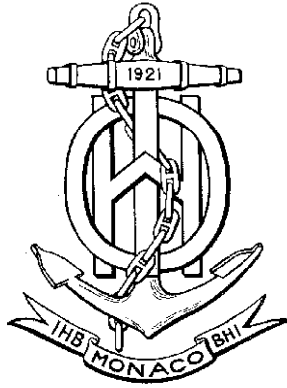# INTERNATIONAL HYDROGRAPHIC ORGANIZATION

IHO UNIVERSAL HYDROGRAPHIC DATA MODEL

Draft – March 2016

Special Publication No. 101
Electronic Navigational Chart Product Specification

Appendix A
Data Classification and Encoding Guide

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MONACO

CONTENTS

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Document Control

Version	Version Type	Date	Approved By	Signed Off By	Role
0.0.0	Editing Committee Draft	Xxx 2014	TSMAD		TSMAD Chair
0.0.1	Draft Document		TSMAD		TSMAD Chair
0.0.2					

3.11 Update information

IHO Definition: **UPDATE INFORMATION**. The Update Information <u>metadata</u> feature is used to represent a change to the information shown.

S-101 Metadata Feature: Update information

Primitives: Point, Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Update description			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text			(S) TE	1,1
Update reference			TE	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Comment [AHO48]: Refer proposal from SNPWG 13/12/14 (Jens – TSMAD29/DIPWG7-10.3E). (AA853533). Approved subject to further consultation with NIPWG. Will also need to amend the Attributes Section.

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Association	Updated Information	Updates	All Geo Features	0,*

<u>INT 1 Reference:</u>

3.11.1 Update information

If it is required to encode information about changes made to ENC data it must be done using **Update Information**. This feature must be encoded to cover the extent of changed data incorporated in the SENC via ENC Updates (ER Application Profile), and may also be used to indicate changes introduced in ENC New Editions. It carries information about the changes. **Update Information** may be associated with features which have changed using the association **Updated Information** (see clause X.X).

<u>Remarks:</u>
- The mandatory attribute **update description** must be used to provide a brief textual description of the changes to the dataset included in the Update. If a more detailed description of the Update is required, this should be encoded using an associated instance of the information type **Supplementary Information** (see clause X.X), complex attributes **information** or **textual description**.
- The attribute **update reference** may be used to indicate the related paper chart notice to mariner's number.
- At each new edition of an ENC cell **Update Information** features which are no longer relevant must be deleted.
- Where information has been deleted from an ENC the **Update Information** feature should cover the extent of the deleted information.

<u>Distinction:</u> Information area; caution area.

5.15   Slope topline

<table>
<tr><td colspan="6">IHO Definition: SLOPE TOPLINE. The upper marking of a slope, e.g. the ridge line or the separation line between two different gradients. (S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.160, November 2000).</td></tr>
<tr><td colspan="6">S-101 Geo Feature: Slope topline (SLOTOP)</td></tr>
<tr><td colspan="6">Primitives: Curve</td></tr>
<tr><td colspan="2">Real World</td><td colspan="2">Paper Chart Symbol</td><td colspan="2">ECDIS Symbol</td></tr>
</table>

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of slope	(CATSLO)	1 : cutting 2 : embankment 3 : dune 4 : hill 6 : cliff 7 : scree	EN	0,1
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 6 : yellow 7 : grey 8 : brown 11 : orange 13 : pink	EN	0,*
Elevation	(ELEVAT)		RE	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Nature of surface	(NATSUR)	4 : sand 5 : stone 6 : gravel 7 : pebbles 9 : rock 11 : lava	EN	0,*
Radar conspicuous	(CONRAD)		BO	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: prominent

Deleted: not visually conspicuous

INT 1 Reference: C 3; D 14, 15

5.15.1 Slope topline (see S-4 – B-312.1; B-363.2 and B-364.1)

If it is required to encode the upper marking of a prominent or visually conspicuous land slope, it must be done using the feature **Slope Topline**.

Remarks:
• No remarks.

Distinction: Land elevation; sloping ground.

6.2   Building, single

<table>
<tr><td colspan="6">IHO Definition: BUILDING. A free-standing self-supporting construction that is roofed, usually walled, and is intended for human occupancy (for example: a place of work or recreation) and/or habitation. (Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2010).</td></tr>
<tr><td colspan="6"><u>S-101 Geo Feature:</u> Building (BUISGL)</td></tr>
<tr><td colspan="6"><u>Primitives:</u> Point, Surface</td></tr>
<tr><td colspan="2"><i>Real World</i></td><td colspan="2"><i>Paper Chart Symbol</i></td><td colspan="2"><i>ECDIS Symbol</i></td></tr>
</table>

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Building shape	(BUISHP)	5 : high-rise building 6 : pyramid 7 : cylindrical 8 : spherical 9 : cubic	EN	0,1
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	0,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes 4 : squared 5 : stripes (direction unknown) 6 : border stripe	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 5 : planned construction	EN	0,1
Elevation	(ELEVAT)		RE	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Function	(FUNCTN)	2 : harbour-master's office 3 : custom office 4 : health office 5 : hospital 6 : post office 7 : hotel 8 : railway station	EN	0,*

		9 : police station 10 : water-police station 11 : pilot office 12 : pilot lookout 13 : bank office 14 : headquarters for district control 15 : transit shed/warehouse 16 : factory 17 : power station 18 : administrative 19 : educational facility 20 : church 21 : chapel 22 : temple 23 : pagoda 24 : Shinto shrine 25 : Buddhist temple 26 : mosque 27 : marabout 28 : lookout 29 : communication 30 : television 31 : radio 32 : radar 33 : light support 34 : microwave 35 : cooling 36 : observation 37 : timeball 38 : clock 39 : control 40 : airship mooring 41 : stadium 42 : bus station 43 : passenger terminal building 44 : sea rescue control 45 : observatory 46 : ore crusher 47 : boathouse 48 : pumping station		
Height	(HEIGHT)		RE	0,1
Multiplicity of features			C	0,1
Multiplicity known			(S) BO	1,1
Number of features			(S) IN	0,1
Nature of construction	(NATCON)	1 : masonry 2 : concreted 6 : wooden 7 : metal 8 : glass reinforced plastic (GRP) 12 : glass	EN	0,*
Status	(STATUS)	4 : not in use 7 : temporary 8 : private 12 : illuminated 13 : historic 14 : public	EN	0,*
Radar conspicuous	(CONRAD)		BO	0,1
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1

Deleted:

Deleted: DA

Vertical clearance fixed				C	0,1
Vertical clearance value	(VERCLR)			(S) RE	1,1
Vertical uncertainty	(VERACC)			(S) RE	0,1
Vertical datum	(VERDAT)		3 : Mean sea level 16 : Mean high water 17 : Mean high water springs 18 : High water 19 : Approximate mean sea level 20 : High water springs 21 : Mean higher high water 24 : Local datum 25 : International great lakes datum 1985 26 : Mean water level 28 : Higher high water large tide 29 : Nearly highest high water 30 : Highest astronomical tide (HAT)	EN	0,1
Vertical length	(VERLEN)			RE	0,1
Visually conspicuous	(CONVIS)		1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Scale minimum	(SCAMIN)		See clause X.X	IN	0,1
In the water				BO	0,1

Deleted: prominent

Deleted: not visually conspicuous

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Composition	Structure/Equipment	Supported by	Equipment Features (see clause X.X)	0,*

INT 1 Reference: D 5-6, 8, 13; E 10.1, 10.3, 11, 13-18; F 51, 60-63

6.2.1   Buildings (see S-4 – B-325; B-328.1; B-362.2; B-370.3; B-370.5; B-372 and B-373.1-4)

Waterfront, landmark and some public buildings should be encoded precisely and individually on the larger maximum display scale ENC data. When representing buildings generally, forming urban and suburban areas, villages, and other built-up areas, the aim of the compiler must be to create the correct impression of the extent of the built-up area and the density of the buildings.

Within built-up areas, only waterfront, landmark, and certain public buildings of interest should be encoded individually.

Scattered buildings of no individual importance must be omitted when more than about 1 mile (or 2 kilometres) inland. Nearer the shore they may be generalised by encoding a few representative buildings, sufficient to give the correct impression of building density.

Public buildings, with the possible exception of Post Offices and Hospitals, are charted mainly as visual features or points of reference ashore, not for their interest for particular functions. Except where they could be useful landmarks for navigation, they should be encoded only on largest maximum display scale ENC data.

Buildings constructed as places of worship often form significant landmarks; their size and structure incorporating towers, spires, cupolas, etc often render them conspicuous. These buildings when known to be prominent or conspicuous should be encoded up to several miles inland, with sufficient information to enable them to be easily identified. When the maximum display scale for the ENC data permits, the building should be encoded as a surface feature with attention being drawn to any significant features (landmarks).

If it is required to encode a building (other than a landmark, tank or silo), it must be done using the feature **Building**.

Remarks:
- For landmarks, see clause X.X; for silos, tanks and water towers, see clause X.X. For common encoding combinations, see clause X.X.
- The feature association **Structure/Equipment** (see clause X.X) must only be used with **Building** features if the main purpose of the building is to act as an aid to navigation (e.g. a lighthouse).
- A ruined building should be encoded in the same way as the feature in good condition, but with attribute **condition** = 2 (ruined).
- For covered boathouses and other buildings that are located in or partially overlap the navigable water area, any associated features should be encoded as they exist in the "real world"; e.g. jetties as **Shoreline Construction**, pontoons as **Pontoon**, mooring posts as **Mooring/Warping Facility**. The roofed area may be covered by a **Building** feature of type surface, with attribute **function** = 47 (boathouse). If the service being provided by the structure is known, features **Small Craft Facility** (see clause X.X) or **Harbour Facility** (see clause X.X) may also be encoded.
- For buildings located in or over navigable water, the Boolean attribute **in the water** must be set to *True* to indicate that the feature is to be included in the ECDIS Base Display. Where such structures are located over the water it is not required to encode any supporting structures (e.g. piles, stilts).
- The complex attribute **vertical clearance fixed** must not be populated, unless the building is located over navigable water (i.e. attribute **in the water** set to *True*), e.g. for boathouses.
- When a building is shown as a surface, indicating its true shape, and it is required to encode a prominent feature such as a tower or spire that is part of the structure, two features must be created (see Figure below):
  - a **Building** feature of type surface for the main building,
  - a **Landmark** feature of type point for the prominent feature.
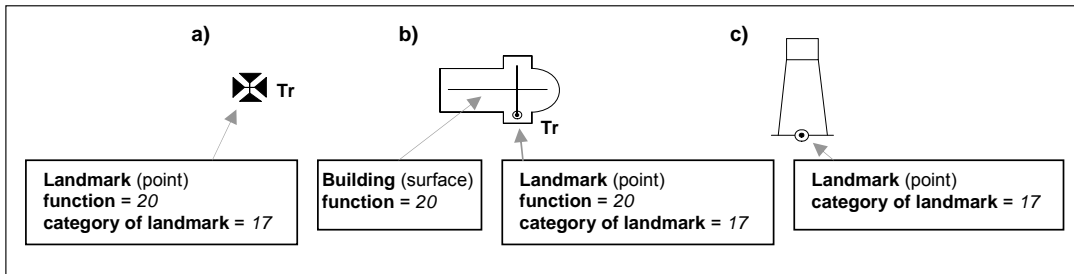
6.2.2 Harbour offices (see S-4 – B-325)

If it is required to encode a harbour office, it must be done using a **Building** feature, with the attribute **function** taking at least one of the values:

  2 - harbour-master's office
  3 - custom office
  4 - health office
  11 - pilot office

6.2.3 Transit sheds and warehouses (see S-4 – B-328.1)

If it is required to encode a transit shed or warehouse, it must be done using a **Building** feature, with attributes **function** = 15 (transit shed/warehouse), and if it is required, **feature name** (**name**) = name or number of the shed.

Distinction: Built-up area; coastguard station; landmark; rescue station; silo; tank.

6.3   Airport/airfield

IHO Definition: **AIRPORT/AIRFIELD**.   A defined area on land (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft. (Adapted from Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2010).

S-101 Geo Feature: Airport/airfield (AIRARE)

Primitives: Point, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of airport/airfield	(CATAIR)	1 : military aeroplane airport 2 : civil aeroplane airport 3 : military heliport 4 : civil heliport 5 : glider airfield 6 : small planes airfield 8 : emergency airfield 9 : search and rescue airfield	EN	0,*
Condition	(CONDTN)	1 : under construction 2 : ruined 3 : under reclamation 5 : planned construction	EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Status	(STATUS)	1 : permanent 2 : occasional 4 : not in use 5 : periodic/intermittent 6 : reserved 7 : temporary 8 : private 12 : illuminated 14 : public	EN	0,*
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: DA

INT 1 Reference: D 17

6.3.1   Airfields (see S-4 – B-366)

Airfields (or airports) within a few miles of the coast must be charted on larger and medium maximum display scale ENC data; they are significant to coastal navigation because of the many visual and audible features associated with them and the related air traffic.

For ENC data at larger maximum display scales, an airport should be encoded using a combination of the following features: **Airport/Airfield** (surface), **Runway** (surface or curve), **Building** (surface or point) and **Landmark** (surface or point). At least one **Airport/Airfield** or **Runway** must be in this set of features.

For ENC data at smaller maximum display scales, an airport should be encoded as an **Airport/Airfield** of type point.

<u>Remarks:</u>
- If individual buildings are visually conspicuous, they must be encoded as separate features.
- If it is required to encode the control tower, it must be done using a **Landmark** feature, with attributes **function** = *39* (control) and **category of landmark** = *17* (tower). If it is required to encode other buildings, this must be done using the feature **Building**.
- If it is required to encode a seaplane landing area, it must be done using the feature **Seaplane Landing Area** (see clause X.X).
- For navigational aids associated with air navigation, and air obstruction lights, see clauses related to navigational aids.

<u>Distinction:</u> Runway; seaplane landing area.

6.8   Conveyor

IHO Definition: **CONVEYOR**. A mechanical device for conveying bulk material or people using an endless moving belt or series of rollers. (Adapted from Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2010).

S-101 Geo Feature: Conveyor (CONVYR)

Primitives: Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of conveyor	(CATCON)	1 : aerial cableway (telepheric) 2 : conveyor 3 : flume 4 : lift/elevator	EN	0,1
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	0,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes 4 : squared 5 : stripes (direction unknown) 6 : border stripe	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 5 : planned construction	EN	0,1
Fixed date range			C	0,1
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1
Height	(HEIGHT)		RE	0,1
Lifting capacity	(LIFCAP)		RE	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1

Deleted: DA

Deleted: DA

Height	(HEIGHT)		RE	0,1
Multiplicity of features			C	0,1
Multiplicity known			(S) BO	1,1
Number of features			(S) IN	0,1
Product	(PRODCT)	4 : stone 5 : coal 6 : ore 10 : bauxite 11 : coke 12 : iron ingots 13 : salt 14 : sand 15 : timber 16 : sawdust/wood chips 17 : scrap metal 22 : grain 25 : clay	EN	0,1
Radar conspicuous	(CONRAD)		BO	0,1
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Status	(STATUS)	4 : not in use 12 : illuminated	EN	0,*
Vertical clearance fixed			C	0,1
Vertical clearance value	(VERCLR)		(S) RE	1,1
Vertical uncertainty	(VERACC)		(S) RE	0,1
Vertical length	(VERLEN)		RE	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Vertical datum	(VERDAT)	3 : Mean sea level 16 : Mean high water 17 : Mean high water springs 18 : High water 19 : Approximate mean sea level 20 : High water springs 21 : Mean higher high water 24 : Local datum 25 : International great lakes datum 1985 26 : Mean water level 28 : Higher high water large tide 29 : Nearly highest high water 30 : Highest astronomical tide (HAT)	EN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: DA

Deleted: prominent

Deleted: not visually conspicuous

<u>INT 1 Reference:</u> D 25

6.8.1   Conveyors (see S-4 – B-382.3)

If it is required to encode a conveyor, it must be done using the feature **Conveyor**.

The value of the vertical clearance between (high) water level and any fixed overhead obstruction must always be given, where known, on the largest maximum display scale ENC data intended for navigation under the obstruction, and for detailed passage planning. The datum above which clearances are given must be a high

water level, preferably Highest Astronomical Tide (HAT), where the tide is appreciable. The value for the vertical clearance must be encoded using the complex attribute **vertical clearance fixed**, and sub-attributes populated relevant to the feature, rounded down to the nearest whole metre (unless under 10m, when metres and decimetres may be quoted). In areas where the tidal range is not appreciable the datum above which clearances are given should be Mean Sea Level (MSL).

Remarks:
- If it is required to encode an overhead cable car, it must be done using a **Conveyor** feature, with attribute **category of conveyor** = *1* (aerial cableway (telepheric)).
- In navigable water, conveyor supports must be encoded, where possible, using a **Pylon/Bridge Support** feature (see clause X.X), with attribute **category of pylon** = *3* (aerial cableway/sky pylon).

Distinction: Cable, overhead; crane; pylon/bridge support.

7.2   Landmark

IHO Definition: **LANDMARK**. Any prominent object on land which can be used in determining a location or a direction. (IHO Dictionary – S-32).

S-101 Geo Feature: Landmark (LNDMRK)

Primitives: Point, Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of landmark	(CATLMK)	1 : cairn 2 : cemetery 3 : chimney 4 : dish aerial 5 : flagstaff (flagpole) 6 : flare stack 7 : mast 8 : windsock 9 : monument 10 : column (pillar) 11 : memorial plaque 12 : obelisk 13 : statue 14 : cross 15 : dome 16 : radar scanner 17 : tower 18 : windmill 19 : windmotor on land 20 : spire/minaret 21 : large rock (or boulder) on land 22 : triangulation mark 23 : boundary mark 24 : observation wheel 25 : torii	EN	1,*
Category of special purpose mark	(CATSPM)	16 : leading mark 17 : measured distance mark 41 : clearing mark	EN	0,*
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	0,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes	EN	0,1

		4 : squared 5 : stripes (direction unknown) 6 : border stripe		
Condition	(CONDTN)	1 : under construction 2 : ruined 4 : wingless 5 : planned construction	EN	0,1
Elevation	(ELEVAT)		RE	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Function	(FUNCTN)	2 : harbour-master's office 3 : custom office 4 : health office 5 : hospital 6 : post office 7 : hotel 8 : railway station 9 : police station 10 : water-police station 11 : pilot office 12 : pilot lookout 13 : bank office 14 : headquarters for district control 15 : transit shed/warehouse 16 : factory 17 : power station 18 : administrative 19 : educational facility 20 : church 21 : chapel 22 : temple 23 : pagoda 24 : Shinto shrine 25 : Buddhist temple 26 : mosque 27 : marabout 28 : lookout 29 : communication 30 : television 31 : radio 32 : radar 33 : light support 34 : microwave 35 : cooling 36 : observation 37 : timeball 38 : clock 39 : control 40 : airship mooring 41 : stadium 42 : bus station 43 : passenger terminal building 44 : sea rescue control 45 : observatory 46 : ore crusher 47 : boathouse	EN	0,*

Deleted:

		48 : pumping station			
Height	(HEIGHT)		RE	0,1	
Multiplicity of features			C	0,1	
Multiplicity known			(S) BO	1,1	
Number of features			(S) IN	0,1	
Nature of construction	(NATCON)	1 : masonry 2 : concreted 3 : loose boulders 6 : wooden 7 : metal 8 : glass reinforced plastic (GRP) 11 : latticed 12 : glass	EN	0,*	
Radar conspicuous	(CONRAD)		BO	0,1	
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1	**Deleted:** DA
Status	(STATUS)	2 : occasional 4 : not in use 5 : periodic/intermittent 7 : temporary 8 : private 12 : illuminated 13 : historic 14 : public	EN	0,*	
Vertical length	(VERLEN)		RE	0,1	
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	1,1	**Deleted:** prominent **Deleted:** not visually conspicuous
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1	
In the water			BO	0,1	**Comment [A59]:** Not sure about this. Is it a landmark if it is in the water? Also, we have modeled (at the moment) offshore wind motors as a category of offshore platform. There is now the potential to encode these two different ways.

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Composition	Structure/Equipment	Supported by	Equipment Features (see clause X.X)	0,*

INT 1 Reference: D 8; E 10.2-10.4, 22-31; L 11; Q 100

7.2.1   Buildings, landmarks, tanks, silos (see S-4 – B-373; B-373.6; B-374.3-7; B-375.1-2; B-456.2; B-487.3)

Depending on height and the topographic relief, structures considered to be landmarks should be encoded up to several miles inland.

Waterfront, landmark and some public buildings should be encoded precisely and individually on the larger maximum display scale ENC data. When representing buildings generally, including urban and other built-up areas, the aim of the compiler must be to create the correct impression of the extent of the built-up area and the density of the buildings.

If it is required to encode a landmark (other than a tank or silo), it must be done using the feature **Landmark**.

Remarks:
- For buildings, see clause X.X; for silos, tanks and water towers, see clause X.X. For common encoding combinations, see clause X.X. For offshore wind turbines, see clause X.X. For flare stacks on offshore platforms, see clause X.X.
- The feature association **Structure/Equipment** (see clause X.X) must only be used with **Landmark** features if the main purpose of the structure is to act as an aid to navigation (e.g. a lighthouse).
- A water tower must be encoded, where required, using the feature **Silo/Tank** (see clause X.X).
- A ruined landmark should be encoded in the same way as the feature in good condition, but with attribute

condition = *2* (ruined).

- Radio and television masts and towers are likely to be visible over long distances and should be encoded as landmarks, even when well inland. They will usually carry air obstruction lights.
- To aid identification of landmarks by the mariner it may be useful to add the height of the top of the structure above ground level (**vertical length**) or above the general height datum (**height**).
- Buildings constructed as places of worship often form significant landmarks; their size and structure incorporating towers, spires, cupolas, etc often render them conspicuous. These buildings when known to be prominent or conspicuous should be encoded up to several miles inland (see Figure below, examples (a) and (b).
- The attribute **category of special purpose mark** should only be used if the **Landmark** is used as the front or rear lead for a transit, clearing line or measured distance, or for a leading line. Values for **category of special purpose mark** such as *16* (leading mark), *17* (measured distance mark) or *41* (clearing mark) in particular should be used for these purposes. See also clause X.X.
- When a building is shown as a surface, indicating its true shape, and it is required to encode a prominent feature such as a tower or spire that is part of the structure, two features must be created (see Figure below):
  - a **Building** feature of type surface for the main building,
  - a **Landmark** feature of type point for the prominent feature.
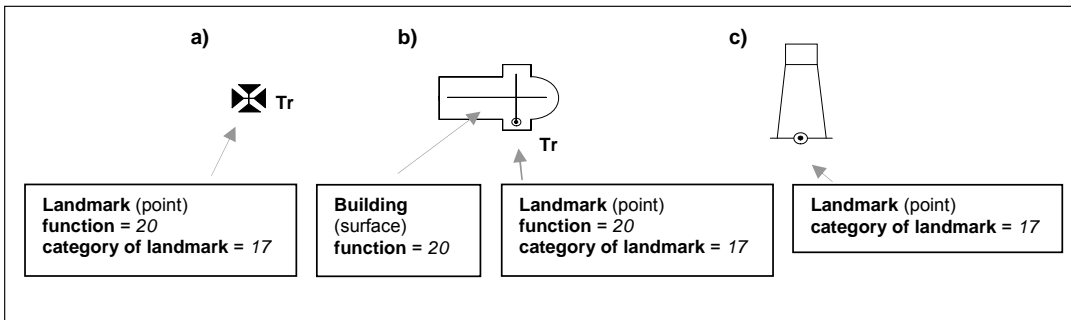
- Not all landmarks are visually conspicuous. If a feature is visually conspicuous (i.e. it is distinctly and noticeably visible from seaward), the attribute **visually conspicuous** must be encoded (see S-4 – B-340).

Distinction: Beacon special purpose/general; building single; daymark; pylon/bridge support; silo/tank; topmark.

7.4   Fortified structure

IHO Definition: **FORTIFIED STRUCTURE**. A structure that is specifically designed or reinforced to provide for defence from armed attack. (Adapted from Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2010).
S-101 Geo Feature: **Fortified structure (FORSTC)**
Primitives: Point, Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*	

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of fortified structure	(CATFOR)	1 : castle 2 : fort 3 : battery 4 : blockhouse 5 : fortified tower 6 : redoubt 8 : fortified submarine shelter 9 : rampart	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined	EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Height	(HEIGHT)		RE	0,1
Nature of construction	(NATCON)	1 : masonry 2 : concreted 3 : loose boulders 6 : wooden 7 : metal	EN	0,*
Radar conspicuous	(CONRAD)		BO	0,1
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Status	(STATUS)	4 : not in use 7 : temporary 8 : private 12 : illuminated 13 : historic 14 : public 28 : buoyed	EN	0,*
Vertical length	(VERLEN)		RE	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1
In the water			BO	0,1

Deleted: DA

Deleted: prominent

Deleted: not visually conspicuous

INT 1 Reference: E 34.1-3

7.4.1   Fortified structures (see S-4 – B-379)

Some coastlines have prominent defensive structures, often disused, decayed, or used for non-defence purposes. Such structures range from major castles and forts to minor lookout posts and may be the main distinctive features of headlands or stretches of coastline. National regulations permitting, any such features as are likely to be visible from seaward and should be encoded on the largest maximum display scale ENC data.

If it is required to encode a fortified structure, it must be done using the feature **Fortified Structure**.

Remarks:
- If it is required to encode a Martello tower, it must be done using **Fortified Structure** with attribute **category of fort** = *5* (fortified tower).
- If it is required to encode an offshore fortified structure, an ECDIS Base Display feature (e.g. **Pile**, **Land Area**) must also be encoded coincident to ensure the feature is always displayed on the ECDIS. Where fitted, lights should be encoded as described in clauses X.X to X.X, with the **Fortified Structure** being used as the structure feature for the relevant light equipment feature(s) (see clause X.X.X).

Distinction: Building; fence/wall; landmark.

7.5   Production/storage area

<table>
<tr><td colspan="6">IHO Definition: PRODUCTION/STORAGE AREA. An area on land for the exploitation or storage of natural resources. (S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.124, November 2000).</td></tr>
<tr><td colspan="6">S-101 Geo Feature: Production/storage area (PRDARE)</td></tr>
<tr><td colspan="6">Primitives: Point, Surface</td></tr>
<tr><td colspan="2">Real World</td><td colspan="2">Paper Chart Symbol</td><td colspan="2">ECDIS Symbol</td></tr>
</table>

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity	
Category of production area	(CATPRA)	1 : quarry 2 : mine 3 : stockpile 4 : power station area 5 : refinery area 6 : timber yard 7 : factory area 8 : tank farm 9 : wind farm 10: slag heap/spoil heap 11 : production plant	EN	1,1	
Condition	(CONDTN)	1 : under construction 2 : ruined 3 : under reclamation 5 : planned construction	EN	0,1	
Elevation	(ELEVAT)		RE	0,1	
Feature name			C	0,*	
Display name			(S) BO	0,1	
Language		ISO 639-3	(S) TE	0,1	
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1	
Fixed date range			C	0,1	
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Height	(HEIGHT)		RE	0,1	
Product	(PRODCT)	1 : oil 2 : gas 3 : water 4 : stone 5 : coal 6 : ore 7 : chemicals 8 : drinking water 9 : milk 10 : bauxite 11 : coke 12 : iron ingots 13 : salt 14 : sand 15 : timber 16 : sawdust/wood chips	EN	0,*	

		17 : scrap metal
		18 : liquefied natural gas
		   (LNG)
		19 : liquefied petroleum gas
		   (LPG)
		20 : wine
		21 : cement
		22 : grain
		23 : electricity
		25 : clay		

Radar conspicuous	(CONRAD)		BO	0,1
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Status	(STATUS)	4 : not in use 12 : illuminated	EN	0,*
Vertical length	(VERLEN)		RE	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: DA

Deleted: prominent

Deleted: not visually conspicuous

INT 1 Reference: E 26.2, 35.1-2, 36; F 52

7.5.1   Production and storage areas (see S-4 – B-328.2; 367; 374.6)

Production or storage areas located in close proximity to the coast are often prominent landmarks used by mariners to assist in position-fixing. Features such as quarry faces, stockpiles, power stations, refineries, timber stacks in timber yards, factories, groups of tanks, groups of wind motors, and slag heaps should be shown on the largest maximum display scale ENC data.

If it is required to encode production or storage area, it must be done using the feature **Production/Storage Area**.

Remarks:
- If there are individual buildings or equipment features contained within this area, they should be encoded as separate features such as **Building, Crane, Landmark** or **Silo/Tank** within the **Production/Storage Area** feature of type surface if the maximum display scale of the ENC data permits.
- If visible from seaward, a quarry face should be encoded as for a cliff (see clause X.X), with attribute **category of slope** = *6* (cliff).

Distinction: Free port area; offshore production area.

8.3   Hulks

IHO Definition: **HULK**. A vessel which is permanently moored or aground. It may be abandoned or put to some other use. Its fittings and superstructure may have been removed. (Adapted from IHO Dictionary – S-32).

S-101 Geo Feature: Hulk (HULKES)

Primitives: Point, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of hulk	(CATHLK)	1 : floating restaurant 2 : historic ship 3 : floating museum 4 : floating accommodation 5 : floating breakwater 6 : casino 7 : training vessel	EN	0,*
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	0,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes 4 : squared 5 : stripes (direction unknown) 6 : border stripe	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 5 : planned construction	EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Horizontal length	(HORLEN)		RE	0,1
Horizontal width	(HORWID)		RE	0,1
Radar conspicuous	(CONRAD)		BO	0,1
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1

Deleted: DA

Vertical length	(VERLEN)		RE	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: prominent

Deleted: not visually conspicuous

INT 1 Reference: F 34

8.3.1   Hulks (see S-4 – B-330)

If it is required to encode a permanently moored ship, it must be done using the feature **Hulk**.

Remarks:
- A **Hulk** feature of type surface must not be bound by curve features **Coastline** or **Shoreline Construction**, unless the edge associated with the curve feature is also the boundary of a **Land Area** feature of type surface.
- If it is required to encode a floating production, storage and off-loading vessel, it must be done using the feature **Offshore Platform** (see clause X.X), with attribute **category of offshore platform** = *8* (floating production, storage and off-loading vessel (FPSO)).
- If it is required to encode a hulk serving the purpose of a floating breakwater, it must be done using a **Hulk** feature, with attribute **category of hulk** = *5* (floating breakwater). If it is required to encode a floating breakwater of any other construction, it must be done using the feature **Shoreline Construction** (see clause X.X), with attributes **category of shoreline construction** = *1* (breakwater) and **water level effect** = *7* (floating).

Distinction: Offshore platform; shoreline construction; wreck.

8.4   Piles

IHO Definition: **PILE**. A long heavy timber or section of steel, wood, concrete, etc., forced into the earth or seabed which may serve as a support, as for a pier, or a free standing pole within a marine environment. (IHO Dictionary – S-32).

S-101 Geo Feature: Pile (PILPNT)

Primitives: Point, Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*	

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of pile	(CATPLE)	1 : stake 3 : post 4 : tripodal 5 : piling 6 : area of piles 7 : pipe	EN	0,1
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	0,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes 4 : squared 5 : stripes (direction unknown) 6 : border stripe	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 5 : planned construction	EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Fixed date range			C	0,1
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1
Height	(HEIGHT)		RE	0,1
Radar conspicuous	(CONRAD)		BO	0,1

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Reported date	(SORDAT)	ISO 8601: 2004	TD	0,1		**Deleted:** DA
Status	(STATUS)	1 : permanent 4 : not in use 6 : reserved 7 : temporary 8 : private 12 : illuminated 14 : public	EN	0,*		
Vertical length	(VERLEN)		RE	0,1		
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1		**Deleted:** prominent **Deleted:** not visually conspicuous
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1		

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Composition	Structure/Equipment	Supported by	Equipment Features (see clause X.X)	0,*
Association	Aids to Navigation Association	Consists of	**Archipelagic Sea Lane**, **Deep Water Route**, **Two-Way Route**	0,1

INT 1 Reference: F 22

8.4.1   Piles (see S-4 – B-327.3)

If it is required to encode a pile or post that is not used as a mooring/warping facility or an aid to navigation, it must be done using the feature **Pile**.

Remarks:
- Stumps of piles or posts that are dangerous to navigation must be encoded, where required, using **Obstruction** features (see clause X.X), with attribute **category of obstruction** = *1* (snag/stump), and must not be encoded using **Pile**.
- **Pile** of type curve must only be used for **Pile** having **category of pile** = *5* (piling), which is sometimes termed "row of piles" or "sheet piling". Point primitive may be used to encode piling for smaller maximum display scale ENC data.
- **Pile** of type surface must only be used for **Pile** having **category of pile** = *6* (area of piles). Point primitive may be used to encode an area of piles for smaller maximum display scale ENC data.
- Stakes and posts that are identified on the source to serve the purpose of aids to navigation must be encoded, where required, using the appropriate beacon feature (e.g. **Beacon Special Purpose/General**), with attribute **beacon shape** = *1* (stake, pole, perch, post).
- See clause X.X for details of how to encode a pile or post that is used as a mooring/warping facility.

Distinction: Beacon cardinal; beacon isolated danger; beacon lateral; beacon safe water; beacon special purpose/general; mooring/warping facility.

8.6   Shoreline construction

IHO Definition: **SHORELINE CONSTRUCTION**. A fixed artificial structure in the water and/or adjoining the land. It may also refer to features such as training walls, which are not necessarily connected to, nor form part of the shoreline. (S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.154, November 2000, as amended).
S-101 Geo Feature: **Shoreline construction (SLCONS)**
Primitives: **Point, Curve, Surface**

Real World	*Paper Chart Symbol*	*ECDIS Symbol*	

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of shoreline construction	(CATSLC)	1 : breakwater 2 : groyne (groin) 3 : mole 4 : pier (jetty) 5 : promenade pier 6 : wharf (quay) 7 : training wall 8 : rip rap 9 : revetment 10 : sea wall 11 : landing steps 12 : ramp 13 : slipway 14 : fender 15 : solid face wharf 16 : open face wharf 17 : log ramp 18 : swimming facility	EN	0,1
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	0,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes 4 : squared 5 : stripes (direction unknown) 6 : border stripe	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 3 : under reclamation 5 : planned construction	EN	0,1
Feature name			C	0,*

Comment [AHO61]: Refer TSMAD29/DIPWG7-10.4A.

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Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	(OBJNAM) (NOBJNM)		(S) TE	1,1
Fixed date range			C	0,1
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1
Height	(HEIGHT)		RE	0,1
Horizontal clearance fixed			C	0,1
Horizontal clearance value	(HORCLR)		(S) RE	1,1
Horizontal distance uncertainty	(HORACC)		(S) RE	0,1
Horizontal length	(HORLEN)		RE	0,1
Horizontal width	(HORWID)		RE	0,1
Nature of construction	(NATCON)	1 : masonry 2 : concreted 3 : loose boulders 4 : hard surfaced 5 : unsurfaced 6 : wooden 7 : metal 8 : glass reinforced plastic (GRP) 11 : latticed	EN	0,*
Radar conspicuous	(CONRAD)		BO	0,1
Reported date	(SORDAT)	ISO 8601: 2004	TD	0,1
Status	(STATUS)	1 : permanent 2 : occasional 3 : recommended 4 : not in use 6 : reserved 7 : temporary 8 : private 12 : illuminated 13 : historic 14 : public 28 : buoyed	EN	0,*
Vertical length	(VERLEN)		RE	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Water level effect	(WATLEV)	1 : partly submerged at high water 2 : always dry 3 : always under water / submerged 4 : covers and uncovers 5 : awash 6 : subject to inundation or flooding 7 : floating	EN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

INT 1 Reference: F 2.1, 2.2, 4.1-6.3, 12-15, 23, 30-33.2

8.6.1 Coastline

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Natural sections of coastlines, lakeshores and riverbanks should be encoded as **Coastline** (see clause X.X), whereas artificial sections of coastlines, lakeshores, riverbanks, canal banks and basin borders should be encoded as **Shoreline Construction**. The exception to this general rule is when a lake, river, canal, dock or basin is not navigable at the maximum display scale for the ENC data, in which case the boundaries must not be encoded as **Coastline** or **Shoreline Construction**.

These features form the border of the **Land Area** feature.

8.6.2   Artificial coastline (see S-4 – B-313; B-320-322; B-324 and B-329)

If it is required to encode artificial sections of coastlines; or lakeshores, riverbanks, canal banks and basin borders that are navigable at the maximum display scale for the ENC data, this must be done using the feature **Shoreline Construction**.

The largest maximum display scale ENC data should make clear whether any shoreline construction along the coastline is intended for ships to berth alongside or not. In most instances, the associated detail (name or berth number, depths alongside, dolphins, cargo sheds, cranes or railway lines), in addition to the usually distinctive outline of such features as piers and jetties, will be sufficient to show that ships may come alongside. For shoreline constructions not intended to berth alongside (such as breakwaters and seawalls), an indication that ships do not go alongside may be given by encoding the sloping sides (e.g. the intertidal portion of the structure). If there is a possibility of misinterpretation by the mariner, the danger may be indicated by encoding an **Obstruction** surface feature (see clause X.X) with the seaward edge running parallel to the shoreline construction.

The Figure below represents a shoreline construction such as a mole, including a berthing facility (INT1 - F12), with a relatively flat top (*abcdlmna*), and sloping sides partly above high water (*nmldefgn*) and partly intertidal (*dopqrhgfed*).
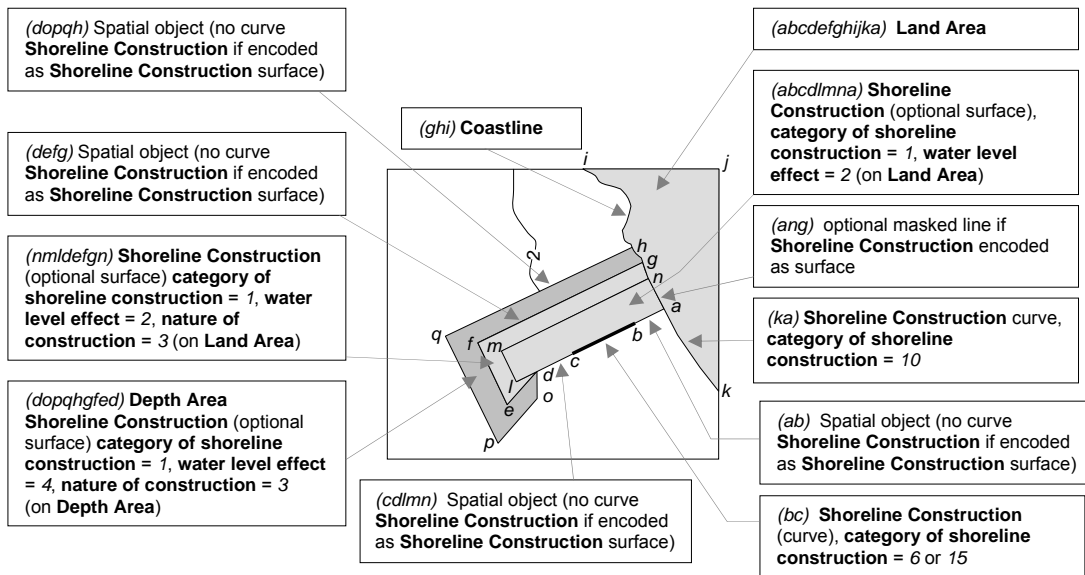
Remarks:
- Each of the three surface parts of the example shoreline construction above may be encoded as separate **Shoreline Construction** features of type surface; the masked curve (*ang*) must be encoded; and, if part of the **Shoreline Construction** boundary has a different characteristic (e.g. (*bc*) attribute **category of shoreline construction = *6* or *15***), it should be encoded as a separate **Shoreline Construction** feature of type curve. Alternatively, all the boundaries of the components of the shoreline construction may be encoded as **Shoreline Construction** features of type curve.
- In this example, the shoreline construction surface above the high water line must also be covered by a **Land Area** feature of type surface, and the intertidal shoreline construction surface must also be covered by a **Depth Area** feature of type surface with attribute **depth range minimum value** = -H (see clause X.X).
- **Shoreline Construction** features must be broken into their constituent parts where possible, and categorised using attributes such as **category of shoreline construction** and **water level effect** as

indicated on the source.

- If the presence of a feature is only indicated on the source by a textual reference, without a clear symbol (e.g. 'pier', 'groyne', 'post'), it should be encoded using a **Caution Area** feature (see clause X.X) or an **Information Area** feature (see clause X.X), with the textual reference encoded using an associated instance of the information type **Supplementary Information** (see clause X.X), complex attribute **information**. **Caution Area** should be used if the information is considered essential for safe navigation.
- Intertidal or submerged artificial rock walls, such as training walls that are not attached to the shoreline, must be encoded, if required, as **Shoreline Construction** using the appropriate value for **category of shoreline construction**, and **water level effect** = *3* (always under water/submerged) or **water level effect** = *4* (covers and uncovers).

Distinction: Canal bank; causeway; coastline; dry dock; floating dock; gridiron; land area; pontoon.

8.10   Gate

<table>
<tr><td colspan="6">IHO Definition: GATE.   A structure that may be swung, drawn, or lowered to block an entrance or passageway on a watercourse. (Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2012).</td></tr>
<tr><td colspan="6"><u>S-101 Geo Feature:</u> Gate (GATCON)</td></tr>
<tr><td colspan="6"><u>Primitives:</u> Point, Curve, Surface</td></tr>
<tr><td colspan="2"><i>Real World</i></td><td colspan="2"><i>Paper Chart Symbol</i></td><td colspan="2"><i>ECDIS Symbol</i></td></tr>
</table>

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of gate	(CATGAT)	2 : flood barrage gate 3 : caisson 4 : lock gate 5 : dyke gate 6 : sluice	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 5 : planned construction	EN	0,1
Depth range minimum value	(DRVAL1)		RE	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Horizontal clearance open			C	0,1
Horizontal clearance value	*(HORCLR)*		(S) RE	1,1
Horizontal distance uncertainty	(HORACC)		(S) RE	0,1
Nature of construction	(NATCON)	1 : masonry 2 : concreted 6 : wooden 7 : metal	EN	0,*
Quality of vertical measurement	(QUASOU)	2 : depth or least depth unknown 3 : doubtful sounding 4 : unreliable sounding 6 : least depth known 7 : least depth unknown, safe clearance at value shown	EN	0,*
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Status	(STATUS)	1 : permanent 4 : not in use 6 : reserved 16 : watched 17 : un-watched	EN	0,*
Vertical clearance open			C	0,1
Clearance value vertical	*(VERCOP)*		(S) RE	1,1

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Vertical uncertainty	(VERACC)		(S) RE	0,1
Vertical datum	(VERDAT)	3 : Mean sea level 16 : Mean high water 17 : Mean high water springs 18 : High water 19 : Approximate mean sea level 20 : High water springs 21 : Mean higher high water 24 : Local datum 25 : International great lakes datum 1985 26 : Mean water level 28 : Higher high water large tide 29 : Nearly highest high water 30 : Highest astronomical tide (HAT)	EN	0,1
Vertical uncertainty	(SOUACC)		RE	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

INT 1 Reference: F 27, 41.1-2, 42-43

8.10.1   Gates (see S-4 – B-326.5-7)

If it is required to encode a gate that controls the flow of water, it must be done using the feature **Gate**. Gates should always be encoded in the closed (to the sea) position.

Remarks:
- **Gate** of type surface must also be covered by a **Depth Area**, **Unsurveyed Area** or **Land Area** feature.
- The attribute **depth range minimum value** is used to encode the minimum depth over the sill, where known.

Distinction: Dry dock; floating dock.

8.12   Crane

IHO Definition: **CRANE**.   A machine for lifting, shifting and lowering objects or materials by means of a swinging boom or with a lifting apparatus supported on an overhead track. (Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2010).

S-101 Geo Feature: Crane (CRANES)

Primitives: Point, Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of crane	(CATCRN)	2 : container crane/gantry 3 : sheerlegs 4 : travelling crane 5 : A-frame 6 : goliath crane	EN	0,1
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	0,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes 4 : squared 5 : stripes (direction unknown) 6 : border stripe	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 5 : planned construction	EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Height	(HEIGHT)		RE	0,1
Lifting capacity	(LIFCAP)		RE	0,1
Orientation			C	0,1
Orientation uncertainty			(S) RE	0,1
Orientation value	*(ORIENT)*		(S) RE	1,1

Radar conspicuous	(CONRAD)		BO	0,1
Radius	(RADIUS)		RE	0,1
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Status	(STATUS)	1 : permanent 4 : not in use 6 : reserved 12 : illuminated	EN	0,*
Vertical clearance fixed			C	0,1
Vertical clearance value	(VERCLR)		(S) RE	1,1
Vertical uncertainty	(VERACC)		(S) RE	0,1
Vertical datum	(VERDAT)	3 : Mean sea level 16 : Mean high water 17 : Mean high water springs 18 : High water 19 : Approximate mean sea level 20 : High water springs 21 : Mean higher high water 24 : Local datum 25 : International great lakes datum 1985 26 : Mean water level 28 : Higher high water large tide 29 : Nearly highest high water 30 : Highest astronomical tide (HAT)	EN	0,1
Vertical length	(VERLEN)		RE	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1
In the water			BO	0,1

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Deleted: not visually conspicuous

INT 1 Reference: F 53.1-3

8.12.1 Cranes (see S-4 – B-328.3)

If it is required to encode a crane, it must be done using the feature **Crane.**

Remarks:
- The purpose of charting these features is primarily to assist the mariner in identifying particular berths, etc.
- The complex attribute **orientation** is used, where required, to encode the angular distance from true north to the axis of the crane's jib (generally perpendicular to the wharf).
- The position of a sheerleg or a travelling crane is defined as its resting position. If it is required to encode the track, it must be done using the feature **Railway** (see clause X.X).
- If it is required to encode an offshore crane, an ECDIS Base Display feature (e.g. **Pile**, **Land Area**) must also be encoded coincident to ensure the feature is always displayed on the ECDIS. Where fitted, lights should be encoded as described in clauses X.X to X.X, with the **Crane** being used as the structure feature for the relevant light equipment feature(s) (see clause X.X).

Distinction: Conveyor.

11.8   Depth – no bottom found

IHO Definition: **DEPTH – NO BOTTOM FOUND**. Upon investigation the bottom was not found at this depth. (Adapted from IHO Dictionary – S-32).

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S-101 Geo Feature: Depth – no bottom found

Primitives: Point

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Technique of vertical measurement	(TECSOU)	1 : found by echo-sounder 2 : found by side scan sonar 3 : found by multi-beam 5 : found by lead-line 6 : swept by wire-drag 8 : swept by vertical acoustic system 9 : found by electromagnetic sensor 13 : swept by side-scan sonar 15 : found by LIDAR	EN	0,*
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

INT 1 Reference: I 13

11.8.1 No bottom found depths (see S-4 – B-412.3)

If it is required to encode a depth that is indicated as having no bottom found at the value shown, it must be done using the feature **Depth – No Bottom Found**.

The geometry of soundings (see clause X.X) and no bottom found depths is held in a 3 dimensional array (latitude, longitude, depth). In the interests of efficiency, multiple no bottom found depths should be encoded in one spatial type, provided that all the spatial and geo feature attributes are common to the group.

Even though the sounding multiplication factor (CMFZ) for ENC is 100, no bottom found depths must be encoded to a whole metre value.

Remarks:
• No remarks.

Distinction: Depth area; sounding; swept area.

13.6   Obstructions

IHO Definition: **OBSTRUCTION.**   In marine navigation, anything that hinders or prevents movement, particularly anything that endangers or prevents passage of a vessel. The term is usually used to refer to an isolated danger to navigation, such as a sunken rock or pinnacle. (IHO Dictionary – S-32).

S-101 Geo Feature: Obstruction (OBSTRN)

Primitives: Point, Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of obstruction	(CATOBS)	1 : snag/stump 2 : wellhead 3 : diffuser 4 : crib 5 : fish haven 6 : foul area 8 : ice boom 9 : ground tackle 10 : boom 11 : underwater turbine 12 : wave energy device 13 : subsurface ocean data acquisition system (ODAS) 14 : artificial reef 15 : template 16 : manifold 17 : submerged pingo 18 : remains of platform 19 : scientific instrument	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 5 : planned construction	EN	0,1
Exposition of sounding	(EXPSOU)	1 : within the range of depth of the surrounding depth area 2 : shoaler than the range of depth of the surrounding depth area 3 : deeper than the range of depth of the surrounding depth area	EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Height	(HEIGHT)		RE	0,1
Maximum permitted draught			RE	0,1
Product	(PRODCT)	1 : oil 2 : gas	EN	0,*

		3 : water 8 : drinking water 23 : electricity		
Quality of vertical measurement	(QUASOU)	1 : depth known 2 : depth or least depth unknown 3 : doubtful sounding 4 : unreliable sounding 6 : least depth known 7 : least depth unknown, safe clearance at value shown 8 : value reported (not surveyed) 9 : value reported (not confirmed)	EN	0,*
Reported date	(SORDAT)	ISO 8601: 2004	TD	0,1
Status	(STATUS)	1 : permanent 4 : not in use 5 : periodic/intermittent 7 : temporary 8 : private 13 : historic 18 : existence doubtful 28 : buoyed	EN	0,*
Nature of surface	(NATSUR)	1 : mud 2 : clay 3 : silt 4 : sand 5 : stone 6 : gravel 7 : pebbles 8 : cobbles 9 : rock 11 : lava 14 : coral 17 : shells 18 : boulder	EN	0,*
Technique of vertical measurement	(TECSOU)	1 : found by echo-sounder 2 : found by side scan sonar 3 : found by multi-beam 4 : found by diver 5 : found by lead-line 6 : swept by wire-drag 8 : swept by vertical acoustic system 9 : found by electromagnetic sensor 10 : photogrammetry 11 : satellite imagery 12 : found by levelling 13 : swept by side-scan sonar 15 : found by LIDAR	EN	0,*
Value of sounding	(VALSOU)		RE	0,1
Vertical length	(VERLEN)		RE	0,1
Vertical uncertainty	(SOUACC)		RE	0,1
Water level effect	(WATLEV)	1 : partly submerged at high water 2 : always dry 3 : always under water/	EN	1,1

Deleted: sounding

Deleted: DA

		submerged 4 : covers and uncovers 5 : awash 7 : floating		
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1
Default clearance depth			RE	0,1
Surrounding depth			RE	0,1

INT 1 Reference: K 1, 31, 40-43, 46; L 21, 23; Q 42

13.6.1 Obstructions and foul areas (see S-4 – B-327.5, B-420.1, B-422.8-9, B-431.6, B-445.1 and B-447.5, B-447.7)

If it is required to encode snags, stumps, wellheads, diffusers, cribs, fish havens, foul areas, booms, ice booms, sites of cleared platforms, ground tackle, wave energy devices, underwater turbines, subsurface ocean data acquisition systems, or artificial reefs, it must be done using the feature **Obstruction**.

> **Comment [j73]:** This sentence is becoming very convoluted. Is there a better way of describing this?

Population of the attributes **quality of vertical measurement**, **technique of vertical measurement** and **water level effect** are described in the Table below.

> **Deleted:** sounding

In the following table, the symbol '/' indicates that this attribute is not relevant for the obstruction instance and therefore must not be encoded. A blank indicates that the encoder may choose a relevant value for the attribute.

Obstruction...	INT 1	water level effect	quality of vertical measurement	technique of vertical measurement
Depth unknown	K40	*3* or *4*	*2** or *<undefined>*	/
Least depth known	K41	*3* or *4*	*1* or *6*	
Swept by wire to the depth shown	K42	*3*	*6*	*6*
Measured by diver	K42	*3*	*1* or *6*	*4*

> **Deleted:** sounding

All obstructions should be encoded using one of the above combinations of attributes.

* For an obstruction where the least depth is unknown, the attribute value *2* (depth or least depth unknown) for **quality of vertical measurement** does not apply to the depth of the seabed near the obstruction.

> **Deleted:** sounding

It is important when encoding obstructions to be aware of the distinction between attribute value **category of obstruction** = *6* (foul area) and foul ground:

Foul areas are defined as areas of numerous uncharted dangers to navigation. When encoded on ENC, **Obstruction** features of type surface with attribute **category of obstruction = *6*** (foul area) will display in the ECDIS "base display" as an obstruction to navigation, with all associated alarms to indicate that it is unsafe for vessels to enter or transit the area.

Foul ground is defined as an area over which it is safe to navigate but which should be avoided for anchoring, taking the ground or ground fishing. When encoded on ENC, **Foul Ground** features (see clause X.X) of type surface will display in the ECDIS "other" display as a "foul area of seabed safe for navigation but not for anchoring", indicating to the mariner that it is safe to enter or transit the area but hazardous to take the ground or undertake other subsurface activities.

In some cases areas on the source indicated to be foul ground have been misinterpreted as foul areas, which has resulted in encoding in ENC of **Obstruction** with **category of obstruction** = *6* (foul area). This encoding results in the incorrect indication in the ECDIS that the area is unsafe for navigation, which is potentially confusing to the mariner.

Foul ground, over which it is safe to navigate but which should be avoided for anchoring, taking the ground or ground fishing, should be encoded using a **Foul Ground** feature. Although the source may depict a "Foul Area", it should be determined whether it is in fact "Foul Ground" before encoding the appropriate feature.

Remarks:

sounding. Where obstructions such as fish havens have a declared maximum authorised draught for vessels passing over the feature, this must be populated, where known, using the attribute **maximum permitted draught**.

- The attribute **height** must be populated for **Obstruction** features having attribute **water level effect** = *1* (partly submerged at high water) or *2* (always dry).
- The attribute **vertical length** is used to populate the distance of the obstruction above the seabed.
- For guidance regarding the population of the attribute **vertical uncertainty**, see clause X.X (**Quality of Bathymetric Data**).
- For reported, not confirmed obstructions, the date of the report must be populated, where known, using the attribute **reported date**.
- If the nature of a dangerous underwater feature, dangerous underwater area, or floating feature is not explicitly known, it must be encoded using **Obstruction**.
- An **Obstruction** feature of type surface must be covered by a surface feature from Skin of the Earth as appropriate.
- An area containing numerous dangers, through which navigation is not safe at the maximum display scale for the ENC data, should be encoded using an **Obstruction** feature of type surface, with attribute **category of obstruction** = *6* (foul area).
- If it is required to encode an **Obstruction** feature where the attribute **value of sounding** is populated with an empty (null) value, but the source information indicates the depth of the feature is within the range of the surrounding depth area, the value **exposition of sounding** = *1* (within the range of the surrounding depth area) must be populated in order to avoid the unnecessary display of isolated danger symbols in ECDIS.
- A danger circle on a paper chart that surrounds a single symbol or sounding (e.g. INT1 – K26, K27, K40(or K41 to K43.1) must not be encoded as a separate surface. However, when a danger line indicates th true shape of the feature, it should be encoded using **Wreck** or **Obstruction** features of type surface. A single sounding enclosed by a danger circle on medium and large scale paper charts must be encoded using an **Obstruction** feature of type point. The sounding value, in this case, must be encoded using the attribute **value of sounding**. Soundings enclosed by a danger circle on small scale paper charts may indicate a reported, not confirmed sounding, and such soundings should be evaluated to determine whether they should be encoded as **Obstruction** features, or **Sounding** features (see clause X.X) with attribute QUAOU = *9* (value reported (not confirmed)).
- Platforms which have been cut-off above the seabed must be encoded as **Obstruction**, while platforms which have been cut-off to the level of the seabed should be encoded as **Foul Ground** (see clause X,X).
- In certain circumstances where an obstruction is always dry (e.g. cribs), it must be covered by a **Land Area** feature.
- Features that are considered to be subsurface Fish Aggregating Devices (FAD) must be encoded as **Obstruction**, with **category of obstruction** = *5* (fish haven), unless the FAD is a vessel that has been deliberately sunk to form a fish haven, which should be encoded as a **Wreck** feature (see clause X,X).
- If it is required to encode a subsurface ocean data acquisition systems (ODAS), whether on the seabed suspended in the water column by a subsurface float, it must be done using **Obstruction** with **category obstruction** = *14* (subsurface ocean data acquisition system (ODAS)). An ODAS buoy must be encoded as a **Buoy Special Purpose/General** feature (see clause X.X).

Distinction: Depth area; fishing facility; foul ground; marine farm/culture; underwater/awash rock; water turbulence; wreck.

> **Comment [AHO74]:** How is this going to work in terms of getting rid of the CSPs?

> **Comment [A75]:** DCEG3: Needs more work. Distinction required between FAD and fish haven.

13.7   Foul ground

IHO Definition: **FOUL GROUND**. Areas over which it is safe to navigate but which should be avoided for anchoring, taking the ground or ground fishing. (IHO Dictionary – S-32).

S-101 Geo Feature: Foul ground *(OBSTRN)*

Primitives: Point, Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*	
S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM) (NOBJNM)*		(S) TE	1,1
Quality of vertical measurement	*(QUASOU)*	1 : depth known 2 : depth or least depth unknown 3 : doubtful sounding 4 : unreliable sounding 6 : least depth known 7 : least depth unknown, safe clearance at value shown 8 : value reported (not surveyed) 9 : value reported (not confirmed)	EN	0,*
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Status	*(STATUS)*	13 : historic 18 : existence doubtful 28 : buoyed	EN	0,*
Technique of vertical measurement	*(TECSOU)*	1 : found by echo-sounder 2 : found by side scan sonar 3 : found by multi-beam 4 : found by diver 5 : found by lead-line 6 : swept by wire-drag 8 : swept by vertical acoustic system 9 : found by electromagnetic sensor 10 : photogrammetry 11 : satellite imagery 12 : found by levelling 13 : swept by side-scan sonar 15 : found by LIDAR	EN	0,*
Value of sounding	*(VALSOU)*		RE	0,1
Vertical uncertainty	*(SOUACC)*		RE	0,1
Water level effect	*(WATLEV)*	3 : always under water / submerged	EN	0,1

Deleted: sounding

Deleted: DA

		4 : covers and uncovers 5 : awash		
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

INT 1 Reference:

13.7.1 Foul ground (see S-4 – B-422.8)

If it is required to encode an area over which it is safe to navigate for surface vessels, but where seabed operations are unsafe, it must be done using the feature **Foul Ground**. Such areas are distinct from the feature **Obstruction**, attribute **category of obstruction** = *6* (foul area), where navigation is considered to be unsafe for surface vessels.

Population of the attributes **quality of vertical measurement** and **technique of vertical measurement** a[   ] described in the Table below.

> **Deleted: sounding**

In the following table, the symbol '/' indicates that this attribute is not relevant for the foul ground instance and therefore must not be encoded. A blank indicates that the encoder may choose a relevant value for the attribute.

Foul Ground...	INT 1	water level effect	quality of vertical measurement	technique of vertical measurement
Depth unknown	K40	*3* or *4*	*2** or *<undefined>*	/
Least depth known	K41	*3* or *4*	*1* or *6*	
Swept by wire to the depth shown	K42	*3*	*6*	*6*
Measured by diver	K42	*3*	*1* or *6*	*4*

> **Deleted: sounding**

All foul ground should be encoded using one of the above combinations of attributes.

* For foul ground where the least depth is unknown, the attribute value *2* (depth or least depth unknown) for **quality of vertical measurement** does not apply to the depth of the seabed near the foul ground.

> **Deleted: sounding**

Remarks:
- The minimum depth, if known, over any foul ground, must be encoded using the attribute **value of sounding**.
- For guidance regarding the population of the attribute **vertical uncertainty**, see clause X.X (**Quality of Bathymetric Data**).
- For reported, not confirmed foul ground, the date of the report must be populated, where known, using the attribute **reported date**.
- A **Foul Ground** feature of type surface must be covered by a surface feature from Skin of the Earth as appropriate.
- Platforms which have been cut-off to the level of the seabed should be encoded as **Foul Ground**, while platforms which have been cut-off above the seabed must be encoded as **Obstruction** (see clause X,X).
- The distributed remains of wrecks must be encoded using the feature **Wreck** (see clause X.X), and must not be encoded as **Foul Ground**.

Distinction: Depth area; fishing facility; marine farm/culture; obstruction; seabed area; underwater/awash rock; water turbulence; wreck.

13.8   Discoloured water

IHO Definition: **DISCOLOURED WATER**. Unnatural coloured areas in the sea which may or may not indicate the existence of shoals. (NOAA – Nautical Chart Manual, Volume 1).

S-101 Geo Feature: Discoloured water

Primitives: Point, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*	

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: DA

INT 1 Reference:

13.8.1   Discoloured water (see S-4 – B-424.6)

If it is required to encode the possible existence of shoal water as indicated by an area of discoloured water, it must be done using the feature **Discoloured Water**.

Remarks:
- The feature **Discoloured Water** must only be used to indicate an area of possible shoal water where an observation of the discolouration has been made and there is no supporting bathymetric data to support the possible shoaling.
- A **Discoloured Water** feature must be covered by **Depth Area** or **Unsurveyed Area** features.

Distinction: Caution area; obstruction; underwater/awash rock; wreck.

14.2   Offshore wind turbine

IHO Definition: **OFFSHORE WIND TURBINE**. A structure consisting of a tower with rotating blades situated in the sea. Offshore wind turbines convert kinetic energy of the wind into mechanical energy and electricity.
S-101 Geo Feature: Offshore wind turbine
Primitives: Point

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	0,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes 4 : squared 5 : stripes (direction unknown) 6 : border stripe	EN	0,1
Condition	(CONDTN)	1 : under construction 2 : ruined 4 : wingless 5 : planned construction	EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Fixed date range			C	0,1
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1
Height	(HEIGHT)		RE	0,1
Radar conspicuous	(CONRAD)		BO	0,1
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1
Status	(STATUS)	1 : permanent 2 : occasional 4 : not in use 7 : temporary 8 : private	EN	0,*

Deleted: DA

Deleted: DA

Deleted: DA

		12 : illuminated 28 : buoyed		
Vertical clearance fixed			C	0,1
Vertical clearance value	(VERCLR)		(S) RE	1,1
Vertical uncertainty	(VERACC)		(S) RE	0,1
Vertical datum	(VERDAT)	3 : Mean sea level 16 : Mean high water 17 : Mean high water springs 18 : High water 19 : Approximate mean sea level 20 : High water springs 21 : Mean higher high water 24 : Local datum 25 : International great lakes datum 1985 26 : Mean water level 28 : Higher high water large tide 29 : Nearly highest high water 30 : Highest astronomical tide (HAT)	EN	0,1
Vertical length	(VERLEN)		RE	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Water level effect	(WATLEV)	2 : always dry 7 : floating	EN	1,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: prominent

Deleted: not visually conspicuous

INT 1 Reference: L 2, 10-15, 17

14.2.1   Offshore platforms (see S-4 – B-445.2; B-445.4 and B-445.5)

Offshore wind turbines are generally tall, multi-bladed structures, usually with two or three blades, which may pose as obstacles to navigation but are often visible over long distances and therefore useful as visual references. Their purpose is to generate electricity for large communities, or to feed a national grid. They are often in groups (known as wind farms). Floating wind turbines are held in position by ground tackle and consequently may be subject to significant lateral and some vertical movement.

If it is required to encode an offshore wind turbine, it must be done using the feature **Offshore Wind Turbine**.

Remarks:
- The attribute **height** is only relevant for fixed wind turbines, and is referred to the vertical datum (see clause X.X).
- The attribute **vertical length** is only relevant for floating wind turbines, and is referred to the sea level.
- If it is required to encode sites of dismantled wind turbines, this must be done using **Foul Ground** features (see clause X.X), unless the source indicates that any remaining structure protrudes far enough above the seabed so as to be an obstruction to surface navigation, in which case this must be encoded using an **Obstruction** feature (see clause X.X).
- If it is required to encode an offshore wind farm, it must be done using the feature **Offshore Production Area** (see clause X.X).
- Wind turbines may carry lights (see clause X.X) or fog signals (see clause X.X). Where fitted, lights should be encoded as described in clauses X.X to X.X, with the **Offshore Wind Turbine** being used as the structure feature for the light equipment feature(s).
- For encoding wind turbines on land, see clause X.X.

14.2.2   Offshore safety zones (see S-4 – B-445.6)

Under UNCLOS, a coastal State may establish safety zones around artificial islands, installations and structures in their EEZ and on their continental shelf. Safety zones normally extend 500 metres from the outermost points of the installations. Within these zones, appropriate measures can be taken to ensure the safety of navigation and of the installations.

If it is required to encode an offshore safety zone, it must be done using a **Restricted Area** feature (see clause X.X), with attribute **category of restricted area** = *1* (offshore safety zone).

Distinction: Landmark; offshore platform; offshore production area.

14.7   Offshore production area

IHO Definition: **OFFSHORE PRODUCTION AREA**. An area at sea within which there are production facilities. (S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.113, November 2000).

S-101 Geo Feature: Offshore production area (OSPARE)

Primitives: Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**	
Category of offshore production area		1 : offshore wind farm 2 : wave farm 3 : current farm 4 : tank farm 5 : seabed material extraction area	EN	0,1	**Comment [AHO77]:** Note email from Julia 18 Sep 15 (AA853538). JW opinion is that the new values proposed by NIPWG are already covered here (in combination with attribute Product).
Condition	(CONDTN)	1 : under construction 2 : ruined 4 : wingless 5 : planned construction	EN	0,1	
Feature name			C	0,*	
Display name			(S) BO	0,1	
Language		ISO 639-3	(S) TE	0,1	
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1	
Fixed date range			C	0,1	
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Height	(HEIGHT)		RE	0,1	
Product	(PRODCT)	1 : oil 2 : gas 4 : stone 6 : ore 10 : bauxite 14 : sand 23 : electricity	EN	0,*	
Radar conspicuous	(CONRAD)		BO	0,1	
Reported date	*(SORDAT)*	ISO 8601: 2004	TD	0,1	**Deleted:** DA
Restriction	(RESTRN)	1 : anchoring prohibited 2 : anchoring restricted 3 : fishing prohibited 4 : fishing restricted 5 : trawling prohibited 6 : trawling restricted 7 : entry prohibited 8 : entry restricted 9 : dredging prohibited 10 : dredging restricted 11 : diving prohibited 12 : diving restricted	EN	0,*	

		13 : no wake 14 : area to be avoided 15 : construction prohibited 16 : discharging prohibited 17 : discharging restricted 18 : industrial or mineral exploration/development prohibited 19 : industrial or mineral exploration/development restricted 20 : drilling prohibited 21 : drilling restricted 22 : removal of historical artefacts prohibited 23 : cargo transhipment (lightening) prohibited 24 : dragging prohibited 25 : stopping prohibited 26 : landing prohibited 27 : speed restricted 28 : swimming prohibited		
Status	(STATUS)	1 : permanent 4 : not in use 7 : temporary 8 : private 12 : illuminated 28 : buoyed	EN	0,*
Vertical length	(VERLEN)		RE	0,1
Visually conspicuous	(CONVIS)	1 : visually conspicuous 2 : not visually conspicuous 3 : prominent	EN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: prominent

Deleted: not visually conspicuous

<u>INT 1 Reference:</u> L 4, 5.2

14.7.1 Offshore production areas (see S-4 – B-445.3; <u>B-445.7;</u> B-445.9; B-445.11 and B-445.12)

Oil and gas fields are exploited in many parts of the world. Although the basic methods for extracting oil and gas are well established, details of the systems and structures may vary with the characteristics of the different fields and are continually being developed. In a typical field, oil or gas is obtained from wells drilled from fixed production platforms, usually standing on the seabed. From each production platform, the oil or gas is carried in pipes to a facilities platform where primary processing, compression and pumping are carried out. The oil or gas is then transported through pipelines to a nearby storage tank, tanker loading buoy or floating terminal, or direct to a tank farm on shore. One facilities platform may collect the oil or gas from several production platforms, and may supply a number of tanker loading buoys or storage units. Such facilities platforms are sometimes termed Field Terminal Platforms. Converted tankers or purpose-built vessels are often permanently moored and used as facilities platforms, floating terminals, and for storage.

Other offshore energy production facilities include wind turbines and underwater current turbines. Other methods of harnessing tidal and wave energy are also in use.

If it is required to encode an offshore production area, it must be done using the feature **Offshore Production Area**.

<u>Remarks:</u>
- General information about a wind farm such as blade diameter and blade vertical clearance should be encoded, if required, using an associated instance of the information type **Supplementary Information** (see clause X.X), complex attributes **information** or **textual description**. If it is required to encode individual offshore wind turbines, it should be done using an **Offshore Wind Turbine** feature of type point (see clause X.X).
- If it is required to encode individual wave energy devices or underwater turbines within a wave or current farm (or turbine field), it should be done using an **Obstruction** feature (see clause X.X) or, if there are associated surface structures, using appropriate features, e.g. **Offshore Platform** or **Beacon Special**

Purpose/General (see clauses X.X and X.X). The extent and nature of any restricted area related to the feature should be encoded using a **Restricted Area** feature (see clause X.X).

14.7.2 Offshore tanker loading systems (see S-4 – B-445.4)

Although the oil and gas from some fields are sent ashore by submarine pipeline, a variety of mooring systems have been developed for use in deep water and in the vicinity of certain ports, to allow the loading of large vessels and the permanent mooring of floating storage vessels or units. These offshore systems include large mooring buoys, designed for mooring vessels up to 500,000 tonnes, and platforms on structures fixed at their lower ends to the sea floor. They allow a vessel to moor forward or aft to them, and to swing to the wind or stream. Those which are fixed are termed Single Point Moorings (SPM). Those which are a form of mooring buoy are termed Single Buoy Moorings (SBM). Like production platforms, SPM and SBM normally have lights and fog signals.

If it is required to encode an offshore tanker loading system, it must be done using the feature **Buoy Installation** (see clause X.X).

If it is required to encode an articulated tower, it must be done using an **Offshore Platform** feature (see clause X.X), with attribute:

category of offshore platform - *4* - articulated loading platform (ALP)
5 - single anchor leg mooring (SALM)
8 - floating production, storage and off-loading vessel (FPSO)
10 - navigation, communication and control buoy (NCCB) (which may include storage facilities)

Distinction: Exclusive Economic Zone; offshore platform; offshore wind turbine.

15.28   Ferry route

IHO Definition: **FERRY ROUTE**. A route in a body of water where a ferry crosses from one shoreline to another. (Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2010).
S-101 Geo Feature: Ferry route (FERYRT)
Primitives: Curve, Surface

Real World	Paper Chart Symbol	ECDIS Symbol

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity	
Category of ferry	(CATFRY)	1 : "free-moving" ferry 2 : cable ferry 3 : ice ferry 5 : high speed ferry	EN	1,*	
Feature name			C	0,*	
Display name			(S) BO	0,1	
Language		ISO 639-3	(S) TE	0,1	
Name	(OBJNAM) (NOBJNM)		(S) TE	1,1	
Fixed date range			C	0,1	
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Periodic date range			C	0,*	
Date end	(PEREND)	ISO 8601: 2004	(S) TD	1,1	**Deleted:** DA
Date start	(PERSTA)	ISO 8601: 2004	(S) TD	1,1	**Deleted:** DA
Status	(STATUS)	1 : permanent 2 : occasional 4 : not in use 5 : periodic/intermittent 6 : reserved 7 : temporary 8 : private 9 : mandatory 14 : public	EN	0,*	
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1	

INT 1 Reference: M 50, 51

15.28.1 Ferries (see S-4 – B-438)

Ferry routes should be encoded on the largest maximum display scale ENC datasets:
* where they cross fairly narrow channels, in order that through traffic is warned of their existence;
* where the ferry tracks are short enough to be reasonably accurately represented; and
* on ENCs used for harbour navigation, as part of the general information about the area.

If it is required to encode a ferry route, it must be done using the feature **Ferry Route**.

Remarks:
* Long distance ferries which have routes varying with weather, tide and traffic should not generally be encoded, although the terminals should be shown on appropriate maximum display scale ENC datasets, using the feature **Harbour Facility** (see clause X.X), with attribute **category of harbour facility** = *1* (RoRo-

terminal) or *3* (ferry terminal).

<u>Distinction:</u>

16.28   Collision regulations limit

<table>
<tr><td colspan="6">IHO Definition: COLLISION REGULATIONS LIMIT.   Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs). The demarcation line between inland navigation rules and international navigation rules.</td></tr>
<tr><td colspan="6">S-101 Geo Feature: Collision regulations limit</td></tr>
<tr><td colspan="6">Primitives: Curve</td></tr>
<tr><td colspan="2">Real World</td><td colspan="2">Paper Chart Symbol</td><td colspan="2">ECDIS Symbol</td></tr>
</table>

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity	
Feature name			C	0,*	
Display name			(S) BO	0,1	
Language		ISO 639-3	(S) TE	0,1	
Name	(OBJNAM) (NOBJNM)		(S) TE	1,1	
Fixed date range			C	0,1	
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Periodic date range			C	0,*	
Date end	(PEREND)	ISO 8601: 2004	(S) TD	1,1	**Deleted:** DA
Date start	(PERSTA)	ISO 8601: 2004	(S) TD	1,1	**Deleted:** DA
Regulation citation			TE	0,1	
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1	

INT 1 Reference:

16.28.1 Collision regulations limit (see S-4 – B-XXX)

If it is required to encode a collision regulations (COLREGs) demarcation line, it must be done using the feature **Collision Regulations Limit**.

Remarks:
- If it is required to encode the national regulation citation it must be done using the attribute **regulation citation**.

Distinction: Administrative area.

19.6   Emergency wreck marking buoys

IHO Definition: **BUOY, EMERGENCY WRECK MARKING**. A buoy is a floating object moored to the bottom in a particular place, as an aid to navigation or for other specific purposes. (IHO Dictionary – S-32).
An emergency wreck marking buoy is a buoy moored on or above a new wreck, designed to provide a prominent (both visual and radio) and easily identifiable temporary (24-72 hours) first response. (UKHO NP 735, 6th Edition).
S-101 Geo Feature: Buoy emergency wreck marking
Primitives: Point

Real World	*Paper Chart Symbol*	*ECDIS Symbol*	

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Buoy shape	(BOYSHP)	1 : conical (nun, ogival) 2 : can (cylindrical) 3 : spherical 4 : pillar 5 : spar (spindle) 6 : barrel (tun) 7 : superbuoy 8 : ice buoy	EN	1,1
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	EN	1,* (ordered)
Colour pattern	(COLPAT)	1 : horizontal stripes 2 : vertical stripes 3 : diagonal stripes 4 : squared 5 : stripes (direction unknown) 6 : border stripe	EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Fixed date range			C	0,1
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1
Marks navigational – system of	(MARSYS)	1 : IALA A 2 : IALA B	EN	0,1

Deleted: DA

Deleted: DA

		9 : no system 11 : CEVNI			**Deleted:** 10 : other system¶
Nature of construction	(NATCON)	6 : wooden 7 : metal 8 : glass reinforced plastic (GRP) 11 : latticed	EN	0,*	
Radar conspicuous	(CONRAD)		BO	0,1	
Topmark	(*TOPMAR*)		C	0,1	
Colour	(COLOUR)	1 : white 2 : black 3 : red 4 : green 5 : blue 6 : yellow 7 : grey 8 : brown 9 : amber 10 : violet 11 : orange 12 : magenta 13 : pink	(S) EN	0,1	
Topmark/daymark shape	(TOPSHP)	1 : cone, point up 2 : cone, point down 3 : sphere 4 : 2 spheres 5 : cylinder (can) 6 : board 7 : x-shape (St. Andrew's cross) 8 : upright cross (St George's cross) 9 : cube, point up 10 : 2 cones, point to point 11 : 2 cones, base to base 12 : rhombus (diamond) 13 : 2 cones (points upward) 14 : 2 cones (points downward) 15 : besom, point up (broom or perch) 16 : besom, point down (broom or perch) 17 : flag 18 : sphere over rhombus 19 : square 20 : rectangle, horizontal 21 : rectangle, vertical 22 : trapezium, up 23 : trapezium, down 24 : triangle, point up 25 : triangle, point down 26 : circle 27 : two upright crosses (one over the other) 28 : T-shape 29 : triangle pointing up over a circle 30 : upright cross over a circle 31 : rhombus over a circle 32 : circle over a triangle pointing up 33 : other shape (see **shape**	(S) EN	1,1	

		information)		
Shape information			(S) C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
Vertical length	(VERLEN)		RE	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Composition	Structure/Equipment	Supported by	Equipment Features (see clause X.X)	0,*
Association	Aids to Navigation Association	Consists of	**Archipelagic Sea Lane**, **Deep Water Route**, **Two-Way Route**	0,1

INT 1 Reference: ?????

19.6.1 Emergency wreck marking buoys (see S-4 – B-461.3 and B-467)

Emergency wreck marking buoys are used to mark new dangers until a permanent form of marking has been established and the danger itself has been promulgated by Notice to Mariners, or removed.

To conform to the IALA Maritime Buoyage System (see clause X.X), the shape of an emergency wreck marking buoy is pillar or spar. The body of the mark has blue and yellow vertical stripes. The topmark (if fitted) is a standing/upright yellow '+' (St. George's cross). Lights (if fitted) are Al.Oc.BuY.3s.

If it is required to encode a buoy having the function of an emergency wreck mark, it must be done using the feature **Buoy emergency wreck marking**.

[diagram]

Remarks:
- If it is required to encode a buoy that has more than one colour, the attributes **colour** and **colour pattern** must be encoded, according to the rules laid out in clause X.X.
- If it is required to encode the total vertical length, including the topmark and any equipment features (e.g. light), of the buoy above the water level, it must be done using the attribute **vertical length**.
- An IALA compliant emergency wreck marking buoy topmark should be populated using the complex attribute **topmark**, with sub-attributes **topmark shape** = *8* (upright cross (St George's cross)) and **colour** = *6* (yellow).
- An IALA compliant emergency wreck marking buoy should also have the following associated equipment features:
  - A **Light All Around** feature (see clause X.X), with attributes **colour** = *5,6* (blue, yellow), **light characteristic** = *17* (occulting alternating), **signal group** = *(1)* and **signal period** = *3*. The attribute **signal sequence** should be populated as *1.00+(0.50)+1.00+(0.50)* and the attribute **value of nominal range** should be populated as *4*.
  - A **Radar Transponder Beacon** feature (see clause X.X), with attributes **category of radar transponder beacon** = *2* (racon, radar transponder beacon) and **signal group** = *(D)*.

Distinction: Buoy cardinal; buoy installation; buoy lateral; buoy safe water; buoy special purpose/general; mooring/warping facility.

20.2   Physical AIS aid to navigation

IHO Definition: **AIS AID TO NAVIGATION**. An Automatic Identification System (AIS) message 21 transmitted from a physical Aid to Navigation, or transmitted from an AIS station for an Aid to Navigation which does or does not physically exist. (Adapted from IALA Recommendation A-126).

S-101 Geo Feature: Physical AIS aid to navigation

Primitives: Point

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity	
Estimated range of transmission	(ESTRNG)		RE	0,1	
Feature name			C	0,*	
Display name			(S) BO	0,1	
Language		ISO 639-3	(S) TE	0,1	
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1	
Fixed date range			C	0,1	
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1	**Deleted:** DA
MMSI code			IN	0,1	
Periodic date range			C	0,*	
Date end	*(PEREND)*	ISO 8601: 2004	(S) TD	1,1	**Deleted:** DA
Date start	*(PERSTA)*	ISO 8601: 2004	(S) TD	1,1	**Deleted:** DA
Status	(STATUS)	1 : permanent 5 : periodic/intermittent 7 : temporary	EN	0,1	
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1	

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Composition	Structure/Equipment	Supports	Structure Features (see clause X.X)	0,1
Association	Bridge Association	Consists of	**Bridge**	0,1

INT 1 Reference: S ??

20.2.1 Physical Automatic Identification System (AIS) aids to navigation (see S-4 – B-480-484)

If it is required to encode a physical AIS aid to navigation, it must be done using the feature **Physical AIS Aid to Navigation**.

Remarks:
- Physical AIS aids to navigation must be encoded, where required, using the geometry of the physical aid to navigation from which the AIS signal is, or appears to be, transmitted. If it is required to encode the actual location from which the signal is transmitted for a physical AIS aid to navigation where the signal is transmitted from another location, it must be done using a **Radio Station** feature (see clause X.X), with attribute **category of radio station** = *16* (AIS base station).
- The unique Maritime Mobile Service Identity (MMSI) code for the physical AIS aid to navigation should be

encoded, where known, using the attribute **MMSI code**.

<u>Distinction:</u> Radar station; radio station; radio calling-in point; virtual AIS aid to navigation.

20.3   Virtual AIS aid to navigation

IHO Definition: **AIS AID TO NAVIGATION**. An Automatic Identification System (AIS) message 21 transmitted from a physical Aid to Navigation, or transmitted from an AIS station for an Aid to Navigation which does or does not physically exist. (Adapted from IALA Recommendation A-126).
S-101 Geo Feature: Virtual AIS aid to navigation
Primitives: Point

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Estimated range of transmission	(ESTRNG)		RE	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Fixed date range			C	0,1
Date end	(DATEND)	ISO 8601: 2004	(S) TD	0,1
Date start	(DATSTA)	ISO 8601: 2004	(S) TD	0,1
MMSI code			IN	0,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) TD	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) TD	1,1
Status	(STATUS)	1 : permanent 5 : periodic/intermittent 7 : temporary	EN	0,1
Virtual AIS aid to navigation type		1 : north cardinal 2 : east cardinal 3 : south cardinal 4 : west cardinal 5 : port lateral 6 : starboard lateral 7 : preferred channel to port 8 : preferred channel to starboard 9 : isolated danger 10 : safe water 11 : special purpose 12 : emergency wreck marking	EN	1,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1

Deleted: DA (Date end — DATEND)
Deleted: DA (Date start — DATSTA)
Deleted: DA (Date end — PEREND)
Deleted: DA (Date start — PERSTA)

Comment [A106]: TSMAD Review 2: Comment from FR – there may be other types of AtoN's.

INT 1 Reference: S ??

20.3.1 Virtual Automatic Identification System (AIS) aids to navigation (see S-4 – B-480-484)

If it is required to encode a virtual AIS aid to navigation, it must be done using the feature **Virtual AIS Aid to Navigation**.

Remarks:
- Virtual AIS aids to navigation should only be encoded where it is known that the Virtual aid is intended to be permanent, or deployed for a specified fixed period. Where it is known that a Virtual AIS aid to navigation is moved or withdrawn on a regular basis and/or at short notice, such that implementing these changes through the application of ENC Updates is impractical, the Virtual aid should not be encoded.
- The unique Maritime Mobile Service Identity (MMSI) code for the virtual AIS aid to navigation should be encoded, where known, using the attribute **MMSI code**.

Distinction: Physical AIS aid to navigation; radar station; radio station; radio calling-in point.

21.2   Vessel traffic service area

<table>
<tr><td colspan="7">IHO Definition: VESSEL TRAFFIC SERVICE. The area of any service implemented by a relevant authority primarily designed to improve safety and efficiency of traffic flow and the protection of the environment. It may range from simple information messages, to extensive organisation of the traffic involving national or regional schemes. (IHO Dictionary – S-32).</td></tr>
<tr><td colspan="7"><u>S-101 Geo Feature:</u> Vessel traffic service area</td></tr>
<tr><td colspan="7"><u>Primitives:</u> Surface</td></tr>
<tr><td colspan="2"><i>Real World</i></td><td colspan="2"><i>Paper Chart Symbol</i></td><td colspan="3"><i>ECDIS Symbol</i></td></tr>
<tr><td colspan="2">S-101 Attribute</td><td>S-57 Acronym</td><td colspan="2">Allowable Encoding Value</td><td>Type</td><td>Multiplicity</td></tr>
<tr><td colspan="2">Feature name</td><td></td><td colspan="2"></td><td>C</td><td>0,*</td></tr>
<tr><td colspan="2">   Display name</td><td></td><td colspan="2"></td><td>(S) BO</td><td>0,1</td></tr>
<tr><td colspan="2">   Language</td><td></td><td colspan="2">ISO 639-3</td><td>(S) TE</td><td>0,1</td></tr>
<tr><td colspan="2">   Name</td><td><i>(OBJNAM)</i>
<i>(NOBJNM)</i></td><td colspan="2"></td><td>(S) TE</td><td>1,1</td></tr>
<tr><td colspan="2">Scale minimum</td><td>(SCAMIN)</td><td colspan="2">See clause X.X
scale minimum > scale maximum</td><td>IN</td><td>0,1</td></tr>
<tr><td colspan="7"><u>INT 1 Reference:</u></td></tr>
<tr><td colspan="7">21.2.1   Vessel traffic service area</td></tr>
<tr><td colspan="7">If it is required to encode an area within which a competent authority provides services to vessels as part of a Vessel Traffic Service (VTS), it must be done using the feature Vessel Traffic Service Area. The area should be captured based on the limits of the VTS or VTS sector.</td></tr>
<tr><td colspan="7"><u>Remarks:</u>
Separate area Vessel Traffic Service Area features should be captured for individual VTS sectors where appropriate.</td></tr>
<tr><td colspan="7"><u>Distinction:</u> Administration area; custom zone.</td></tr>
</table>