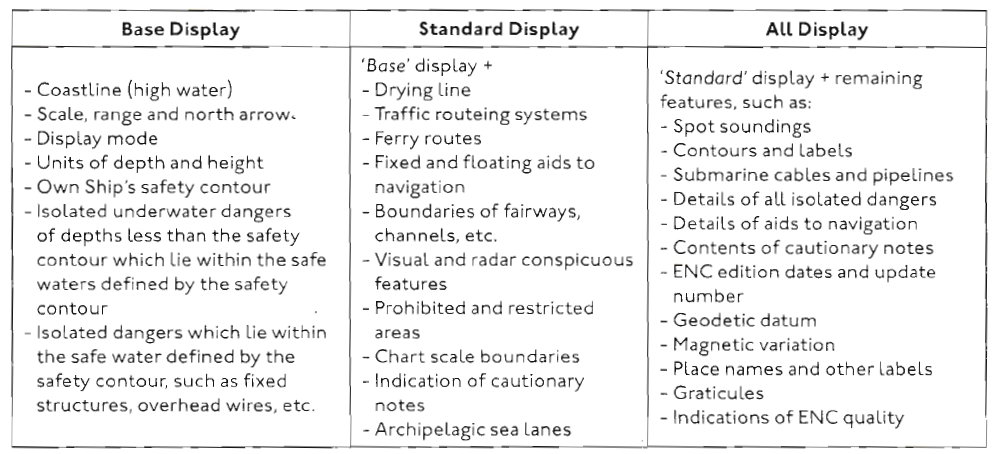
1. **Electronic Navigational Chart (ENC)**

* 1. When used in an ECDIS, the ENCs content can be displayed as a seamless pattern in user selected scales presenting user selected chart items.
  2. ENC are layered with digital information enabling the mariner to electronically interrogate features on the chart such as buoys, navigational marks, traffic separation schemes (TSS) and safety contours with detailed information displayed for the user.
  3. They do not distort the chart display when the scale is reduced
  4. The chart display may be rotated also to match course-up and still display text and symbols right
  5. ENCs enable the ECDIS to set different types of navigational alarms to act as a visual and/or audible warning to the mariner such as:
     1. hazards as shallow depths, shoals and isolated dangers, minimum under-keel clearance (provided the ship’s echo sounder is integrated with the ECDIS and the draught details specified)
     2. approaching waypoints and alteration of course points, position fixing reminders
  6. If unofficial data (ECS) is displayed on ECDIS, its boundaries are identified by a special line style - a “one-sided” RED line with the diagonal stroke on the side of the line containing the unofficial data and warning similar to the following: “No official data available. Refer to the paper chart”
  7. **Datums:**
     1. Horizontal Datum - Defines the datum used to quote the geographical positions of all features in the ENC data. All ENCs are based on WGS84, as used by GNSS like GPS
     2. Sounding Datum - Defines the datum used to quote the depths of water, and includes drying heights in the inter-tidal area. The zero point on this datum defines the boundary between the blue and green inter-tidal areas of the chart
        + - When determining the UKC (under-keel clearance), only the sounding datum added to the height of the tide needs to be considered
          - See [Fleet Ops](http://srv-glas301:82/Leisure/content/parent%20category%20topics/procedures%20and%20operations/fleet_ops.htm) > [4.0 Marine Operations](http://srv-glas301:82/Leisure/content/parent%20category%20topics/procedures%20and%20operations/deck_operations.htm) > [4.1 Navigational Operations](http://srv-glas301:82/Leisure/content/vessel%20management%20system/fleet%20ops/marine%20operations/navigational%20operations.htm) > 4.1.4 Bridge (Team) Resource Management for requirements on UKC
     3. Vertical Datum - Defines the datum used to quote the heights and elevations of physical features, such as lights, and includes the vertical clearances for overhead obstructions like cables and bridges
        + - When determining overhead clearance, the difference between the vertical and sounding datums needs to be considered, with this difference added to the vertical clearance value quoted against the relevant chart feature (less the tide) in order to determine the  
            actual overhead clearance.
          - See [Fleet Ops](http://srv-glas301:82/Leisure/content/parent%20category%20topics/procedures%20and%20operations/fleet_ops.htm) > [4.0 Marine Operations](http://srv-glas301:82/Leisure/content/parent%20category%20topics/procedures%20and%20operations/deck_operations.htm) > [4.1 Navigational Operations](http://srv-glas301:82/Leisure/content/vessel%20management%20system/fleet%20ops/marine%20operations/navigational%20operations.htm) > 4.1.4 Bridge (Team) Resource Management for requirements on overhead clearance
     4. Different ENC cells may have different vertical and sounding datums
        + - The details of which vertical and sounding datums have been used in each ENC cell should be available by looking at the 'General Information' display option of the ECDIS or in the information about the ENC cell available in the pick report

* 1. **Survey accuracy of ENC sources and precautions:**
     1. Depends on the survey frequency, time and method
     2. Areas which have been surveyed very accurately may lie adjacent to areas which have not
     3. Information about the accuracy of the survey data can be displayed for each ENC cell by the function CATZOC (Category of Zone of Confidence)
  2. **ENC Symbols:**
     1. ECDIS can display symbols in either traditional or simplified form
     2. All simplified point symbols are positioned on the centre of the feature
     3. All traditional point symbols are positioned using the base of the symbol
     4. Most simplified ENC symbols are more similar to the traditional paper chart symbols but some may be very different. The simplified symbols are mostly used for the display of beacons and buoys
  3. **Safety Settings / alarms:**
     1. The ECDIS “look ahead” function (also known as “watch vector”, “anti-grounding” or “guardzone” will then compare the set safety settings with the depth information in the ENC and will generate a warning if the safety settings will be exceeded.
        + **Guard Ring:** Size of monitoring sector can be adjusted to suit the prevailing navigational situation. Any navigational hazard entering this zone will trigger an alarm.
        + **Guard Vector:** Initiates an alert when an obstruction is encountered on the vessel’s heading. The vector length must be set appropriately in relation to the vessel’s speed and proximity of navigational hazards.
        + **Waypoint Approach**: Provided that the manoeuvring or handling parameters of the vessel are correctly entered, the system will draw the voyage plan through the waypoints but will mark on the chart the wheel-over positions and will show the expected radius of turn. The navigator must remember that the vessel will follow the radius of the turn and not necessarily go through the geographical waypoint; this is particularly relevant if the autopilot is integrated with the ECDIS and operating in Track Control\* mode
        + **Off-course –** to be set as per Master’s instruction
        + **Special Areas:** traffic separation zone, recommended traffic lane, Restricted Area, Anchoring Area, Anchoring Prohibited Area, Territorial Sea Area, Harbour Limit, Military Practice Areas, and Specially Protected Areas etc) will trigger an alert when a safety zone violation is detected.
     2. **Safety Contour**
        + The Safety Contour provides a visible and alarm boundary with respect to the depth of available water.
        + When representing the chart display the ECDIS software will then draw the next available deeper depth contour. Ie if a value of 6m is set, the next available contour is 10m which will be drawn in bold line style and waters shallower of 10m will be highlighted.
        + The ECDIS should inform for each ENC cell if the safety contour value is available and /or default to the next deeper contour. (If no value is set, the ECDIS will default to 30 metres)
        + Once the safety contour is set it may be permissible for the vessel to cross it if the mariner is fully aware of the depth of the surrounding water , the display is populated with spot soundings and isolated dangers and if “No go Areas” are annotated on the screen (using the “Add Info” function)
     3. **Safety depth:**
        + In order to provide an improved visualisation, the mariner is usually able to set a safety depth value independently of the safety contour value. The ECDIS will then use this value to control the display of the sounding information contained in the ENC data. Any (spot) sounding with a value equal to, or less than, the safety depth value entered by the operator will be displayed in bold to make them more prominent.
        + The Safety depth will provide an alarm when reached
     4. **Height Alarm (if fitted)**
        + The alarm setting for the height alarm should be set to the final air draft plus minimum clearance (typically 1.0 m) as specified in [Fleet Ops](http://srv-glas301:82/Leisure/content/parent%20category%20topics/procedures%20and%20operations/fleet_ops.htm) > [4.0 Marine Operations](http://srv-glas301:82/Leisure/content/parent%20category%20topics/procedures%20and%20operations/deck_operations.htm) > [4.1 Navigational Operations](http://srv-glas301:82/Leisure/content/vessel%20management%20system/fleet%20ops/marine%20operations/navigational%20operations.htm) > 4.1.4 Bridge (Team) Resource Management for air draft/overhead clearance
     5. **Cross track error (XTE)**
        + The voyage plan check function only flags up hazards within the intended footprint of the passage.
        + Alerts will not be activated for navigational hazards outside of the XTE track lines
     6. **Isolated danger**



* + - * This symbol could represent various types of underwater features (wrecks, rocks, and obstructions (wellheads, fish havens and diffusers) that are submerged) which may pose a danger to navigation.
      * The symbol is displayed where one of the above features has a depth less than or equal to the safety contour value and is in the deeper waters beyond the safety contour (i.e. it is a hazard to navigation located in otherwise 'safe waters'). It is NOT applied to soundings.
  1. **ENC Display colour palettes**
     1. Different palettes of colours may be used in different ambient lighting such as day, dusk and night
     2. ECDIS display different colour schemes for depth of water, land and objects for the above modes
     3. The following settings are recommended to optimize clarity of the display:
        + The safety contour is to be set, rather than left to default to 30m as features behind the safety contour, like buoys and depth contours, may become more difficult to see
        + The use of four depth shades reduces the contrast difference between adjacent depth areas. This may make it more difficult to distinguish between safe and unsafe waters under certain lighting conditions, particularly at night where its use is not recommended
  2. **Soundings**
     1. Soundings are not currently included as part of the ECDIS 'Standard' display mode (see below), and so are not displayed when using this default mode. This includes soundings which are shallower than the entered safety depth. Soundings must therefore be switched on manually by the ECDIS operator.
     2. Most ECDIS types have alarm functions which are not sensitive to soundings. The look-ahead watch vector will therefore not trigger an alarm if it crosses one of these shoal depths.
  3. **ENC Display modes**
     1. ENC display different layers of information, much of it can be selected by the user
     2. The table below is a guide of the available features in each display mode:



* + 1. Base display (a subset of Standard display) – the very minimum level of information, NOT sufficient / intended for safe navigation (some ECDIS may not allow switching to it)
    2. **All Information display:**
       - This display mode presents all of the information available in the ENC data
       - To assist the mariner, most ECDIS manufacturers either allow for display features to be removed from the “All information” display or added to the “Standard display”
    3. **The voyage plan (SAF09) must include a list of settings required for each phase:** 
       - Example:

| **Scenario** | **Standard Display plus additional layers:** | **Other considerations:**  (XTE = cross track error) |
| --- | --- | --- |
| **Deep Sea** | **Spot Soundings to a depth of 2000m**  Details of isolated dangers | **Max XTE 3704m (2nm)** |
| **Coastal** | **Spot Soundings to a depth of 100m**  Details of isolated dangers  Ferry routes  Details of aids to navigation  Contents of cautionary notes | **Max XTE 926m (0.5nm)** |
| **Anchoring** | **Spot Soundings to a depth of 50m**  Details of isolated dangers  Submarine cables and pipelines  Contents of cautionary notes | **Max XTE 1852m (1nm)** |
| **Pilotage** | **Spot Soundings to a depth at least equal to the value of the Safety Contour**  Details of isolated dangers  Contents of cautionary notes | **Max XTE 185m (0.1nm)** |

* 1. **ENC Pick Report / feature object**
     1. There are some 170 classes of “feature object” (real world objects) defined in and some ECDIS display their codes when a feature pick report is used
     2. Different ENC producers however may display the same real world object differently
  2. **ENC Cells**
     1. ECDIS is actually made if series of individual files known as “ENC cells”
     2. Producers sell ENC cells individually or a number of neighboring cells in a single package referred to an “ENC unit” or “folio”
     3. Cells are numbered using a unique 8 character code (producer code, navigational purpose and a name) and with a three character file extension
     4. Not all ECDIS display the file type extension
     5. Not all ECDIS display the cell limits on a screen
     6. It is not always possible to produce a perfect join in the data coverage between two adjacent ENC cells. This will leave very small gaps in ENC coverage, often representing only a couple of metres in the real world.
     7. These small gaps may trigger warning indicators
  3. **ENC Scale**
     1. It is quite common for the ENC compilation scale to be set to a slightly larger scale than the equivalent paper chart like this in order to reduce display clutter
     2. An ENC displayed at the same scale as the equivalent paper chart will tend to look more cluttered because:
        + The ECDIS has to follow rules on minimum sizes when drawing symbols and text
        + The ECDIS display is drawn dynamically leading to an unpredictable placement of text information
     3. When zooming in and out caution must be exercised when displaying two adjacent ENC cells of different scales on the screen at the same time
     4. **Zooming In:**
        + The apparent precision of the chart display and the overlaid ship's position from GNSS like GPS can give a very misleading impression of accuracy
        + The ability of ECDIS to zoom in to a scale larger than the compilation scale of the paper chart, whilst displayed symbols stay the same size, can give a false sense of sea room and safety
        + The 'over scale area' warning symbol should only appear as a result of automatic over scaling performed by the ECDIS when matching adjacent ENC cells at different compilation scales.
        + ENC data is compiled to be used at a certain scale, and the accuracy of the compilation is appropriate for this scale. Over zooming could be dangerous as it implies that the data is more accurate and could therefore be inappropriately used for a purpose for which it was not intended
     5. **Zooming Out and SCAMIN:**
        + Where it is likely that an ENC cell may be required to be used at smaller scales in certain situations, the Scale Minimum attribute (SCAMIN) may be used which allows defining the minimum display scale at which individual features with greater navigational significance (as determined by the ENC producer) to remain on display. If the ECDIS is zoomed out beyond this scale, it will no longer display the feature, and therefore reduce clutter
        + Different ENC producers apply different approaches to SCAMIN, and in some cases SCAMIN will not be used
        + Some ECDIS allow the operator to select whether or not the ECDIS will apply the available SCAMIN values to filter the ECDIS display
     6. If two adjacent ENC Cells have been applied different scale (incl. SCAMIN) approaches, the user will notice inconsistencies in the density of data appearing as the display scale is changed

1. **Raster Navigational Chart (RNC) (or Raster Chart Display System (RCDS)** 
   1. A RNC has no intelligence and other than visually, cannot be interrogated for additional information
   2. RNCs can have different horizontal datum (and a correction to WGS-84/GNSS like GPS datum may need to be applied)
   3. They may also display depth in fathoms and not meters (so ECDIS may need to be configured for correct unit)
   4. Navigational data layers cannot be applied or filtered out
2. **Monthly Contingency Drills for ECDIS to be held and recorder per the guidance below:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Scenario/Actions** | **GNSS /GPS Input Failure** | **Speed Log Input Failure** | **Gyro Input Failure** | **Primary ECDIS Failure** | **Failure of Secondary Means of Navigation** |
| Inform Master | http://www.aluminumtrailer.com/images/tick_black.png | tick_black | tick_black | tick_black | tick_black |
| Engage hand steering | tick_black |  | tick_black | tick_black | tick_black |
| Inform E/R | tick_black | tick_black | tick_black | tick_black | tick_black |
| Prepare engines for manoeuvring | tick_black | tick_black | tick_black | tick_black | tick_black |
| Fix vessels position | tick_black | tick_black | tick_black | tick_black | tick_black |
| Take action to manoeuvre ship away from danger | tick_black |  | tick_black | tick_black | tick_black |
| Prepare for anchoring if in shallow water | tick_black |  | tick_black | tick_black | tick_black |
| Broadcast URGENCY message to ships in vicinity | tick_black |  | tick_black | tick_black | tick_black |
| Modify AIS status | tick_black |  | tick_black | tick_black | tick_black |
| Inform VTS or port authority if in coastal waters | tick_black |  | tick_black | tick_black | tick_black |
| Radars/ECDIS to Head Up mode |  |  | tick_black |  |  |
| Steer by magnetic heading |  |  | tick_black |  |  |
| Change speed input to Speed Over Ground (SOG) |  | http://www.aluminumtrailer.com/images/tick_black.png |  |  |  |
| Change-over to Back-up ECDIS |  |  |  | tick_black |  |
| Use alternate GNSS position or engage DR Mode | tick_black |  |  |  |  |
| Notify DPA | http://www.aluminumtrailer.com/images/tick_black.png | http://www.aluminumtrailer.com/images/tick_black.png | http://www.aluminumtrailer.com/images/tick_black.png | http://www.aluminumtrailer.com/images/tick_black.png | http://www.aluminumtrailer.com/images/tick_black.png |
| **Other actions:** |  |  |  |  |  |
|  |  |  |  |  |  |