIGATION IN ICE AND/OR WINTER COLD WEATHER

8.19.3.1 GENERAL

Navigation in ice and/or winter cold weather requires considerable skill and advance planning to ensure safety of the vessel

8.19.3.2 ICE PASSAGE

Where considered necessary, passage through ice shall be planned on the advice of an Expert after consulting the technical Superintendent who shall ensure that detailed and relevant instructions are issued to the ship.

Special equipment where needed shall be supplied to the vessel.

Reference shall be made to the Mariners Handbook and similar publications.

Follow the checklist given in the form No 2.12 and/or form No.2.25, and Risk Assessment for Navigation in Ice shall be consulted.
8.20 Effect of Wind.

8.20.1 General.
The ship handler faces many problems but there is none more frequently experienced and less understood than the effect of wind. All too often when slowing down after a river passage, whilst entering locks and during berthing, it can create a major difficulty. With or without tugs, if the problem has not been thought out in advance, or if it is not understood how the ship will behave in the wind, the operation can get out of control extremely quickly. Needless to say, with no tug assistance it is wise to get this area of ship handling right first time and also appreciate what the limits are.

It is frequently stated by many a master that “the large funnel right aft, acts like a huge sail”. Whilst this is to some extent true, it simply does not explain everything satisfactorily. It is important to look at the problem more closely.

8.20.2 Calculations.

It is very useful to have a quantitative understanding of the actual force that a ship experiences whilst influenced by the wind. This may be of considerable benefit to pilots when endeavouring to estimate the wind limitations of a particular class of ship, establishing the size of tugs for a district and so forth. When confronted by the harbour authorities or charterers it is perhaps better, in the interests of professionalism, to be armed with concrete facts rather than simply say, “We don’t think it can be done”. Worse is to be forced to attempt a movement with unacceptable risks.

Whilst complicated formulae do exist, for calculating the force of wind upon a ship, it would be more practical to have at hand a relatively simple method of achieving a working figure. The first requirement is to obtain the best available estimation of the area of the ship presented to the wind in square metres, if it were on the beam. This can be as simple as …..

Length overall (m) x max, freeboard (m) will give an approximation of the total windings area (m$^2$).

An approximate wind force in tones per 1,000 m$^2$ can then be calculated using:

$$\text{Force (tonnes) per 1000 m}^2 = \frac{\text{Windspeed (Knots)}}{18} \times \frac{\text{V}^2}{2}$$

It should be noted that the wind force varies as the square of the wind speed. Small increases in wind speed can mean large increases in wind strength, especially in stronger winds, when gusting can place an enormous strain on the ship.
Examples
Pictures 1 & 2

Using the above formulae, this is illustrated (see picture 1) with the graphs of wind force (tonnes) over a wide range of wind speeds (knots) for a large 197 m car carrier.

Kicks ahead with full rudder will, at best, be somewhere in the region of 45% of these figures.

Similarly, if we assume stern power to be a little over half that of ahead power, we can compile an approximate list of the range of stern powers.

Transverse thrust may be no more than 10% of these figures.

A similar exercise is outlined in picture 2 for the car carrier with a 10,000 SHP main engine. This type of ship may also be fitted with a bow thruster, of 1,000 kW (1341 ship or 13 tonnes) for example, and it is interesting to compare the combined efforts of the main engine and the bow thruster when endeavouring to hold the ship against a beam wind.

8.20.3 Summary.

By comparing the wind force at its worse, i.e. on the beam, with the forces available to the ship handler, including tugs, several important points come to light.

- Kicks ahead with fully power are very effective against a wide range of wind strengths.
- Kicks ahead of dead slow and slow will be ineffective at certain wind strengths and more power must be used.
- The weakness of transverse thrust as a force.
- The likely wind strength at which the transverse thrust will be overcome by the wind.
- The limits of the bow thruster in beam winds.
- The size of tugs required for that class of ship, or its wind limits with the operational tugs in a specific port.

This information is of course extremely basic, referring in the main to a ship, which is initially stopped in the water, on even keel and with a beam wind. Ships like passenger vessels with high ‘rounded’ superstructures generate considerable aerodynamic lift in a wind, which can change the balance of forces. It is, nevertheless, surprisingly accurate to use the ‘slab sided’ effect, as trials have shown, and more than adequate for practical purposes.
Effective of Wind

Wind Velocity

Picture No: 1, Wind thrust curves in relation to the wind speed and draft of the vessel
Main engine = 10000 SHP  Full Ahead 100 tonnes bollard pull, Kick ahead 45% of ahead power

Estimation of rudder force
Full Ahead 45 tonnes, Half Ahead 34 tonnes, Slow ahead 22 tonnes, Dead Slow Ahead 11 tonnes

Estimation of forces
Full astern at 60% of full power = 6000 SHP,
Transverse Thrust is 10% of stern power at full astern = 600 SHP = 6 tonnes

Picture No: 2, Comparison of forces on a car carrier when attempting to thrust sideways
8.21 OPERATION OF AIS

8.21.1 The AIS system should be considered an aid to navigation and may provide a means of assessing risk of collision provided the restrictions of AIS are appreciated and it not used in isolation and when used in conjunction with the application of the Collision Regulations and good watch-keeping practice, it will enhance situational awareness.

NOTE: AIS requires an accurate time signal. If a GPS signal is not received by the unit it will not function.

8.21.2. BASIC OPERATION PROCEDURES

The ship-borne AIS unit is connected to a power source, an antenna and to a variety of on board equipment, including the integrated navigation system where available. In addition, at the time of installation, important static ship-related information has to be entered into the AIS memory unit; this includes identity, length and beam, type of ship and the location of the position-fixing antenna. The AIS should ideally be connected through an uninterrupted power supply (UPS) to the ship's power supply as defined in SOLAS Chapter II-1. The unit will be fitted with, at least, a minimum keyboard and display (MKD) or a dedicated graphical display which interfaces with the AIS and performs two functions:
- Displays the unit's operational status (which should be regularly checked); and
- Displays target information, which is described in the Guidelines.

8.21.2 ONBOARD OPERATIONAL USE OF AIS:

With the exception of any specific local requirements, in accordance with Chapter V Regulation 19 section 2.4.5.1 of SOLAS, every vessel should display, 'the ship's identity, type, position, course, speed, navigational status and other safety-related information.' For clarity, 'other safety-related information' should not include the vessel's destination or ETA to that destination.

The destination should, excluding the ETA to that destination, be displayed in the format of the country in which the port is located and not the port itself. Additionally, if the total number of ports in a particular country, by number or geographical location, result in the precise destination of the vessel becoming easily ascertainable, then the AIS shall display a sea area in lieu of that country.

The status of the AIS including the manually entered voyage data shall be checked very watch to confirm it is correct and up to date. The 'Navigational Status' is of particular importance because if status is set ‘At Anchor’ or ‘moored’ the dynamic data will transmit at an interval of 3 minutes rather than at least once every 10 seconds if the status is set as ‘Underway’.
The AIS text facility shall not be used for collision avoidance communications. It shall only be used for emergency / distress scenarios and then only with the Master prior approval.

In order to enhance vessel security as well as to minimise commercial appropriation of information, the AIS shall transmit only the minimum information as required by the ISPS Code, SOLAS, and local authorities including the USCG.

When approaching port safety related information transmitted by port authority via the AIS text facility shall be reviewed. When in port at a cargo-handling facility, ships should be guided by local regulation as to whether the AIS unit is to be switched off or set to a low power transmission status. The unit shall not be left switched on and in full power transmission mode when cargo is being worked in port.

The Master shall have the right to stop transmitting AIS data at any time when he/she consider that it may be detrimental to the security of the vessel.

If the AIS is shut down, static data and voyage related information remains stored. Restart is achieved by simply switching on the power to the AIS unit. Own ship’s data will be transmitted after a two-minute initialization period.

The AIS shall be subjected to a performance test conducted by a qualified radio inspector as part of the annual Ship Safety Equipment Survey. A copy of the test report shall be retained on board the ship.

8.21.3 CAUTION: -

8.21.3.1 NOT ALL SHIPS CARRY AIS

The Officer of the Watch (OOW) should always be aware that other ships and, in particular, pleasure craft, fishing boats and warships, and some shore stations including Vessel Traffic Service (VTS) centers, might not be fitted with AIS. The OOW should always be aware that AIS fitted on other ships as a mandatory carriage requirement, might, under certain circumstances, be switched off, particularly where international agreements, rules or standards provide for the protection of navigational information.

8.21.3.2 AIS overlay on radars must not be left on continuously. On some vessel the AIS can be fully integrated with the vessel’s radars, such that information from the AIS unit can be displayed as an overlay on the radar screen. AIS information displayed in this way, must be treated with extreme caution, and should never be used in isolation to determine if a risk of collision exits. In this mode the target data may be provided by either the AIS or the ARPA and may not be identical. Due to the difficulty in determining the source of the target information (AIS or ARPA) the AIS data should be overlaid intermittently to identify targets but must not be left on continuously. Target data from AIS is
less reliable than that calculated by the ARPA since it is dependent on
inputs from a third party which cannot be readily verified.
Navigators should be aware of the limitations of AIS. The mariner must
always remember that AIS is just one of the several tools available to a
watch-keeper.

**8.21.4. USE OF AIS INFORMATION IN COLLISION AVOIDANCE**

**Risk of Collision**

**COLREG** Rule 7 - Risk of Collision - states that “Every vessel shall use all available
means appropriate to the prevailing circumstances and conditions to determine if
risk of collision exists. If there is any doubt such risk shall be deemed to exist.”

The COLREGs oblige ships to apply all available means to detect the danger of
collision and to take preventive measures. One of these means, especially during
reduced visibility, is ship-borne radar; another aid now available is AIS.

But remember:-
The AIS system should be considered an only aid to navigation and may provide a
means of assessing risk of collision provided the restrictions of AIS are appreciated
and it not used in isolation

**8.21.5 AIS Performance**

AIS broadcasts the identity, position, heading, course over ground (COG), speed
over ground (SOG) and certain other relevant ship data at an update rate dependent
upon the ship’s speed or rate of turn during course alterations. Its performance
surpasses ship-borne radar in three aspects:

- AIS aims to achieve a positional accuracy of better than 10 m when associated
  with DGNSS corrections.
- Due to the higher positional accuracy and less need for plot filtering, the position
  and changes of course over ground can be presented with less delay than that by
  radar.
- The AIS provides supplementary information about other vessels that is not
  readily available from radar, such as identity, heading, COG, SOG, rate of turn and
  navigational status.

When used in conjunction with radar, it enhances the available information. AIS can
also assist in the identification of targets by name or call sign and by ship type &
navigational status, thus reducing the requirement for verbal information exchange.

**8.21.6 INHERENT LIMITATIONS OF AIS**

The officer of the watch (OOW) should always be aware that other ships, in
particular leisure craft, fishing boats and warships, and some coastal shore stations
including Vessel Traffic Service (VTS) centers, might not be fitted with AIS.
The OOW should always be aware that other ships fitted with AIS as a mandatory carriage requirement might switch off AIS under certain circumstances by professional judgment of the master. In other words, the information given by the AIS may not be a complete picture of the situation around the ship. The users must be aware that transmission of erroneous information implies a risk to other ships as well as their own. The users remain responsible for all information entered into the system and the information added by the sensors. The accuracy of AIS information received is only as good as the accuracy of the AIS information transmitted. The OOW should be aware that poorly configured or calibrated ship sensors (position, speed and heading sensors) might lead to incorrect information being transmitted. Incorrect information about one ship displayed on the bridge of another could be dangerously confusing. If no sensor is installed or if the sensor (e.g. the gyro) fails to provide data, the AIS automatically transmits the "not available" data value. However, the built-in integrity check cannot validate the contents of the data processed by the AIS. It would not be prudent for the OOW to assume that the information received from other ships is of a comparable quality and accuracy to that which might be available on own ship.

### 8.21.6.1 IMO GUIDELINES FOR INSTALLATION OF SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEM (AIS)

Attached is a copy of the IMO Circular 227 which is to be complied with by all vessels.
8.22 ELECTRONIC CHART DISPLAY INFORMATION SYSTEM (ECDIS)

8.22.1. GENERAL

ECDIS is an abbreviation of Electronic Chart Display and Information System. It is not an instrument in the way that it has any receiving antennas or transducers, but it combines the vessel's common bridge instruments such as GPS, Gyro and Log with an electronic chart system to display the correct ship position including its heading and speed.

Route planning and monitoring are easier and faster. The feature of automatic updating of charts saves a lot of work. During monitoring, the ECDIS is constantly searching for dangers ahead and may trigger warnings for any danger or hazard. Tides and currents may also be displayed in real time if available.

SOLAS Chapter V acknowledges the use of dual ECDIS as a replacement for corrected paper charts, but only under certain conditions such as using official and corrected ENC’s and complying with given installations and certification requirements.

8.22.1.1 Mandatory carriage of ECDIS:

The amendments to SOLAS Chapter V Regulation 19 – Carriage Requirements for Ship borne Navigational Systems and Equipment came into effect on 1 January 2011 and vessels must be fitted with ECDIS as follows:

<table>
<thead>
<tr>
<th>Vessel type</th>
<th>Date to be implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>New tankers &gt; 3000 GT</td>
<td>1 July 2012</td>
</tr>
<tr>
<td>New cargo ships &gt; 10,000 GT</td>
<td>1 July 2013</td>
</tr>
<tr>
<td>New cargo ships &gt; 3,000 GT</td>
<td>1 July 2014</td>
</tr>
<tr>
<td>Existing tankers &gt; 3,000 GT</td>
<td>1 July 2015</td>
</tr>
<tr>
<td>Existing cargo ships &gt; 20,000 GT</td>
<td>1 July 2017</td>
</tr>
</tbody>
</table>

8.22.2 TERMINOLOGIES:

ARCS = Admiralty Raster Chart Service - the service for distributing British Admiralty (BA) electronic charts in HRCF format;

AVCS = the Admiralty Vector Chart Service that brings together Electronic Navigational Charts (ENCs) from national Hydrographic Offices around the world and new ENC coverage produced by UKHO in co-operation with Foreign Governments to provide comprehensive, official, worldwide coverage;

EC = Electronic chart –is any digitised chart intended for display on a computerised navigational system.

ECS = Electronic Chart System- is a commercial chart system which does not satisfy SOLAS requirements.

ECDIS = Electronic Chart Display & Information System
A navigation information system which with adequate back-up arrangements can be accepted as complying with the up-to-date chart required by regulation V/20 of the 1974 SOLAS Convention, by displaying selected information from a system electronic navigational chart (SENC) with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and if required, additional navigation-related information.

(In short ECDIS is the ECS which satisfies SOLAS requirements for carriage of charts in an electronic format when used with ENC)

ENC = Electronic Navigational Chart - the database, standardized as to content, structure and format for use with ECDIS. It is developed by national Hydrographic authorities. The ENC contains all the chart information for safe navigation and may contain supplementary information in addition to that contained in the paper chart (e.g. sailing directions) that may be considered necessary for safe navigation.

IC-ENC = International Centre for Electronic Navigation Charts - a Regional Electronic Navigation Centre (RENC) based in the UK;

RCDS = Raster Chart Display System - a navigation information system displaying RNCs with positional information from navigation sensors to assist the mariner in route planning and route monitoring and, if required, display additional navigational-related information;

RENCs = Regional Electronic Navigation Centre - PRIMAR and IC-ENC are RENCs and we understand that it is envisioned by the International Hydrographic Office (IHO) to have 7 RENCs around the world;

RNC = Raster Navigational Chart - a facsimile of a paper chart originated by or being distributed on the Authority of a Government-authorized Hydrographic Office. RNC is used in these standards to mean a single chart or collection of charts;

SENC = System Electronic Navigational Chart - the ENC chart with corrections and overlays. A database resulting from the transformation of the ENC by the ECDIS for appropriate use and updates. It is the database that is actually assessed by the ECDIS for the display generation and other navigational functions and is the equivalent to an up-to-date paper chart. The SENC may also contain information from other sources.

S-57, HRCF, BSB, PCX = these are different formats of electronic charts; IHO Special Publication S-57 prescribes the standards to which ENC should be developed by each national Hydrographic authorities.

System Raster Navigational Chart = a database resulting from the transformation of the RNC by the RCDS to include updates to the RNC by appropriate means;

VAR's - Value Added Retailers = a vendor that has a special agreement with a RENC.

WEND – Worldwide Electronic Navigational Chart Database. IHO has developed this to provide a timely, reliable worldwide uniform ENC data distribution service.
8.22.3 FACTS ABOUT ECDIS

8.22.3.1 ELECTRONIC CHARTS:
The charts used in an ECDIS are of two (2) principal categories, namely:

a. Raster charts (Scanned charts) - these are basically scanned copies of the paper chart and are recognized as somewhat unsuitable for use with ECDIS due to limitations in safety features, zoom, and the quite cluttered appearance of the chart itself when seen on the screen. When distributed from a Hydrographic Office they carry the name of RNC, and the most common type is ARCS;

RNCs are normally produced by digitally scanning the stable colour bases used in the multi-colour printing process. Unlike ENCs there is not a single accepted format for RNCs. The main formats are

- BSB (used by USA, Canada, Cuba and Argentina), and CRF used by UK, Australia and New Zealand).

b. Vector Charts - A vector chart is built up of several independent layers of information and every object or feature of the chart is assigned properties. This allows the chart to be displayed almost as a normal paper chart and with full information, but also to be customized to suit the individual ship and task. A ship with 12 meters draft may chose the 20m depth contour to be highlighted, instead of the default 10m curve on paper chart, or that all depth soundings below 15 to be highlighted. A ship transiting an area during daytime may remove light sectors and bottom features from the display to clean up the appearance. Further, the software inside the ECDIS may use these data to search for dangerous objects, giving the OOW a warning when planning a route across a small island, or give an early alarm if vessel is crossing into shallow areas (even if OOW is not looking at that exact chart on the screen!). The official ENC that are required for ECDIS paperless navigation are vector charts. Vectorized charts of a non-official nature are also sold from private enterprises such as C-Map, TRANSAS and Navionics. Non-official chart shall not be used in the ECDIS.

8.22.3.2 Official electronic charts:
Vessel using ECDIS shall make use of officially issued ENC’s for navigation. If there is no available ENC for the area, they may use Raster Navigational Charts (RNCs) together with paper charts.

The ENCs and RNCs must be issued officially by- or on the authority of a Government, authorized Hydrographic Office or relevant institution and designed to meet the requirements of marine navigation. It must be of latest edition and updated to the latest available updates. All ENC and RNC charts ordered through professional Chart Agents meet or exceed these requirements.

8.22.3.3 SENC:
An ECDIS does not process the ENC content directly for the matter of display. ENCs in S-57 format are optimized to absorb the Hydrographic object information but this structure is not
adequate for the fast generation of the resulting computer image on the screen. In order to get efficient data structures that facilitate the rapid display of ENC data, ECDIS firstly converts each ENC from S-57 ENC format into an internal format called SENC System ENC which is optimized for chart image creating routines. Such routines are not standardized; they are part of the individual software know-how of the ECDIS manufacturers. Consequently the SENC format differs between the ECDIS of different manufacturers. In contrast to the common uniform ENC format the SENC format is proprietary for each ECDIS manufacturer.

8.22.3.4 SENC delivery

The WEND system has established an optional distribution mechanism called SENC delivery. This is in addition to the standard ENC distribution. In this case, the RENC delivers the ENCs to an authorized chart data distributor who then performs the ENC-to-SENC conversion (that otherwise would have to happen inside the ECDIS), and deliver the SENCs to the end user.

However, it is up to the individual Hydrographic Offices to decide whether they allow the ENCs for their waters to be distributed in SENC format.

It is possible for the ECDIS to determine if the SENC data being displayed is from either an ENC or a private source by use of the Agency Code (a two character combination which is unique for any data producer) embedded in the data.

Using this code the ECDIS is able to inform the mariners that they must navigate with an official up to date paper chart if SENC data from a private source is in use. The ECDIS will show a warning on the ECDIS screen:

8.22.3.5 ECS - ELECTRONIC CHART SYSTEMS:

All systems, which are not tested to show compliance with the ECDIS Performance Standards, can be generically designated as "Electronic Chart Systems" (ECS). An ECS may be able to use ENCs, RNCs or other chart data produced privately and could have functionality similar to ECDIS. Some ECS equipment manufacturers also produce vector and raster data to use in their products. These suppliers have been producing private chart data for a number of years and have established themselves in the market. They were the pioneers and have established the idea and the use of electronic chart systems on vessels. Their charts are derived from Hydrographic Office paper charts or Hydrographic Office digital data. Hydrographic Offices do not take any responsibility for the accuracy or reliability of privately produced charts.

Where the vessel operates with ECS, the paper chart remains the official basis for navigation onboard. The vessel must retain and use a full folio of up to date paper charts on-board, regardless of the type of electronic charts used.

Because ECS is not intended to meet SOLAS requirements, there are no IMO Performance Standards for ECS. Some ECS manufacturers also use the term RCDS to describe their systems. In this case the manufacturer is stating that the system uses RNCs and possibly that it has the same functionality as required by the ECDIS Performance Standards. However, such systems cannot be used to meet carriage requirements.
8.22.3.6 Required chart type:
Vessels that are equipped with dual ECDIS and approved for paperless navigation should use:

- ENC (Vector charts) where world-wide available – No need for paper chart;
- Raster charts where Vector charts are not available - back-up paper charts is also required;
- Paper charts where neither Vector charts nor Raster charts are available or, where less than two ECDIS units remains operative, then paper charts should be available as for any ship operating without ECDIS.

8.22.3.7 Back-up arrangement:
For back-up purposes, the following arrangements are accepted:

- A second type-approved ECDIS connected to the main and emergency source of power or;
- An electronic back-up arrangement for ECDIS mode of operation (using ENC), type-approved in accordance with relevant international standards or;
- An appropriate folio of up-to-date paper nautical charts.

8.22.3.8 Updating of electronic charts:
It is included in the license of electronic charts that updates are being provided to the vessel weekly during the license period. Electronic chart correcting is carried out by inserting an updating disk in the PC or uploading correction files through the web. Refer to NP 294 “How to keep your admiralty product up to date” section 2 chapter 8 for more information.

8.22.3.9 ECDIS display
The strict separation between the hydro graphic information contained in the ENC, operational information taken from navigation sensors and their situation related presentation by means of the presentation library gives the flexibility to display the diversity of ECDIS information, e.g.:

- Physical chart information, (e.g. coastline, depth contours, buoys);
- Traffic routeing; specified areas; cautions; etc.;
- Supplementary Hydro graphic Office information from light list, etc.;
- Mariner’s notes; additional local chart information; manufacturer’s information; - Chart work such as planned route; electronic bearing lines and range rings etc.;
- Own ship’s position and course/speed vector; ship’s heading and rate of turn; past track;
- Fix accuracy, or position check from secondary positioning system;
- Possibly, ship handling options, based on ship’s characteristics;
- Alphanumeric navigation information
  (Ship’s latitude, longitude, heading, course, etc.);
- Information from radar and other sensors,

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- Information from AIS;
- Navigational indications and alarms generated by ECDIS;
- Possibly, telemetered information from shore authorities, (traffic, real-time tides etc.);
- Possibly, ice information;
- Reminders, (e.g. time to contact pilot station); and
- Possibly, a message from other displays (e.g. alarm on engine room display).

The ECDIS Presentation Library follows that of the paper chart to the widest extent possible. However, studies and early experience indicated that good visual communication between the ECDIS display and the user requires more flexibility of display than is available from paper charts.

Consequently some alternative display methods are being introduced as options in the Presentation Library, e.g.:

- Displaying/removing various types of chart and non-chart information;
- Selecting standard chart display or a thinned out display, and full or simplified symbols;
- Using cursor interrogation for further detail;
- Overlaying/removing radar video or radar target information (in order to: confirm ship's positioning; aid radar interpretation; show the entire navigation situation on one screen);
- Overlaying/removing various other sensor information, or information telemetered from shore;

Changing the scale or orientation of the display:

- Selecting true motion or relative motion;
- Changing screen layout with windowed displays, text information in the margins, etc.;
- Possibility of pull-down menus and other operator interaction devices being alongside the operational navigation display and so interacting with it;
- Giving navigation and chart warnings such as "too close approach to safety contour"; "about to enter prohibited area"; "over scale display"; "more detailed (larger scale) data available" etc.;
- Possibly, a diagrammatic representation of a computer evaluation of grounding danger;

- Possibly, a diagrammatic representation of the immediate vicinity of the ship to aid in close quarters manoeuvring;

**8.22.4 RESPONSIBILITY**

The Master is responsible in ensuring that sufficient charts are available either in electronic or paper format for the vessel's itineraries, and also in that they are updated to the latest correction available in order to ensure compliance with SOLAS and Flag State Administration
carriage requirement. He shall ensure that all deck officers are well familiarized with the operation of the ECDIS system using ECDIS familiarization checklist (Form 2.23)

Second officer is responsible for:

- Update and maintenance of ECDIS equipment.
- Proper inventory Management and correction of all ENCs
- Primary means of navigation on board is clearly displayed (Ref section V)
- Passage plan is prepared as per company ,industry requirements,
- Update the chart database, request for the missing charts when the vessel is bound for a new port or on expiry of the permits.

OOW: Navigating officer has the responsibility to ensure that ECDIS operation and limitation is clearly understood. Checking the route, set warnings, alarms prior to the start of voyage and marks the charts with no go areas.

8.22.5 COMPANY POLICIES

8.22.5.1 Primary means of navigation:

On vessels fitted with one ECDIS, it is company policy that ECDIS is to be used as a primary means of navigation. Paper charts shall be used as an additional aid to navigation. The equipment guidance provided in this chapter with respect to limitations of the equipment, ordering and correcting the electronic charts, training to staff, voyage planning and monitoring shall be adhered to.

On vessels fitted with two ECDIS, company will provide paper charts to be kept for either as back up arrangements or for emergency and will provide charts for area where vector charts are not available. These paper charts shall be maintained up to date by the vessel. Vessel will need to check SEQ certificate to check vessel ECDIS/Charts approval status.

On vessels which are not required to carry an ECDIS paper charts will continue to be the primary means of navigation.

There should be a clear display on bridge indicating the primary means of navigation. This shall be displayed on the chart table and on the ECDIS equipment.

The planned route shall at all times be updated on the back-up system. When paper nautical charts serves as the only back-up arrangement, the charts shall include the planned route and, in narrow waters, the vessel's position must be updated regularly thereby enabling a safe take-over of ECDIS functions.

8.22.5.2 Chart management:

The Company will provide the vessels with a subscription of official electronic charts (Vector charts) and weekly update services to fulfil the chart carriage requirement.
The management of electronic charts, paper charts, licenses and updates are normally assisted by a Chart Management System such as MDS, ChartCo, Chart Assistant and E-Navigator. This will allow for continuous reception of new editions, permits/licenses and weekly updates even while the vessel is at sea.

The Master is responsible in ordering the Electronic Charts needed for a particular voyage. The most cost efficient way of ordering is chart by chart with minimum allowed period of subscription. Company use different chart agents based on the maker of ECDIS. This is to ensure immediate response in processing the permits and licenses of electronic charts. It will also ensure an immediate action in providing technical support in the event that a system error may arise in installing and updating of charts.

8.22.5.3 Training:

Training definitions:

Generic ECDIS Training:

ECDIS training to ensure that navigators can use and understand ECDIS in the context of navigation and can demonstrate all competencies contained in and implied by STCW 2010.

Such training should ensure that the navigator learns to use ECDIS and can apply it in all aspects of navigation, including the knowledge, understanding and proficiency to transfer that skill to the particular ECDIS system(s) actually encountered on board, prior to taking over Navigational duties. This level of training should deliver the competencies at least equivalent to those given in IMO Model Course 1.27

a) Generic training:

Masters and all navigating officers should undergo generic ECDIS training (based on IMO Model Course 1.27) before they are being assigned to a vessel fitted with ECDIS. In addition to this, company policy is that the Marine superintendent in charge of vessels fitted with ECDIS shall undergo a generic ECDIS training course.

b) Type specific training:

Following the successful demonstration of competencies contained in the Generic ECDIS Training, familiarisation is the process required to become familiar with any onboard ECDIS (including backup) in order to assure and demonstrate competency onboard any specific ship’s ECDIS installation, prior to taking charge of Navigational Watch. Type specific training should be based on the actual equipment installed on board and be provided before the officer is expected to use the equipment, for example, prior to sailing. The general consensus from the IMO is that officers who have undergone ECDIS generic Training may not be familiar or be able to fully operate confidently an ECDIS model that they have never used or trained on before. However, debate remains within the industry on acceptable forms of providing type/model specific training. STCW does not make type/model specific training a mandatory requirement and is very much left open to the interpretation of flag states to determine training requirements.

For type specific training, industry is still finding solutions as many options are not available.
Company is looking at the various options, to fulfil the given type specific ECDIS training requirements such as

1. Obtain a demo model and fit in office for training and certification by approved trainer or to use type specific CBT training modules with tests and student certification included.

2. Training in Approved Institutes conducting the Type Specific Training

However, training as required by Flag State needs to be met always.

Presently industry is facing a gap between the Training requirements. In case of urgent joining or other unusual circumstance, the above cannot be met, after MD's approval, the OOW will have to do a specific ECDIS familiarization on board, complete company form “ECDIS familiarization checklist” (Form 2.23) for the type of ECDIS on board. This should be completed after the officer undergoes training and able to demonstrate his knowledge in ECDIS (as per form 2.23) and has completed at least 3 watches under the supervision of another officer. Master shall then allow the Officer to keep an independent watch.

The subjects in these forms are essential for a safe watch keeping on the Navigation Bridge and for avoiding incorrect operation, misinterpretation, malfunction or, even worse, over-reliance on the highly-automated navigation system.

The content of the familiarization form must be carefully studied and understood by the new-joining navigational officer in order that an independent watch can be taken over. Already ECDIS type specific familiar navigational officers on board must assist the newly joined officer in completing the familiarization form.

A copy of the completed familiarization form shall, when completed and signed for, be forwarded by e-mail to office. The original certificates for the completed generic training certificate and the original type specific familiarization form must be kept in file together with the personal certificates that belong to the Navigational Officer.

Furthermore, the Master must ensure that all Navigational Officers have the proper and certified ECDIS generic and type specific training before implementing ‘Paperless Navigation’ on board the particular vessel.

8.22.5.4 Readiness for port state control inspection

Ships arriving at a port may be subject to Port State control by local officials based on

Flag State regulations and international agreements. Checks may include whether:

- The ship has documentation indicating that the system complies with IMO Performance Standards for ECDIS. In the absence of such documentation, the PSCO should seek confirmation from the Flag State that the system does meet the statutory requirements;
- The system is being used for primary navigation. It should be established if ECDIS is
used in the ENC mode or RCDS mode or in both modes;
- There are written procedures onboard the vessel for using ECDIS;
- The master and watch-keeping officers are able to produce appropriate
documentation that Generic and type-specific ECDIS familiarisation has been
undertaken;
- The charts used for the intended voyage are the latest official editions;
- The charts in use are updated; and
- There are approved back up arrangements available to ensure a safe transfer of the
ECDIS functions in the event of ECDIS failure and to provide safe navigation for the
remaining part of the voyage.
- Port State Control officers may use the ECDIS listing to ensure that ENCs are being kept
up to date in accordance with SOLAS V Regulation 27.

8.22.6 PLANNING USING ECDIS

8.22.6.1 voyage planning:

Most of the voyage planning can be carried out in the ECDIS. The voyage plan document that is
being created in the ECDIS may be attached to the passage plan form provided to support
relevant sections.

The marking/highlighting of electronic charts can be carried out in a similar manner as done in
paper charts and for identifying radar conspicuous targets, no go areas, parallel index lines,
transit marks, clearing bearings, wheel over etc. In the ECDIS, all this information can be saved
for future use, allowing the vessel to build up a bank of layer for different places and drafts.

The automated functions in the ECDIS system should be used, and the time spent on voyage
planning should as much as possible be spent doing checks and verifications rather than manual
editing.

The route can then be created in the ECDIS and the system will then automatically calculate
legs, times, waypoint positions, courses and distances.

The primary purpose of the created route is that it should be so well defined, especially in a way
of cross track limits, that in the event of failure of the charts resulting in a blank screen, the
vessel should still be safe within the route boundaries.

When the route has been drafted, additional ENCs or RNCs chart permits and corrections may
be needed. After receipt of chart permits and updates, the route should be opened and checked
for navigational safety since the received corrections may include new dangers along the
intended route.

8.22.6.2 Speed plan:

ECDIS can auto calculate the Speed Required provided the operator provides the ETD and ETA
8.22.6.3 Checking the routes

For areas covered by suitable ENCs, the system can automatically check for dangers according to given criteria.

These criteria normally include:

- The land located inside the route leg;
- The water depth which is less than the pre-set safety depth inside the route leg;
- The vessel heading the wrong way in any TSS;
- Floating aids to navigation inside the route leg.

Such checks must always be performed on any route before being made the active route. Since the function is automated and only according to the set criteria, the route must be carefully checked by initiating a simulated passage, manually zooming in on each leg and systematically visually checking each section of the route at the chart scale intended for safe navigation.

Specific ECDIS manual have to be studied in detail reg the various alarms and procedure to set them.

8.22.6.4 Setting of critical parameters

ECDIS provides the Bridge Team in finding danger around own ship with alarms, warnings and indications.

Setting parameters for depths can act as a useful tool and provide “ONE LOOK” guidance to the Conning Officer.

Setting shall be such that an alarm shall be activated at following occasions as minimum requirement, but not limited to:

a) Own ship exceeds cross track limits;
b) Own ship will cross the safety contour;
c) When the input from the position fixing system is lost;
d) If the ship, within a specified time or distance set by the user, will reach a critical point on the planned route.
e) If the positioning system and the ENC is not on the same geodetic datum;
f) Any malfunction on the ECDIS,
g) Manually entered points, critical points, lines and areas for which alarm may be required.
h) When the ship crosses a point, line or is within the boundary of a mariner-entered feature within a specified time or distance
i) Largest scale data is available but not in use (if onboard system cannot set this as alarm, then it must be set as indicator);
j) Anchor watch during anchorage (when out of swinging circle etc.);
k) Own ship crosses the Wheel over position;
l) CPA/TCPA alarm etc.

Definitions:

Safety Depth: In ECDIS the depth defined by the mariner. It is the ship's dynamic draft plus
under keel clearance (As per Company’s UKC Policy), to be used by the ECDIS to emphasize soundings on the DISPLAY equal to or less than this value.

This is the Minimum safety Depth that vessel needs to stay in as per company’s UKC Policy

Safety Contour: In ECDIS the contour related to the own ship selected by the mariner from the contours provided for in the SENC, to be used by ECDIS to distinguish on the DISPLAY between the safe and the unsafe water, and for generating anti-grounding ALARMS.

8.22.6.5 Shallow contour and deep contours

The shallow and deep contours are utilised when the multi-colour depth display is selected. The deep contour is normally set at five times vessel’s draught or 30 mtrs whichever is greater. The area between the 0m contour and the shallow contour is coloured dark blue, the area between the shallow and safety contour is coloured light blue, and the area between the safety contour and the deep contour is coloured grey and beyond is coloured white. This allows the gradient of the seabed to be graphically displayed.

In addition to the safety depth/ safety contour there is feature for “Approach to Critical Point” This alarm is used alert when own ship reaches the specified distance / time before a critical point for ex: Safety Contour, No Go Areas.

These values are to be set during Passage Planning Stage by the Navigating Officer in consultation with the Master. This will depend on the prevailing conditions.

Officers are required to be familiar with setting of these parameters in the Make/Model fitted on board.

Illustration of Safety Depth, Safety Contour and Approach to Critical Point (Look Ahead Range)
Procedure:

Enter the safety depth value taking the own ship dynamic draft and the company’s stipulated
UKC into account.

Different colours (Colour Coding) can be used to highlight the different depths.

Depth colours can be in 2 – colour and 4 colour display.

In 2 colour display, the shallower area is filled in deep blue than the safety contour

In 4 colour display, the below are displayed in 4 different colours

1. Shallow Contour
2. Safety Depth
3. Safety Contour

Example (To Be used as guidance only):

Let’s assume a vessel with Dynamic Draft of 10 mtrs.

The following Safety Depth shall be fed in for various legs as per company’s UKC Policy

Safety depth while vessel is in Shallow Waters = 11.0 mtrs
Safety depth while vessel is in Coastal Navigation = 12.0 mtrs

Once the safety depth is entered, the safety contour parameter which is same as safety depth or
slightly above the safety depth shall be selected. Unlike safety depth, in most of the equipment,
the safety contour value cannot be entered. It has to be selected from the range of fixed
parameters available and the range varies from model to model. In some models parameters
such as 10 mtrs, 30 mtrs etc. are available.

Under ECDIS performance standards Safety Contour alarm is mandatory. However, for effective
activation of this alarm, correct setting of Vector Length/Time is essential (ref above diagram for
“look ahead range” and “safety channel depth”.

In some models Safety contour setting available after 10 mtrs is 30 mtrs. In these models,
Masters will face some difficulty in selecting the perfect safety contour setting. This can be
illustrated by an example.
Example:

Vessels dynamic draft = 10 mtrs

Safety depth at shallow waters = 11 mtrs

First Safety contour above safety depth available = 30 mtrs

Safety contour which is closer to safety depth = 10 mtrs

Master has got two options in selecting a suitable safety contour.

Option 1

In case 30 mtrs safety contour is selected, the alarm will be received when vessel is about to cross 30 mtrs contour, based on the look-ahead settings.

However this may not be useful because the safety contour alarm will be activated much earlier when vessels is about to cross 30 mtrs contour. The purpose of this alarm gets defeated.

Option 2:

In case 10.0 mtrs is selected as safety contour, you will get alarm only when vessel is about to cross 10.0 mtrs contour. This is a serious problem but it can be overcome by setting No-Go Area, No-Go Line around depths below 11 mtrs which are outside safety contour and set look ahead for this No-Go area to get an alarm. In all ECDIS models, depths below safety depth and which are outside safety contour stand out in Bold colour.

While both options have inherent shortcomings, Master shall decide the best option based on the knowledge of staff in ECDIS and other navigational parameters.

8.22.6.6 Setting NO-GO areas

In shallow waters and during pilotage where the above is too strict, the system should be set to display only sounding up to a certain depth. The highlighted depths can be used to create a user layer of manual No-Go areas and other annotation.

8.22.6.7 Setting cross track deviation limits

Due diligence need to be exercised when setting this limits and need to make sure you have adequate cross track error for the various legs of your route to take into account the nature of the environment and expected possible deviations, lateral separation from the route and collision avoidance.

8.22.6.8 Setting waypoints:

Waypoints can be made to display with Name/NO on the ECDIS Display for Easy Reference.
8.22.6.9 Setting radius of turn:

ECDIS is capable of computing Radius of Turn and Wheel over Point, provided operator input the correct settings. If the positional information is accurate, the system can be used to give valuable information about a ship's position when turning in confined conditions. Some manufacturers have developed precise navigation tools such as the docking mode function that allows detailed information on the forces at work on the vessel to be viewed in a separate panel. Furthermore, functions, such as the predictor, can also be used to predict the future position of the ship based upon real time influences on the vessel such as wind, tidal stream, acceleration and deceleration.

8.22.6.10 Mariners note

The function 'Mariners Note' is available to add relevant text (such as reporting points), at any given points on the chart. Type specific Procedures need to be studied upon.

8.22.6.11 Tidal & port databases

Some systems offer additional databases such as tidal curves and prediction data to aid in calculating HW, LW, tidal heights and predicted TS. However, before committing to such databases, it is worth considering where the data is from, whether it is official data and if or how it can be updated? Not all Flag States approve data provided by ECDIS manufacturers, with some stating that only Admiralty Total Tide (ATT) is acceptable (most systems are able to integrate ATT).

The environmental data in some systems may be official, in that it has been purchased from official sources, but it does not necessarily state exactly where it is from, so be careful. Some systems are able to provide their own database of worldwide ports and port information to aid the mariner, while others can be integrated with existing publications such as IHS Fair play. If utilising databases provided by the manufacturer then consider how the database is updated and whether information can be updated by the user as changes occur.

8.22.6.12 New symbology:

All officers must be Proficient with the new symbols brought by the ENC.

8.22.6.13 Route planning check:

ECDIS systems have the ability to check the planned route for dangers. However, be careful as the check only looks within the cross track distance (XTD) or corridor of the route, so ensure that it is correctly configured to cover the required area. The wider the XTD the more alarms will be generated, although this is not a reason to reduce it below what is required.

The check looks for set parameters, which could be system defined, as well as operator defined, depending on the system. If your system offers the ability to configure the search beyond set parameters, ensure that what you want the system to search for is selected. Also, when checking the route it is important to ensure that the correct display is selected. If the system is in the standard display and the route check is highlighting a danger, although it is not shown. If the display has been set to custom and isolated dangers have been selected for display. The highlighted symbol is now displayed (non-dangerous wreck). One more important aspect when
using ECDIS systems to check a route is that it may highlight the same danger on multiple occasions without recourse for the operator to clear the specific danger in one action. When conducting the check of the route, the system will only check ENCs and not RNCs, unless there are manual alarm able constructs within the XTD. The inability of most systems to highlight gaps in ENC. Once the route has been checked, additional information pertinent to the route can be added. The system can even be configured to alert the operator of such notices. Considerations at this stage are how best to display the information so that it can be clearly seen by the operator.

8.22.6.14 Some ECDIS route planning tips:

- Screen into 'large' or 'planning' screen format.
- Orientate the chart to show the beginning and end of the route to get a 'big handful' feel for the route.
- Create a blank canvas by hiding all old routes, constructs etc.
- Begin with waypoint plotting in the general area of the start and end of the route.
- Select either Rhumb Line or Great Circle route etc.
- Zoom in to a more appropriate scale to modify the start and finish waypoints and ‘massage’ waypoints to account for TSS Etc.
- Ensure that you have adequate XTD for the various legs of your route to take into account the nature of the environment and expected possible deviations, lateral separation from the route and collision avoidance.
- Check Zones of Confidence (ZOC) or Source Data Diagrams and amend the route or highlight as necessary.
- Set Safety Depth and Safety Contour values.
- Conduct a system check of the route at an appropriate XTD to allow for deviations, collision avoidance etc.
- Once all alarms have been checked and verified, check the route in its entirety on 1:1 scale by manually scrolling along it.
- Add relevant additional information and manual corrections.
- Double check distance/ETD/ETA and tidal constraints.
- Protect the route as necessary and save a backup.
- If updates are installed prior to sailing or during the execution of the route, ensure that the route is checked again, as updates may affect it.

8.22.6.15 RNCs:

RNCs are digital copies of paper charts conforming to IHO special publication S-61 Product Specifications for Raster Navigational Chart (RNC) that are issued by, or on the authority of a national Hydrographic Office. When displayed on an ECDIS screen they appear to be a facsimile
of the paper chart however, they contain significant metadata to ensure that they have certain minimum functionality; e.g. a means for geo-referencing positions on the chart, automatic updating of the RNC from digital files (and the ability to show the state of correction) and the display of the RNC in day or night colors as appropriate.

As a digital copy of the original paper chart, a RNC has no intelligence and other than visually, cannot be interrogated for e.g. automatic route checking or hazard warnings; however some of these limitations can be minimized by manual user input to the ECDIS.

On RNC charts the route will also be displayed with all data, but the review of the route is very important since the RNC chart is dead and cannot trigger any alarms. This lack of automatic alarm is made worse by the 'Keyhole Effect' whereby the operator may only see a portion of the RNC at any time.

Due to the above, any part of a route that lies within RNC coverage must be checked carefully, using the best scale chart available. If any waypoint needs to be adjusted, the checks need to be repeated for both connecting route legs.

On any RNC chart, No-Go areas must be created (using the editor) the same way they are laid out in paper charts.

The marking of charts to highlight dangers etc. must be carried out in a way that is beneficial to the Bridge Team and without cluttering the chart too much. 'No Go' areas should only be marked where they are actually of help to the user of the chart. For ships with an 8.0m draft or less, the normal 10m-depth contour provides a natural 'No Go' area in most cases.

The paper charts that together make up the RNC back-up charts should also be marked with the route and waypoints.

It is not necessary to program each GPS with the same route, since there is a risk of confusion should there be any difference between route in ECDIS and route in GPS.

Any paper chart that is used in conjunction with RNC chart should have a route drawn, but all navigational officers must be aware of the possibility of differences.

### 8.22.6.16 RNC display

- RNCs are designed to be displayed at the same resolution as that which they are provided. Excessive zooming in or out of the same image seriously degrades the RNC image. RCDS allows charts of appropriate scale to be displayed; when the user wants to zoom in then a larger scale chart will be displayed and similarly on zooming out a smaller scale chart will be used;

- Orientation of the RCDS display to other than north-up(e.g. course-up or route-up),may affect the readability of chart text and symbols;

- RNCs incorporate very similar colour palettes to the day/night colours used by ENCs. It is mandatory for RCDS to have the capability to use different colour palettes;
• RNCs are treated as individual charts (not seamless like ENCs). However, it is possible for ECDIS to automatically load adjoining chart based on the meta data provided;

• ARPA radar targets can be overlaid onto an RNC. It is also possible for a radar video image to be scaled to fit the RNC. Scaling the RNC to fit the radar video image is unsatisfactory as this is likely to result in a degraded chart image; and

• RNCs include significant meta data to allow the ECDIS to make maximum use of the image. For example chart notes and tide panels may be accessed directly by the RCDS rather than the user having to scroll to the appropriate area of the chart. RNCs maintain the horizontal datum of the paper chart from which the RNC has been derived. Mariners should understand, how the chart horizontal datum relates to the datum of the position fixing system. In some instances, this may appear as a shift in position. (Any differences will be most noticeable at grid intersections and during route monitoring). Where the difference between the local horizontal datum and WGS 84 is known, an adjustment should be automatically applied by the ECDIS. If the horizontal datum of the paper chart from which the RNC is produced is not known then it is not possible to relate GPS positions accurately to the RNC; IMO SN circular 255 has been issued to alert users to this problem.

8.22.7 MONITORING USING ECDIS

8.22.7.1 Take Over:

Prior allowing any officer to take over a watch for the first time, Master shall ensure that the OOW has sufficient knowledge on ECDIS for proper understanding of the information provided in the ECDIS. Important points are:

• Naming of the ENC chart

• SCAMIN

• Correct scale to be used

• Correct display to be used

Brief explanation of above points:

A) Naming of ENC charts:

Each ENC is identified by an 8 character identifier e.g. FR501050. The first two characters indicate the producer e.g. FR for France, GB for Great Britain (a complete list of producer codes is included in the IHO standard S-62). The third character (a number from 1 to 6) indicates the navigational purpose band (as shown in the table xx). The last 5 characters are alpha-numeric and provide a unique identifier.

B) SCAMIN

The system auto-filter means that unless you are navigating on the best scale chart, you will not see all the information available for display. Therefore, when zooming out the system will automatically de-select certain features from display such as soundings, lights and topographical detail. The only way to ensure that your display is not affected by SCAMIN is to always ensure
you are navigating on the best scale chart! It is therefore essential that the operator knows how to select the best scale chart on their system.

C) Correct scale to be used:

During production, ENCs are assigned a compilation scale based upon the nature of the source data they are based on, and are allocated to a navigational purpose band related to this. As shown in the table below there are 6 navigational purpose bands (scale ranges are indicative only).

<table>
<thead>
<tr>
<th>Navigational Purpose</th>
<th>Name</th>
<th>Scale Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overview</td>
<td>&lt;1:1 499 999</td>
</tr>
<tr>
<td>2</td>
<td>General</td>
<td>1:350 000 - 1:1 499 999</td>
</tr>
<tr>
<td>3</td>
<td>Coastal</td>
<td>1:90 000 - 1:349 999</td>
</tr>
<tr>
<td>4</td>
<td>Approach</td>
<td>1:22 000 - 1:89 999</td>
</tr>
<tr>
<td>5</td>
<td>Harbour</td>
<td>1:4 000 - 1:21 999</td>
</tr>
<tr>
<td>6</td>
<td>Berthing</td>
<td>&gt; 1:4 000</td>
</tr>
</tbody>
</table>

To facilitate the display of the radar overlay on ENCs, Hydrographic Offices are recommended to set the compilation scales of their ENCs to be consistent with the standard radar range scales as shown in the following table:

**Radar range / standard scale**

<table>
<thead>
<tr>
<th>SELECTABLE RANGE</th>
<th>STANDARD SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 NM</td>
<td>1:3 000 000 1:1</td>
</tr>
<tr>
<td>96 NM</td>
<td>500 000</td>
</tr>
<tr>
<td>48 NM</td>
<td>1:700 000</td>
</tr>
<tr>
<td>24 NM</td>
<td>1:350 000</td>
</tr>
<tr>
<td>12 NM</td>
<td>1:180 000</td>
</tr>
<tr>
<td>6 NM</td>
<td>1:90 000 1:45</td>
</tr>
<tr>
<td>3 NM</td>
<td>000 1:22 000</td>
</tr>
<tr>
<td>1.5 NM</td>
<td>1:12 000</td>
</tr>
<tr>
<td>0.75 NM</td>
<td>1:8 000 1:4</td>
</tr>
<tr>
<td>0.5 NM</td>
<td>000</td>
</tr>
<tr>
<td>0.25 NM</td>
<td></td>
</tr>
</tbody>
</table>
D) Correct display to be used:

i) BASE-STANDARD-OTHER-CUSTUM --- DISPLAYS:

- The 'Base' display provides a minimal amount of information and represents data that cannot be removed from the display. As such, the base display does not provide enough information for safe navigation.

- The 'Standard' display incorporates the base display plus additional features to provide a more appropriate display for safe navigation (of note it does not include soundings).

- The 'All Other' display presents all layers of data and this provides too much information for effective navigation. This is because the volume of data shown clutters the display making it difficult to see safety critical information. Therefore, most manufacturers provide an extra display category, normally called 'custom' that allows the operator to configure their display to incorporate information between base and all other. Some systems also allow the saving of such displays so that the operator can customise displays for all environments such as pilotage, coastal, Open Ocean, anchoring etc., selecting them as and when required. However, due to the sheer volume of settings and configuration that is possible, it is recommended that check-off cards be produced to cover all environments. Remember, too much information is as dangerous as too little!
ii) Day/night settings:

The ambient lighting on the bridge varies between the extremes of bright sunlight, which washes out information on the display, and night, when the light emitted by the display has to be low enough that it does not affect the mariner's night vision. Because the ECDIS display uses emitted light, compared with reflected light for the paper chart, ECDIS must switch to a negative image of the chart at night, using a dark background in place of the white background of the paper chart, in order not to impair night vision.

Three predefined different colour schemes are therefore provided:

- Day (white background)
- Dusk (black background)
- Night (black background)

Before getting underway, prior taking over each watch and at regular intervals, checks shall be made to ensure that the correct settings are used for:

- Vessel's draft and air draft;
- Safety depths and safety contours;
- Alarm settings for Guard Zone, Targets and Route;
- Best scale selected

Position fixing:

The navigational officers must not become over-reliant on the ECDIS equipment. The ECDIS system tirelessly fixes and records ship position based upon the primary fixing system (GPS or DGPS). Additionally, ECDIS also offers high levels of confidence by fusing different fixing modes (GPS/visual/RIO) into one display. Manual fixing functionality is also provided, although some systems provide more functionality in this regard than others.

Estimated positions should be marked on the chart for each watch, well in advance. OOW to ensure that frequent checks are made of the ECDIS position fixing system by the use of other means available on board. Position fixing / monitoring should be carried out in accordance with Company procedures.
Such checks shall include:

- Parallel indexing and use of clearing bearings;
- Use of radar to check the accuracy of the charted position by comparing the location of the radar target against the charted symbol;
- Use of Radar Overlay function to counter check;
- Visual cross bearings;
- Echo sounder reading;

All above verification of position by other means shall be recorded in a position log.

Zones of confidence:

Zones of confidence exist as a separate layer that can be viewed when planning a route then switched off until needed again. Mariners don’t need to search the face of the chart to find the ZOC diagram as, when switched on, the information is visible throughout the entire ENC. The various ratings are shown using a system of stars — the higher the ZOC rating, the greater the number of stars. Unlike paper charts which use both bold italic and upright hairline soundings as further confidence indicators, ENCs use only upright characters. Instead, those “approximate” soundings shown as upright hairline characters on the paper chart are shown circled on the ENC. This is the international method for showing approximate soundings in ENCs. However, the use of continuous or broken contours has been carried over from the traditional paper chart. Additionally, every single feature and area in an ENC can also be interrogated to obtain additional information.

Colour coding defining safe and unsafe waters:

Different Colour coding exists as per the Specification of the Model, the officers need to familiarise with the ECDIS equipment on board and Set colours for Shallow and Deep waters accordingly.

1. CHART DATUM

Correct chart datum on the GPS is in use and there are no manual offset.

2. Other Items:

On vessels fitted with dual ECDIS, both ECDIS units should be in operation simultaneously and they should, whenever appropriate, be set as below:

- Close route monitoring with a zoom appropriate for the OOW to observe the immediate
situation in relation to the intended route and navigational dangers;

- Look ahead with a zoom level appropriate for the OOW to have a good overview of the route ahead and upcoming areas of interest.
- To avoid the possibility of confusion from the chart symbols being used in the ENC chart, one ECDIS unit may be set to display 'traditional symbols'.
- Normally the AIS overlay or ARP target overlay should be in use on at least one ECDIS unit.

- When the vessel is entering and leaving areas with RNC coverage, it may be prudent to display ENC on one of the ECDIS units while displaying RNC on the other and in order to enable a visual appreciation of any discrepancies in chart datum.

- Data input from the gyrocompass, speed log, Navtex, echo sounder and other electronic equipment should also be periodically monitored to ensure their accuracy.

8.22.7.5 Record Keeping:

The ECDIS does keep an electronic copy of all events and with further development in storage time and presentation; it may in the future be used as an electronic logbook. For the time being and in awaiting this development, the Master is to ensure that the normal hard copy paper logbook is being maintained as required. All above verification of position by other means shall be recorded in a position log.

Inventory of ENC permits shall be maintained along with ADP update certificates.

8.22.8 RESPONDING TO ECDIS FAILURES

Vessels equipped with dual ECDIS must strictly follow the following in the event that one or both ECDIS fails to operate. In order that the vessel can reach her port of destination, emergency BA Charts for voyage should be provided on board (for vessels fitted with dual ECDIS) must be consulted. These BA Paper Chart should cover Trading areas, in which, vessel could still continue her voyage until she reaches her port of destination wherein she could have the appropriate scale of charts and necessary services. These paper charts must be maintained up-to-date and ready for use at any time.

8.22.8.1 Ordering of electronic charts:

The Master is responsible in ordering the Electronic Charts needed for a particular voyage. The most cost efficient way of ordering is chart by chart with minimum allowed period of subscription. Company use different chart agents based on the maker of ECDIS. This is to ensure immediate response in processing the permits and licenses of electronic charts. It will also ensure an immediate action in providing technical support in the event that a system error may arise in installing and updating of charts.
ENC anomalies such as missing buoyed channels, navigational marks, TSSs, etc. which are shown on the paper charts but missing from ECDIS displays are being reported. The anomalies persist even after removal of filters/adjustment of settings. It has been observed that such anomalies are few but are largely present in ENCs whose source information is from lesser renowned Hydrographic offices.

If and when any anomalies are noticed, they should be reported to the UKHO (copy to FSMHK) using the form given at the end of the chapter with supporting evidences such as screen snapshots. This feedback is vital to the current efforts to make the ENCs fool-proof.

**8.22.9 UPDATING CHARTS IN ECDIS**

Electronic chart correcting is carried out by inserting an updating disk in the PC or uploading correction files through the web. Refer to NP 294 “How to keep your admiralty product up to date” section 2 chapter 8 for more information.

There are many drawbacks for T&P display on ECDIS.

- Not all ENC suppliers provide any additional service for T&P’s on ENC. Admiralty has started T&P service as Information Overlay since Nov 2010.

- 2) Overlay requires compatible ECDIS equipment.

- Most ECDIS equipment installed prior to 2011 will require an upgrade. Even on these, T&P information may be displayed in an unfamiliar format that has to be interrogated to reveal its content as different ECDIS manufacturers use different ways to display on the screen. Refer to NP 294 “How to keep your admiralty product up to date” section 2 chapter 9 for more information.

As a company policy, all vessels with ECDIS as primary navigation will be supplied with weekly Notices to Mariners. Second officer shall:

- Check manually each T&P (not required if Information Overlay service is available)

- Maintain record for each T&P and apply on voyage ENC. If not applied, then appropriate comments made, so that this can be readily referenced and used.

**RNC updating**

- Updates can be supplied as complete refreshed images or as patches (tiles or areas) that the RCDS can superimpose on the original RNC. The latter method is normally used as this minimises the amount of data to be provided;
Updates are provided in line with those made available for the equivalent paper chart; &

Most RNC services currently rely on CD as the transfer media; however electronic courier services are now being established to allow mariners to download selected chart updates.

8.22.10 MAINTENANCE OF ECDIS

Second officer is responsible for the update and maintenance of ECDIS equipment available on board. ECDIS will be considered as Critical equipment for ships with dual ECDIS and approved for paperless navigation.

He is also responsible of proper inventory Management of all ENC units.

8.22.10.1 Virus control:

Please follow instruction with regard to Virus control as mentioned in Specific ECDIS Manual, Officers should understand virus control is very important as in any computer and to use only designated Flash drives /CD's in the system for Updating.

8.22.11 LIMITATIONS OF ECDIS

Over Reliance:

The ECDIS may appear to be a fantastic tool, but this new equipment also has its own drawbacks and pitfalls, all of which may not have been seen yet. For the purpose of using ECDIS within the Company for improving safety and efficiency, the following must be considered:

- All positions in an ECDIS are based on GPS. This means it is vulnerable to GPS errors such as chart datum, multipath or GPS system errors or jamming. The Master and the Navigational Officers must consequently use all available means to check the GPS position at frequent intervals;

- Use the appropriate scale and proper settings including display settings, draft settings and alarm settings

- Ensure ENCs are corrected to latest update CDs

- T&P corrections are checked on ships without Admiralty Information Overlay feature

- Practice the use of all functions and features of the ECDIS and ENC charts whenever it is safe, and make use of the second ECDIS in a different mode than that on the first one ECDIS in order to benefit from look ahead as well as learning by comparing;

- Maintaining overview of where you are and what lies ahead of the vessel by proper use of the zoom and scroll function;

- AIS and ARPA targets may be overlaid to improve situational awareness, but these
overlays may also clutter the screen to a point where other vital data is obscured. Both the AIS and the ARPA have their own limitations, so not all targets will be detected or displayed. Make use of all available means, including visual means whenever possible:

- Set up and use all the safety features of the ECDIS in ENC charts. This may give you an early warning of upcoming shallow waters, TSS boundaries, overhead cables etc.;

- Create and use 'user layers' to improve the safety of RNC charts;

- Create and use ‘Mariner Notes’ as a mean to highlight things that were previously written on the paper chart;

- Last but not least - don't forget that you are an officer and a sailor. Use good seamanship all the time and learn to master the equipment, don't let the equipment master you.

The accuracy of charts has not improved significantly. Much of the data of any chart, be it ENC or RNC, is still based on surveys and data more than 50 years old. Therefore, stay in the main fairways, maintain minimum UKC required by company and use good seamanship while navigating the vessel.

**8.22.12 CALLING MASTER:**

Master should be informed immediately at least in the following cases:-

i) Failure or Malfunction of ECDIS or any of its sensors (including error in primary position system i.e. between two GPS).

ii) Any doubt with regards to accuracy of chart or available data.

iii) If license of ENC has expired during the watch.

iv) Any special instruction by Master.

v) If in doubt of any sort with regards to safety of navigation.

**8.22.13 Hydro graphic Note:**

Below mentioned is Hydrographic Note on the ECDIS and reporting requirement Admiralty Charts, ENCs and Nautical Publications and reporting ENC display issues.
## HYDROGRAPHIC NOTE

Forwarding information for Admralty Charts, ENCs and Nautical Publications and reporting ENC display issues

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<table>
<thead>
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<th>GPS</th>
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<th>Admiralty Charts affected</th>
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<tr>
<th>Latest Weekly Edition of Notice to Mariners held</th>
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<tr>
<th>Replacement copy of Chart No ENCs affected</th>
<th>Week</th>
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<table>
<thead>
<tr>
<th>Date of latest supplement page 8 Light List No. etc. Details:</th>
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<table>
<thead>
<tr>
<th>Signature of observer/reporter</th>
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<table>
<thead>
<tr>
<th>Tick box if not willing to be named as source of this information</th>
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</table>
INSTRUCTIONS:

1. Mariners are requested to notify the United Kingdom Hydrographic Office (UKHO) (by mail: SDRA, UKHO, Admiralty Way, Taunton, Somerset, TAI 2DN, United Kingdom or by email: hdcfiles@ukho.gov.uk) when new or suspected dangers to navigation are discovered, changes observed in aids to navigation, or corrections to publications are seen to be necessary. Mariners can also report any ENC display issues experienced. The Mariner's Handbook (NP 100) Chapter 4 gives general instructions. The provisions of international and national laws should be complied with when forwarding such reports.

2. This form and its instructions have been designed to help both the sender and the recipient. It should be used, or followed closely, whenever appropriate. Copies of this Form may be obtained gratis from the UKHO at the above address, or from Admiralty Chart Agents (see Annual Notice to Mariners No. 2). This form is also available on the web: www.ukho.gov.uk/msi

3. Accurate position or knowledge of positional error is of great importance. Latitude and longitude should only be used to specifically position the details when they have been fixed by GPS or Astronomical Observations. A full description of the method, equipment, time, estimated error and datum (where applicable) used should be given. When position is defined by sextant angles or bearings (true or magnetic to be specified), more than two should be used in order to provide a redundancy check. Where position is derived from Electronic Position Fixing (eg LORAN C) or distances observed by radar, the raw readings of the system in use should be quoted wherever possible. Where position is derived after the event, from other observations and/or Dead Reckoning, the methodology of deriving the position should be included.

4. Paper Charts: A cutting from the largest scale chart is the best medium for forwarding details, the alterations and additions being shown thereon in red. When requested, a new copy will be sent in replacement of a chart that has been used to forward information, or when extensive observations have involved defacement of the observer's chart. If it is preferred to show the amendments on a tracing of the largest scale chart (rather than on the chart itself) these should be in red as above, but adequate details from the chart must be traced in black ink to enable the amendments to be fitted correctly.

ENCs: A screen shot of the largest scale usage band ENC with the alterations and additions being shown thereon in red. If it is to report an issue with the display of an ENC, a screen shot of the affected cell should be sent along with details of the ECDIS make and version in use at the time.

5. When soundings are obtained The Mariner's Handbook (NP 100) should be consulted. The echo sounding trace should be marked with times, depths, etc., and forwarded with the report. It is important to state whether the echo sounder is set to register depths below the surface or below the keel; in the latter case the vessel's draught should be given. Time and date should be given in order that corrections for the height of the tide may be made where necessary. The make, name and type of set should also be given.

6. For modern sets that use electronic ‘range gating’, care should be taken that the correct range scale and appropriate gate width are in use. Older electro- mechanical echo sounders frequently record signals from echoes received back after one or more rotations of the stylus have been completed. Thus with a set whose maximum range is 500m, an echo recorded at 50m may be from depths of 50m, 550m or even 1050m. Soundings recorded beyond the set's nominal range can usually be recognised by the following:
(a) the trace being weaker than normal for the depth recorded;
(b) the trace passing through the transmission line;
(c) the feathery nature of the trace.

As a check that apparently shoal soundings are not due to echoes received beyond the set's nominal range, soundings should be continued until reasonable agreement with charted soundings is reached. However, soundings received after one or more rotations of the stylus can still be useful and should be submitted if they show significant differences from charted depths.

7. Reports which cannot be confirmed or are lacking in certain details should not be withheld. Shortcomings should be stressed and any firm expectation of being able to check the information on a succeeding voyage should be mentioned.

8. Reports of shoal soundings, uncharted dangers and aids to navigation out of order should, at the mariner's discretion, also be made by radio to the nearest coast radio station. The draught of modern tankers is such that any uncharted depth under 30 metres or 15 fathoms may be of sufficient importance to justify a radio message.

9. Changes to Port Information should be forwarded on Form H.102A and any GPS/Chart Datum observations should be forwarded on Form H.102B together with Form H.102. Where there is insufficient space on the forms an additional sheet should be used.

10. Reports on ocean currents should be made in accordance with The Mariner's Handbook (NP 100) Chapter 4.

Note. - An acknowledgement or receipt will be sent and the information then used to the best advantage which may mean immediate action or inclusion in a revision in due course; for these purposes, the UKHO may make reproductions of any material supplied. When a Notice to Mariners is issued, the sender's ship or name is quoted as authority unless (as sometimes happens) the information is also received from other authorities or the sender states that they do not want to be named by using the appropriate tick box on the form. An explanation of the use made of contributions from all parts of the world would be too great a task and a further communication should only be expected when the information is of outstanding value or has unusual features.
8. 23 BRIDGE NAVIGATIONAL WATCH ALARM SYSTEM (BNWAS)

8.23.1. Bridge Navigational Watch Alarm Systems (BNWAS), where fitted, must be in operation at all times when the vessel is at sea (including period at anchorage) and underway. (SOLAS V 19.2.2.3)

8.23.2. Operating modes of BNWAS may vary depending upon the equipment fitted on board. However, generally a BNWAS interfaced with vessel’s Auto Pilot system and fitted with three modes, viz. “Auto, On and Off” should be operated on the respective modes as per guidelines below:

**Auto Mode:** If Automatic mode is available, same SHOULD NOT be used

**Manual ON:** At all times except when vessel is alongside, in Dry dock or at a repair facility

**Manual OFF:** May be engaged once the vessel is alongside, in Dry dock or at a repair facility

The means for selecting the operational modes and the duration of the dormant period are security protected. The access to these security controls, example password or key, should be restricted to the Master only.

The BNWAS must be tested monthly to ensure correct operation and the results of the tests recorded in the Deck Operations Log.

Any time BNWAS is switching ON/OFF entries to be made in Bell book or in deck log book.