TSMAD22/DIPWG3-08.6D

Paper for Consideration by TSMAD/ DIPWG

Contradictions in Presentation of Navigation (Mariners') objects between IHO Presentation Library and IEC 62288

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Executive Summary:	There are some discrepancies between symbol descriptions given in IHO Presentation library (Edition 3.4) and the description of them in IEC 62288. Generally it concerns the colours used for presentation of Navigation symbols (Mariners' Navigational Objects).
Related Documents:	IHO S-52, IEC 62288, IHO S-52 CPB PB9
Related Projects:	

Introduction

At present presentation of Navigation objects (Mariners' objects) is regulated by several standards. They are:
- S-52 ANNEX A, IHO Presentation Library, edition 3.4
- IEC 62288, Maritime navigation and radiocommunication equipment and systems –Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results
- S-52 Chart Presentation Bulletins (CPB) PB9

S-52 Chart Presentation Bulletins (CPB)

According to the requirements of Type Approval authorities and Presentation Bulletin PB9 presentation of Navigation symbols (Mariners' Navigational Objects described in Part II of presentation library and Look-up tables for Mariners' Objects from Part I) should be superseded by presentation given in IEC 62288 (Edition 1.0 2008-07)

PB9

S-52-CPB-No 9: Definition of navigation symbology contained in IEC62288 (CSMWG18 Action 19)
IEC Standard 62288: Presentation of navigation-related information on shipborne navigational displays provides the guidelines for the presentation of navigation-related symbols, terms and abbreviations originally described in Safety of Navigation Circular SN/Circ. 243 together with some requirements published in resolution MSC.192(79) on radar and resolution MSC.232(79) on revised Performance Standards for ECDIS; and MSC/Circ. 982 on Guidelines on ergonomic criteria for bridge equipment and layout. IEC62288 replaces Annex E of IEC 61174 for navigational symbols including AIS-symbols used in stand-alone ECDIS displays. **Although the Presentation Library and its updates endeavour to reproduce all current non-chart symbology, IEC definitions in IEC standards 61174 and 62288, IMO directions for AIS display and other future technologies remain the authority for navigational symbols, and their latest editions should always be consulted**. It has to be noted that IEC 62288 does not relate navigational symbols to specific colours. In the interest of safe navigation, through ensuring that symbology for navigational and for chart information are consistent with each other, all non-chart symbology reproduced in the Presentation Library is added by colour tokens belonging to the colour model of S-52, Appendix 2.

The effect of this CPB is that non-chart symbology in IHO S-52 Presentation Library cannot be modified without adjusting with IEC 62288. But in IEC 62288 engineering specification for colours, symbols and styles are absent. This seems to be correct - it is not the matter of this standard, but unfortunately results in unforeseen and unnecessary complications during ECDIS elaboration and its type approval.

Colour schemes, symbols and styles specifications for navigation symbology against a background of ENC objects

Table 1 (Examples of colour schemes, see below) was added to IEC62288 as background material and unfortunately contains mistakes. The tables for navigational objects in IEC 62288 (see Table A.3 – Navigation symbols) simply contain the names of colours, for example Red, Black and etc. In some cases even such definitions are absent. This is not engineering definition and it is not sufficient from an ergonomics point of view. Colours of objects, both ENC and not, for chart display have been carefully elaborated for more than 20 years. For their description different colour schemes are used. The only one correct way to display jointly multiple feature and navigation objects on several palettes (DAY, DUSK and NIGHT) is to use colour schemes that were elaborated for Presentation Library. Primary indexes to these Colours schemes should be the taken from PL and S-52 (SPECIFICATIONS FOR CHART CONTENT AND DISPLAY ASPECTS OF ECDIS). Such primary index should be a colour token because in fact red, black, etc colours names can be result in different colour tokens. This may result in different RGB (or CIE) values for palettes (DAY, DUSK, NIGHT) and will differ for back ground/fore colours.

See below some examples from PL clause 4 (DESCRIPTION OF THE COLOUR CODING SYSTEM) for Black/Grey/White colours:

Colour Section I / Chart Contents (31 uses)

Token		Colour, day/night	Usage
CHBLK	-	black/grey	(general)
CHWHT	-	white	(general)
OUTLW	-	black	(symbol outline on sea area background)
CSTLN	-	black/grey	(Coastline, shoreline constructions)
SNDG1	-	grey	(deep soundings > safety depth)
SNDG2	-	black/white	(shallow soundings <= safety depth)
DEPDW	-	white/black	(deeper than selected deep contour) – **it is background colour!!!**

Colour Section V / Ship symbol & Planned Route (5 uses)

Token		Colour,day/night	Usage
SHIPS	-	black/white	(own ship, Co&SpMG vector)
PSTRK	-	black/white	(Past Track)

There is the special note in IEC 62288 in which the examples on colour schemes that may be use for navigation symbology is given:

Table 1. Examples of colour schemes

NOTE Examples of colour schemes that may be used are given below.

Symbol	Colour	Colour token (IHO S-52)
1.1a, 1.1b	White	Ship
1.7a	White	PSTRK
2.1a	Blue/green	ARPAT
2.4, 2.5a, 2.10	Pale blue	RESBL
2.12, 4.1, 4.2, 4.3, 4.4, 4.5	Orange	CURSR
2.14, 3.7	Orange	NINFO
3.1a	Red	PLRTE
	Orange	APLRT

Numbers in first column correspond to the numbers of table rows from Annex A (Presentation colours and symbols) of IEC 62288[1].

All that was written above is also concerns the symbols and lines description. The specifications for symbol's size in many cases are simply absent and style definition - such as "long dash" or "thick line" is again descriptive but it is not engineering description.
Strict engineering definitions of various symbols' and lines' styles (and methods of their drawing) are given in IHO Presentation Library and appendixes to it, but not in IEC 62288.

It should be pointed that ignoring of ergonomics principles that were use by IHO for colours, symbols and styles elaboration can lead to unfortunate results – objects will not be clearly distinguishable.

Contradictions in Presentation of Navigation (Mariners') objects between IHO Presentation Library and IEC 62288

At present there are some discrepancies between symbols' description that is given IHO Presentation library (Edition 3.4) and the description of them in IEC 62288. Generally it concerns the colours used for presentation of Navigation symbols (Mariners' Navigational Objects).

To the point colour for rows 1 and 2 of table 1 should be **black/white but not white.** Colour token should be **SHIPS but not Ship**

SHIPS - black/white (own ship, Co&SpMG vector)
PSTRK - black/white (Past Track)

To align IHO presentation library with IEC 62288 it is necessary to change some Conditional Symbolization Procedures, namely:

1. Conditional Symbology Procedure ‘CLRLIN01’. Suggestions see in Review of Conditional Symbology Procedure CLRLIN01.
2. Conditional Symbology Procedure ‘LEGLIN03”. Suggestions see in Review of Conditional Symbology Procedure LEGLIN03.
3. Conditional Symbology Procedure ‘VESSEL02’. Suggestions see in Review of Conditional Symbology Procedure VESSEL02.
4. Review of FC for mnufea object. Suggestions see in Review of FC for mnufea Review of Presentation of Mariners' Object Class Manufacturers' Feature (mnufea).

Suggestions

It is suggested that the following alternative solutions to the problems, described above, be considered:

I. To bring into align IHO presentation library with IEC 62288 it is necessary to revise existing Conditional Symbology Procedures for navigation symbology.

II. To ask IHO to come to agreement with the International Electrotechnical Commission (IEC) about strict formulating of used styles and colors in IEC 62288. It is suggested that the IEC standard adds references to IHO PL instead of quoting portions. This will allow IHO PL to be updated without IEC 62288 also having to be updated.

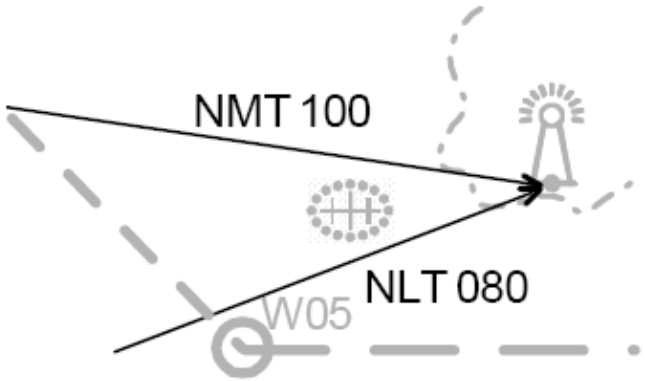
III. The simplest solution may be to;
- To delete Part II (MARINERS’ NAVIGATIONAL OBJECTS) from IHO Presentation Library.
- To delete all references to Mariners’ objects in Part I of presentation library (Look-up table and etc)
- To delete all references to Mariners’ objects in IHO PUBLICATION S-52 APPENDIX 2, ADDENDUM TO ANNEX A, PART I, USERS´ MANUAL EDITION 3.4 (2008)

But in this case there must be distinct answers and decisions for the following question:
a) Any standardization of presentation of such objects will be impossible. ECDIS producers will develop the presentation of Mariners’ objects by themselves within the limits set by standards, noting that description of symbolization given in IEC 61174 is rather descriptive but it is not “engineering drawings”.
b) Usage of NEWOBJ with SYMINS attribute with instruction for Mariners’ object may not be impossible or very complicated.
c) ECDIS CHART 1 should be revised – all references to Mariners’ objects should be deleted and some datasets should be modified.

Review of Conditional Symbology Procedure 'CLRLIN01'

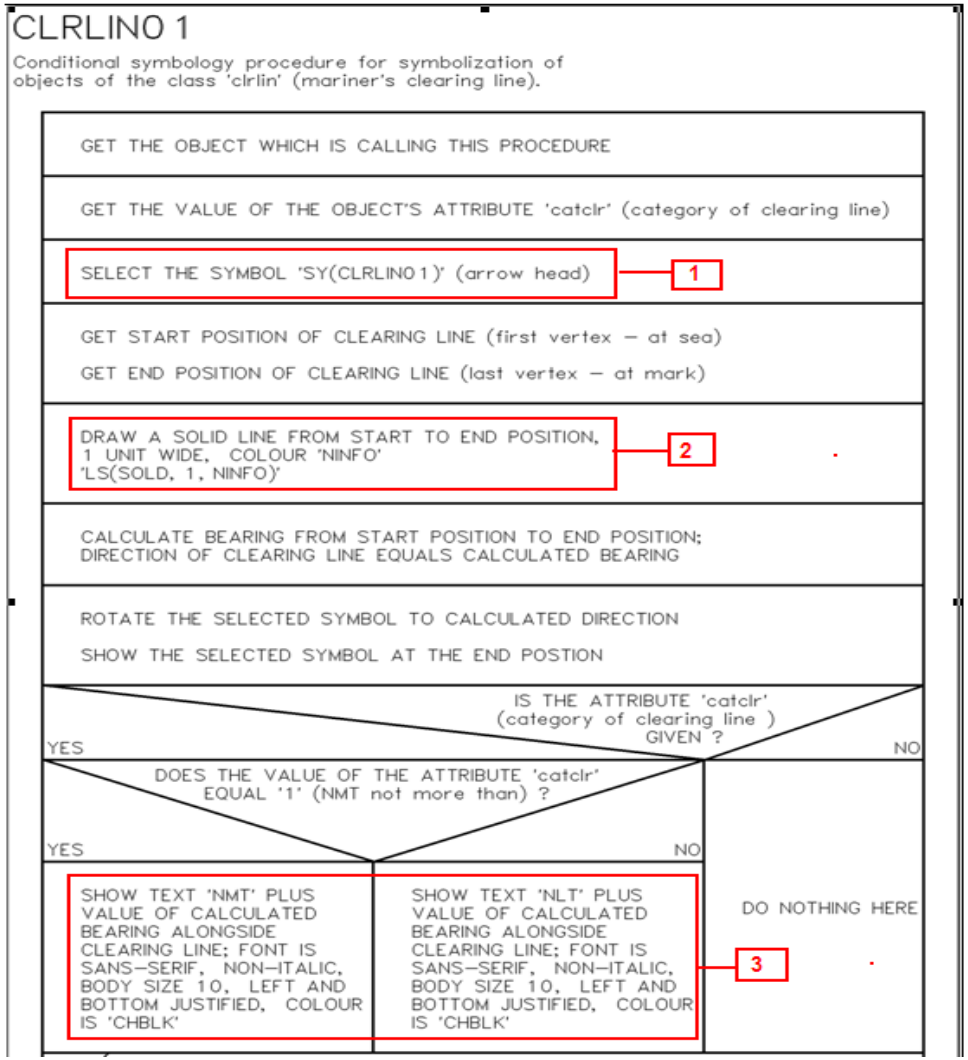
There is the discrepancy in colours for presentation of Clearing Line (Danger bearing) between IEC 62288 (see Annex A (Presentation colours and symbols), Table A.3 – Navigation symbols) (see A.4 Navigation-related symbols, Table A.3 – Navigation symbols) and IHO presentation library.

Table A.3, 3.6 – Danger bearing

3.6	**Danger bearing** A danger bearing or clearing line shall be presented as a single line with an arrowhead directed at the base of a charted object. The line shall extend at least 20 mm in length and ideally through or across the monitored route. The line shall be drawn using a thin solid line style with the required colour red. A danger bearing shall be labelled with its bearing. The letters "NMT" shall be used to indicate "not more than". The letters "NLT" to indicate "not less than". Alphanumeric text used to label the danger bearing shall be the same basic colour as the line. NOTE The drawing is not to scale. The example shows the default symbols for a light and a dangerous wreck at an unknown depth.	

According to PL 3.4 clearing line (clrlin) should be presented with CSP CLRLIN01.
"clrlin","","CS(CLRLIN01)","9","O","MARINERS OTHER","53020"
All parts of CLRLIN01 in PL 3.4 are drawn with colour NINFO. In IEC danger bearing or clearing line must be drawn with colour red.

Picture 2. CSP CLRLIN01 – IHO presentation library.



Suggestions:

Two decisions are possible:

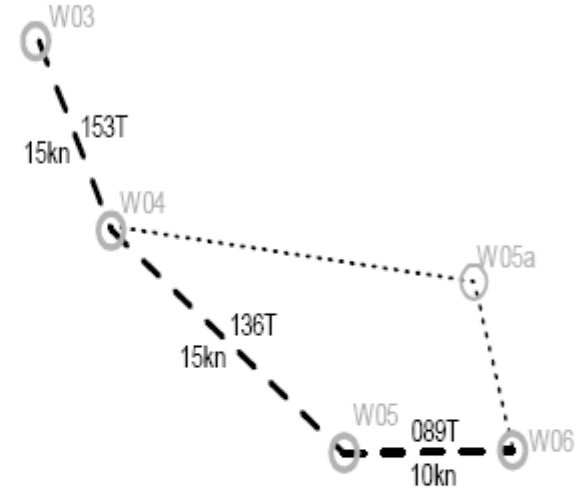
I. To revise CSP CLRLIN01
a) Change color tokens for mark items 2 and 3 (picture 2) to DNGHL (red - danger highlight)
c) Change colour token (or add new symbol instruction) for symbol instruction SY(CLRLIN01) (Arrowhead for mariner's clearing line) from NINFO to DNHLT in PAPER BASED DESCRIPTION OF SYMBOLS FOR USE ON ECDIS (S-52 APPENDIX 2 ADDENDUM TO ANNEX A, PART I, USERS´ MANUAL).

II. To ask IHB Directing Committee to come to agreement with the International Electrotechnical Commission (IEC) about the possibility of using NINFO color token for presentation Clearing line (Danger bearing)

Review of Conditional Symbology Procedure 'LEGLIN03'

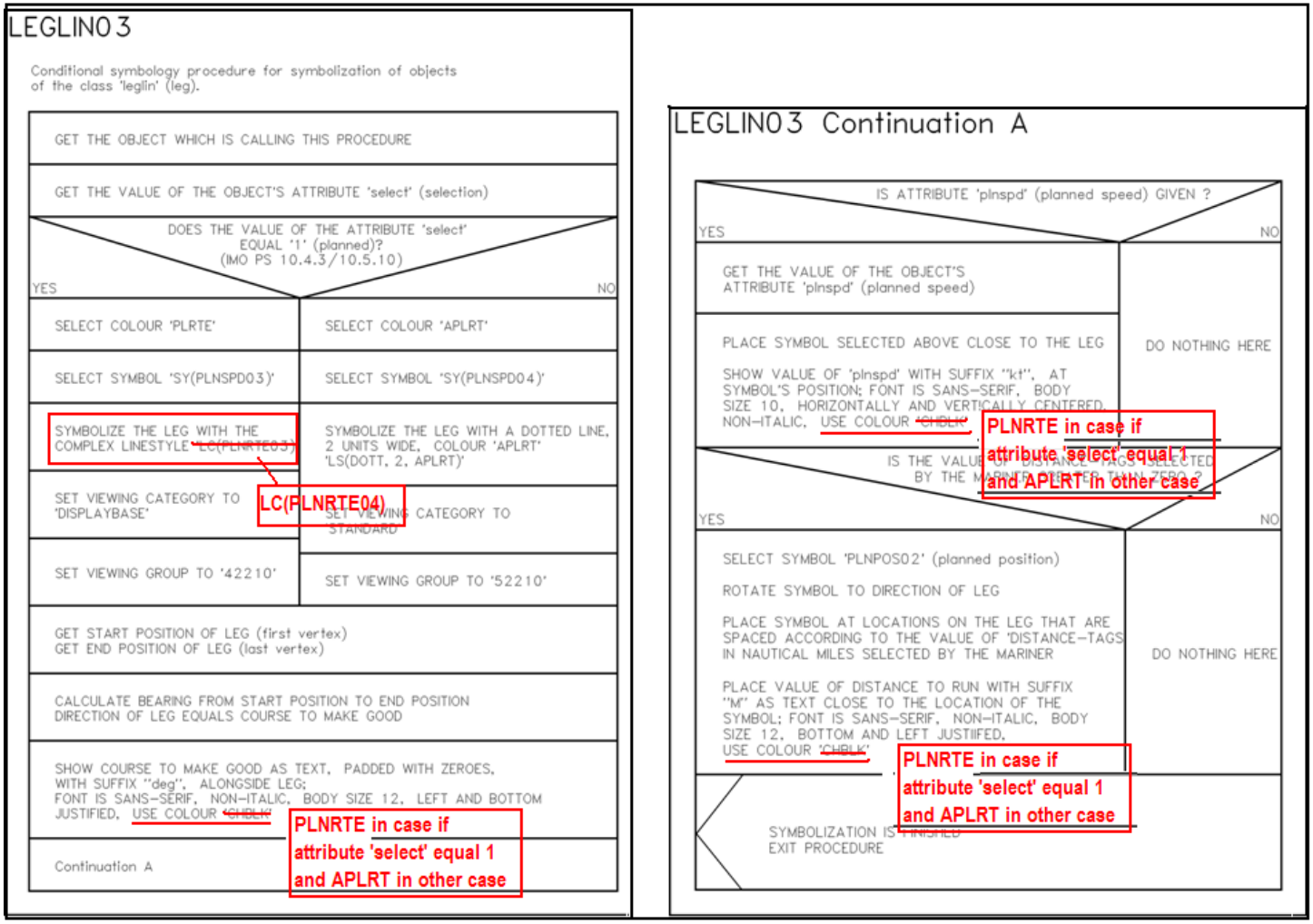
There is the discrepancy in colours and line styles for presentation of monitored (and/or planned) route between IEC 62288 (see Annex A (Presentation colours and symbols), Table A.3 – Navigation symbols) and IHO presentation library.
Below there is the extract from Table A.3 – Navigation symbols of IEC 62288

Table A.3, 3.1 b – Routes

	Description	Symbol
3.1 b	**Routes** A route is as a series of waypoints connected by one or more legs. Leg lines on the monitored route shall be drawn using a thick long-dashed line style. Leg lines on an alternate planned route shall be drawn using a thin dotted line style. NOTE The IHO recommends a dotted line style for a leg line on the monitored route. The IHO's recommended colour for leg lines on the monitored route is red. Leg lines on the monitored route may be labelled adjacent to their line with their course and planned speed, ideally on opposite sides. The label shall be offset by at least 2 mm from the line and shall not interfere with text used to label the waypoint. NOTE The IHO recommends drawing a box around the planned speed. Alphanumeric text used to label a leg line shall be the same colour as the leg line. The alternate planned route shall be presented as a series of track legs connecting a series of waypoints.	 NOTE Not to scale

According to IHO Presentation Library routes should be presented according CSP LEGLIN03.
But in IEC 62288 as opposed to CSP LEGLIN03 for IHO Presentation Library, edition 3.4 Leg line on monitored (and/or planned) route shall be presented with long-dashed style. Although there is the note about IHO recommendation for route presentation with dotted line style our eexperience has shown that Type Approval authorities in practice follow the rule described in CPB9 notably that the priority of IEC 62288 for navigation symbols is higher than IHO presentation library. And in this case they demanded the use thick dashed style. Beside this alphanumeric text used for labelling should use the same colour as the leg line that is red.
I would like to note that in my opinion IHO style for route presentation is more ground on ergonomic requirements. In case dashed red (PLRTE) style monitored or planned route can be mixed up with feature objects presented with LS(DASH,2,CHMGD) line style, e.g. NEWOBJ, FERYRT, CBLARE and etc.
But except the problem that described above current version of conditional procedure LEGLIN03 use obsolete symbolization instruction. SHOWLINE instruction LC(PLNRTE03) now is changed to LC(PLNRTE04). Line instruction LC(PLNRTE03) in List of symbol names & meanings of IHO Presentation Library should be change to LC(PLNRTE04).
Other discrepancies of CSP LEGLIN03 with IEC 61174 are shown in red at the picture below.

Conditional Symbology Procedure LEGLIN03



Suggestions:

I. In any case CSP LEGLIN03 should be revised to use new complex line instruction LC(PLNRTE04) instead of obsolete LC(PLNRTE03). Obsolete LC(PLNRTE03) instruction should be deleted from Tables List of symbol names & meanings from clause 15 of IHO Presentation Library and new LC(PLNRTE04) instruction should be added.

II. It is necessary to ask IHB Directing Committee to come to agreement with the International Electrotechnical Commission (IEC) about more strict formulating for note about possibility of using dot stile for route instead of long dash style.

III. It is necessary to ask IHB Directing Committee to come to agreement with the International Electrotechnical Commission (IEC) about possibility for using CHBLK color token for labelling. In other case colour for text labels in CSP LEGLIN03 should be changed to PLRTE color token in case if attribute ‘select’ is equal to 1 (planned) and APLRT (orange) in other case

Review of Conditional Symbology Procedure 'VESSEL02'

There is the discrepancy in colours for presentation of AIS and ARPA targets (heading lines, velocity vectors, selected targets) between IEC 62288 (see Annex A (Presentation colours and symbols, Table A.2 – Radar and AIS symbols) and IHO presentation library. Below there are the extracts from Table A.2 – Radar and AIS symbols.

Table A.2, 2.7 a – Heading lines

2.7 a	**Heading lines** Heading lines shall be selected for display for activated AIS targets and associated targets, represented by AIS target symbols. Heading lines shall originate at the apex of the AIS triangle and shall extend not less than 4 mm and at least 4 mm beyond the bow of the true scaled outline when it is used. They shall be drawn using a solid line style with the same basic colour as used for target symbols. Heading lines for dangerous AIS targets shall flash with their base symbol until acknowledged by the user. An activated target without a reported heading shall be orientated to the top of the operational display area and when AIS heading is enabled shall not include a heading line.	 (SN243)

Table A.2, 2.8 a – Velocity vectors

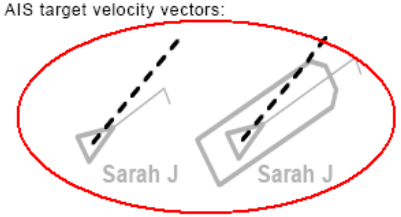
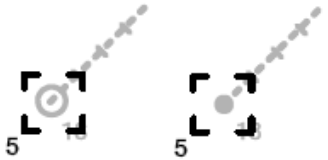
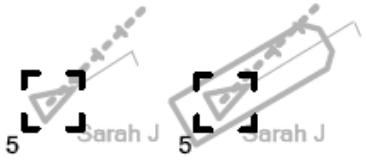
2.8 a	**Velocity vectors** Velocity vectors for targets shall be selected for display. Velocity vectors shall be presented as single lines originating at the targets' tracked/reported position and extending in the direction of course CTW or COG, as appropriate, for a length representing the distance the target will travel in the time interval used for own ship's velocity vector. Vectors shall be drawn using a thick short-dashed line style with the same basic colour used for target symbols. Velocity vectors for dangerous targets shall be the required red basic colour and shall flash with their base target symbols until acknowledged by the user. Once acknowledged, the symbols shall cease flashing and unless considered as dangerous, shall assume the basic colour of other non-dangerous target symbols.	Radar target velocity vectors: (SN243) AIS target velocity vectors:  (SN243) Associated target velocity vectors:

Table A.2, 2.12 – Selected targets

	Symbol name and description	Symbol graphic(s)
2.12	**Selected targets** Selected target symbols shall be presented as broken squares indicated by their corners, centred on the selected target symbol by the user and clearly extending beyond it. The square shall be drawn using a dashed line. Alphanumeric text used to label a selected target shall be the same basic colour as the selected target symbol.	Selected radar targets:  (SN243)
		Selected AIS targets:  (SN243)

Presentation of ARPA and AIS Targets are described in clause 12.2.25 of IHO presentation library in Conditional Symbology Procedure 'VESSELnn'. (see below).
Discrepancies between presentation required by IEC 62288 and current version of CSP VESSEL02 are emphasized in red.
Besides this some symbol instructions are obsolete and had been changed to new ones in IHO PUBLICATION S-52 APPENDIX 2, ADDENDUM TO ANNEX A, PART I, USERS´ MANUAL EDITION 3.4 (2008). They are listed in the Table 1 (see below)

Table 1. Symbol instructions for AIS and ARPA symbology

Old name of instruction	New name of instruction	Definition	Comments
SY(ARPATG01)	SY(ARPATG02)	ARPA target	
SY(AISSLP01)	SY(AISSLP02)	sleeping AIS target	
SY(AISLST01)	SY(AISLST02)	Lost AIS target	
SY(AISVES01)	SY(AISVES02)	active AIS target showing vector and/or heading	
SY(AISSEL01)	Absent	selected AIS target	Was deleted
SY(AISDGR01)	SY(AISDGR02)	dangerous AIS target	
SY(AISTRN01)	SY(AISTRN03)	SY(AISTRN01) SY(AISTRN03) AIS target turning to starboard	
SY(AISTRN02)	SY(AISTRN04)	target turning to port	
SY(VECGND21)	SY(VECGND22)	arrowhead for ARPA (or AIS) vector for course and speed over the ground	
SY(VECWTR21)	SY(VECWTR22)	arrowhead for ARPA (or AIS) vector for course and speed through the water	
SY(ARPSIX01)	SY(ARPSIX02)	six minute mark on ARPA vector	
SY(ARPONE01)	SY(ARPONE02)	one minute mark on ARPA vector	

VESSEL02

Conditional symbology procedure for symbolizing «other vessels» than own-ship, and for drawing the associated vectors and heading lines.

The «other vessel» is symbolized in a manner depending on whether the source is ARPA or AIS, and on which other options are selected by the mariner:

1. Show vessel symbol only:

1.1 ARPA target selected (vessel, vesrce1): show ~~SY(ARPATG01)~~ SY(ARPATG02) at the position indicated.

1.2 AIS 'sleeping target' selected - (vessel, vesrce2, vestat2, headng): show ~~SY(AISSLP01)~~ SY(AISSLP02) «sleeping target» at the position indicated and rotate the symbol in the direction given by (headng).

1.3 AIS 'lost' target (vessel, vesrce2, vestat5, headng): show ~~SY(AISLST01)~~ SY(AISLST02) at the position indicated and rotate the symbol in the direction given by the last (headng) report.

2. Show vessel symbol, heading line and course and speed vector:
(Note that the time period which determines the scaling of vector length must be the same for all vectors.)

2.1 ARPA

2.1.1 ARPA target selected (vessel, vesrcel, vecper,...): show ~~SY(ARPATG01)~~ SY(ARPATG02) at the position indicated.

2.1.2 (There is no heading line from ARPA).

2.1.3 Vector, starting at the pivot point of the vessel symbol, draw a line scaled by the vector period (vecper) and the speed (sogspd or stwspd), in the direction given by the course (cogcrs or ctwcrs). (The vector period is selected by the mariner). Linestyle is LS(SOLD,2,ARPAT).

2.1.4 For selected ARPA target it is necessary to show symbol for selected ARPA target – see Table A.2, 2.12 – Selected targets of IEC 62288. Such symbol is absent both in IHO Presentation library and in IHO PUBLICATION S-52 APPENDIX 2, ADDENDUM TO ANNEX A, PART I, USERS´ MANUAL EDITION 3.4 (2008). Thereby it is necessary:

a) To elaborate symbol for selected ARPA target

b) To show this symbol in case vestat = ‘3’ (selected)

c) To change the Remarks for vestat (Vessel Status) attribute in Part II (MARINERS’ NAVIGATIONAL OBJECTS) of IHO presentation library. In current version this attribute according its remark is used only for AIS target

2.2 AIS

2.2.1 AIS target selected (vessel, vesrce2, vestat1 or 3 or 4, vecper,...) :

Symbolise the vessel as follows:

- vestat1 ('activated') show ~~SY(AISVES01)~~ SY(AISVES02) 'activated AIS target'
- vestat3 ('selected) show SY(AISSEL01) (this instruction had been deleted) 'selected AIS target' *
- vestat4 ('dangerous') show ~~SY(AISDGR01)~~ SY(AISDGR02) 'dangerous AIS target'**

Rotate the symbol in the direction given by (headng)

* (detailed information for a 'selected AIS target' is shown in a separate data display area.)

**(the 'dangerous AIS target' is coloured red. If the signal from a dangerous target is lost show a flashing lost target symbol until this alarm is acknowledged.)

2.2.2 Heading line and turn indications: starting at the bow (apex of the vessel symbol) draw a line 50mm in length in the direction given by (headng). Linestyle is ~~LS(SOLD,1,ARPAT)~~ LS(SOLD,1,RESBL). If available, show the direction of a turn indication at the end of the heading line: ~~SY(AISTRN01)~~ SY(AISTRN03) for a turn to starboard, ~~SY(AISTRN02)~~ SY(AISTRN04) for a turn to port.

2.2.3 Vector: starting at the pivot point of the vessel symbol draw a line scaled by the vector period (vecper) selected by the mariner and the speed (sogspd) in the direction given by the course (cogcrs). Linestyle is ~~LS(DASH,2,ARPAT)~~ LS(DASH,2,RESBL). Alternatively, a path predictor may be provided using the same linestyle. (Note that the course and speed vector and heading, plus the direction and rate of turn if available, are always drawn for activated AIS targets.)

3. Show vector stabilization for ARPA

3.1 For ground stabilization (vessel, vecstb1,...): place ~~SY(VECGND21)~~ SY(VECGND22) at the end of the vector**,** replacing the last time mark. Rotate the symbol in the direction given by (cogcrs).

3.2 For water stabilization (vessel, vecstb2,...): place ~~SY(VECWTR21)~~ SY(VECWTR22) at the end of the vector, replacing the last time mark. Rotate the symbol in the direction given by (ctwcrs).

4. Show time marks on vector

4.1 ARPA target selected (vessel, vesrcel,...):

4.1.1 One-minute marks selected (vessel, vesrce1 ,vecmrk1,...): place ~~SY(ARPSIX01)~~ SY(ARPSIX02) at every sixth minute mark, and ~~SY(ARPONE01)~~ SY(ARPONE02) at every remaining one-minute mark. Rotate all symbols in the direction given by (cogcrs or ctwcrs).

4.1.2 Only six-minute marks selected (vessel, vecmrk2,...): place ~~SY(ARPSIX01)~~ SY(ARPSIX02) at every six-minute mark. Rotate in the direction given by (cogcrs or ctwcrs).

4.2 *(Note that there are no time marks on AIS vectors)*

Suggestions:

1. To bring into accord IHO presentation library with IEC 62288 it is necessary to revise existing Conditional symbology procedure VESSELnn. Minimum changes are suggested in red in the description of VESSEL02 listed above.
2. It is necessary to eliminate differences between existing symbol instructions for AIS and ARPA symbology in Tables of clause 15 (List of symbol names & meanings) of IHO Presentation Library and IHO PUBLICATION S-52 APPENDIX 2, ADDENDUM TO ANNEX A, PART I, USERS´ MANUAL EDITION 3.4 (2008) – see Table 1, Symbol instructions for AIS and ARPA symbology.
3. It is necessary to elaborate new symbols for selected AIS and ARPA targets and to change the remark for attribute vestat (Vessel status). Coodding the IEC 62288 the colour token for these symbols should be CURSR (orange) – see table from IEC 62288 in IEC 62288 and PL.doc.

Review of Presentation of Mariners' Object Class Manufacturers' Feature (mnufea)

For symbolization of Manufacturers' feature object in look-up tables of IHO Presentation library attribute for Point geometry type attribute Category of mariners' note (catnot) is used.

"mnufea","","SY(CHINFO10)","5","O","MARINERS STANDARD","55010"
"mnufea","catnot1","SY(CHINFO10)","5","O","MARINERS STANDARD","55010"
"mnufea","catnot2","SY(CHINFO11)","5","O","MARINERS STANDARD","55020"

But such attribute is absent in the description for Manufacturers' feature object in Part II (Mariners' objects).

Mariners' Object Class:	**Manufacturers' feature**

Acronym: **mnufea** Code: 8201

Reference: To implement IMO PS section 2 : "The SENC may also contain information from other sources", and IHO S-52 section 2 : "Additional information obtained from other sources should be distinguished from HO data."

Set Attribute_A: OBJNAM; catnot

Set Attribute_B: SCAMIN;; usrmrk;

Set Attribute_C: RECDAT;

Geometric Primitive: Area; Line; Point;

Suggestions:

It is necessary to add to the Set Attribute_A attribute Category of mariners' note (catnot).