Paper for Consideration by NCWG/NIPWG

KHOA S-100 Portrayal Harmonization Project

Submitted by:	Republic of Korea
Executive Summary:	This paper introduce KHOA S-100 portrayal harmonization project and discuss it for IHO symbols and colour guideline development.
Related Documents:	S-4, S-52, S-98, S-12X
Related Projects:	S-100 Test Bed and KHOA S-100 symbol project

Introduction / Background

Since S-100 was published to replace S-57 in 2010, many S-100 based product specification has developed for implementation and testing purpose until the first half of 2019. At first, S-102 was developed, many S-100 based product specifications have developed such as S-101 Electronic navigational chart, S-111 Surface current, S-122 Marine protected area, S-123 Radio services, S-127 Vessel traffic management, etc.

In addition to the electronic navigational chart, various additional information will be used for ECDIS and it includes non-hydrographic information such as weather information. S-100WG has developing S-98 for representing various S-100 based information harmonized but it is to adjust and suppress display priority between navigational data. The guideline of symbol and colour for each product specification is not included.

KHOA has led S-100 symbol harmonization project for Korean e-Navigation S-100 hydrographic service since 2018 (KHOA symbol harmonization project). The progress of this project was shared S-100WG and S-101PT, also KHOA would share it with NCWG and propose a symbol developing guideline for S-100 based products.

Analysis

KHOA symbol harmonization project is to analyze existing symbol examples and it is to modernize symbols or create new modern symbols. The scope of this project is S-102 Bathymetric Surface, S-104 Water Level Information for Surface Navigation, S-111 Surface Currents, S-122 Marine Protected Areas, S-123 Radio Services, S-124 Navigational Warnings, S-127 Vessel Traffic Managements and S-129 Under-Keel Clearance Management.

To find out symbols the project needs to improve or to create, all the categories S-4 and INT1 are used are surveyed. For chart layer symbols, the S-52 presentations for symbol information are also surveyed. The project adopts the existing categories for the symbols commonly used but defines new categories for the symbols which are not matched to any existing categories.

For the symbols identified to be improved or created, discussions about colors and shapes are needed. Few candidates will be suggested however the final decision will be done through a test on the S-100 testbed.

This section describes the survey and research process for this work briefly.

1. Identifications of symbol categories

Step i. Surveying categories of S-4 and INT1

IHO S-4 and INT1 were surveyed to match the features and symbols from the target products of this project. Table 1 shows the result.

Table 1. Symbol categories of INT1 and S-4

Category 1	Category 2 (sub-category)
General	Position–Distance–Directions–Compass
Topography	Natural Features
	Cultural Features
	Landmark
	Ports
Hydrography	Tides–Currents
	Depths
	Nature of the Seabed
	Rocks – Wrecks – Obstructions – Aquaculture
	Offshore Installations
	Tracks – Routes
	Areas – Limits
Aids to Navigation and Services	Lights
	Buoys–Beacons
	Fog signals
	Radar, Radio–Satellite Navigational Systems
	Services
	Small Craft (Leisure) Facilities

Step ii. Surveying chart layer information of S-52

Symbol presentation of S-52 was surveyed to portray the symbols on the chart layer and Table 2 shows the results.

Table 2. 10 priority areas for display in S-52

Priority layers
1. ECDIS visual alarms/indications
2. HO-data: points/lines and areas + official updates
3. NtMs, manual input and Radio Navigational Warnings
4. HO-caution (ENC cautions)
5. HO-color-fill area data
6. HO's on demand data
7. Radar information
8. Mariner's data: points/lines and areas
9. Manufacturer's data: points/lines and areas
10. Mariner's color-fill area data

Step iii. Matching the features of target products to the existing categories

The next step is to match the features and symbols from the target products of this project to the categories survey through the previous steps i and ii.

Table 3. The matching table of the features, INT1 categories and S-52 layer

Feature name	INT1 category (Category 2 of Table 1)	S-52 layer	Remark
Landmark	Landmark	2. HO-data: points/lines and areas + official updates	
Building	Cultural Features	2. HO-data: points/lines and areas + official updates	
Radio Station	Radar, Radio – Satellite Navigational Systems	3. NtMs, manual input and Radio Navigaional Warnings	
ShipReportingServiceArea	Tracks – Routes	3. NtMs, manual input and Radio Navigaional Warnings	
RadioServiceArea	Radar, Radio – Satellite Navigational Systems	3. NtMs, manual input and Radio Navigaional Warnings	
RadioCallingInPoint	Tracks – Routes	3. NtMs, manual input and Radio Navigaional Warnings	
CoastguardStation	Services	2. HO-data: points/lines and areas + official updates	
PilotService	Services	2. HO-data: points/lines and areas + official updates	
PilotBoardingPlace	Services	2. HO-data: points/lines and areas + official updates	
PilotageDistrict	Services	5. HO-color-fill area data	
PlaceOfRefuge	Services	2. HO-data: points/lines and areas + official updates	
SignalStationTraffic	Services	2. HO-data: points/lines and areas + official updates	
RadarRange	Radar, Radio – Satellite Navigational Systems	7. Radar information	
RouteingMeasure	Tracks – Routes	2. HO-data: points/lines and areas + official updates	
WaterwayArea	Tracks – Routes	2. HO-data: points/lines and areas + official updates	
**MarineProtectedArea	Areas – Limits	2. HO-data: points/lines and areas + official updates	
MillitaryPracticeArea	Areas – Limits	2. HO-data: points/lines and areas + official updates	
CautionArea	Areas – Limits	4. HO-caution (ENC cautions)	
RestrictedAreaNavigational	Areas – Limits	2. HO-data: points/lines and areas + official updates	S-122

RestrictedAreaRegulatory	Areas – Limits	2. HO-data: points/lines and areas + official updates	S-122
*RestrictedAreaNavigational	Areas – Limits	2. HO-data: points/lines and areas + official updates	S-127
*RestrictedAreaRegulatory	Areas – Limits	2. HO-data: points/lines and areas + official updates	S-127
SignalStationWarning	Services	2. HO-data: points/lines and areas + official updates	

Step iv. Defining new categories for the symbols not matched

There are some features of target products that are not matched to the existing categories such as UKCM features. For those features and symbols, adequate categories were defined to fit them in. Table 4 shows the related categories of INT1 and newly created categories.

Table 4. New categories about non-matched features

Feature name	Category	S-52 layer	Remark
NavtexStationArea	(related to Radar, Radio – Satellite Navigational Systems)	2. HO-data: points/lines and areas + official updates	
InmarsatOceanRegionArea	(related to Radar, Radio – Satellite Navigational Systems)	2. HO-data: points/lines and areas + official updates	
UnderKeelClearance ControlPoint	Under keel clearance management service	2. HO-data: points/lines and areas + official updates	New
UnderKeelClearance NonNavigableArea	Under keel clearance management service	5. HO-color-fill area data	New
UnderKeelClearance AlmostNonNavigableArea	Under keel clearance management service	5. HO-color-fill area data	New
UnderKeelClearance AllowanceArea	Under keel clearance management service	5. HO-color-fill area data	New
UnderkeelClearance ManagementArea	Under keel clearance management service	5. HO-color-fill area data	New
GMDSSArea	(related to Radar, Radio – Satellite Navigational Systems)	2. HO-data: points/lines and areas + official updates	
IspsCodeSecurityLevel	Security service	2. HO-data: points/lines and areas + official updates	New
VesselTrafficServiceArea	(related to Services – Signal stations)	2. HO-data: points/lines and areas + official updates	
*VesselTrafficServiceArea	(related to Services – Signal stations)	2. HO-data: points/lines and areas + official updates	
WeatherForecast WarningArea	(related to Area, limits – Restricted area)	5. HO-color-fill area data	
PiracyRiskArea	(related to Area, limits – Restricted area)	4. HO-caution (ENC cautions)	
ConcentrationOf ShippingHazardArea	(related to Area, limits – Restricted area)	4. HO-caution (ENC cautions)	

S-124_TextPlacement	TBD	2. HO-data: points/lines and areas + official updates	
S-124_Navigatoinal WarningFeaturePart	TBD	2. HO-data: points/lines and areas + official updates	
S-123 ApproximateAreas	TBD	TBD	

2. Defining Colors for the symbols not matched

Also, with classification of information, it was analyzed for symbol color presentation. By comparing S-4 and S-52, it was able to get the information of color presentation in the navigational chart. Table 5 shows the matching result of S-12x features and the color presentation.

For the features which are not matched into the existing categories, expected colors are suggested. Table 5 shows the examples but more discussions will be followed for the final decisions.

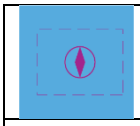
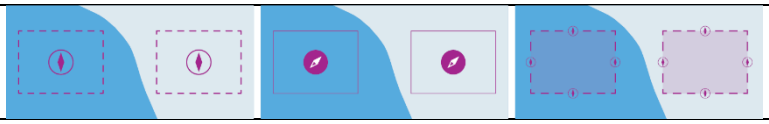
Table 5. The matching table of S-12x features and the color presentation

Feature name	Expected color	Remark
Landmark	Brown (S-52)	
Building	Brown (S-52)	
Radio Station	Magenta (S-4)	
ShipReportingServiceArea	Magenta (S-4)	
RadioServiceArea	Magenta (S-4)	
RadioCallingInPoint	Magenta (S-4)	
NavtexStationArea	Magenta (S-4)	
CoastguardStation	Black (S-4)	
InmarsatOceanRegionArea	Magenta (S-4)	
PilotService	Magenta (S-4)	
PilotBoardingPlace	Magenta (S-4)	
PilotageDistrict	Magenta (S-4)	
UnderKeelClearanceControlPoint	Grey (S-52)	
UnderKeelClearanceNonNavigableArea	Magenta (S-4) / Red (S-52)	
UnderKeelClearanceAlmostNonNavigableArea	Magenta (S-4)	
UnderKeelClearanceAllowanceArea	Magenta (S-4)	
UnderkeelClearanceManagementArea	Magenta (S-4)	
GMDSSArea	Magenta (S-4)	
IspsCodeSecurityLevel	Magenta (S-4)	
PlaceOfRefuge	Magenta (S-4)	
VesselTrafficServiceArea	Magenta (S-4) / Blue (S-52)	S-122
*VesselTrafficServiceArea		S-127
SignalStationTraffic	TBD	
RadarRange	Magenta (S-4)	
RouteingMeasure	Grey (S-52)	
WaterwayArea	TBD	
**MarineProtectedArea	Magenta (S-4) / Grey (S-52) / Red (S-52)	
MillitaryPracticeArea	Magenta (S-4) / Red (S-52)	
WeatherForecastWarningArea	TBD	
PiracyRiskArea	TBD	
CautionArea	TBD	
ConcentrationOfShippingHazardArea	TBD	
RestrictedAreaNavigational	Magenta (S-4) / Red (S-52)	S-122
RestrictedAreaRegulatory		S-122
*RestrictedAreaNavigational		S-127
*RestrictedAreaRegulatory		S-127
SignalStationWarning	TBD	
S-124_TextPlacement	Black(day)/White(night) (S-52)	
S-124_NavigatoinalWarningFeaturePart	TBD	
S-123 ApproximateAreas	TBD	

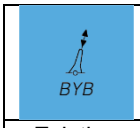
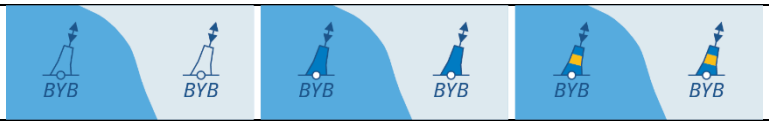
3. Example of symbol modernization

Symbol improvement guideline will include the information about modernization and creation of electronic chart symbols. Below images show the examples which are the alternatives of symbol improvement for Area, Point and Line.

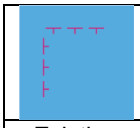
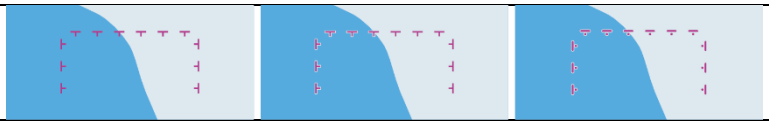
- Area

		
Existing symbol (Paper chart)	Existing symbol (ENC)	1. Re-sized symbol and line 2. Changing symbol and line 3. Filling the area and line with symbol

- Point

		
Existing symbol (Paper chart)	Existing symbol (ENC)	1. Changing color to blue 2. Filling blue color in the symbol 3. Filling blue color in the symbol and adding yellow middle line

- Line

		
Existing symbol (Paper chart)	Existing symbol (ENC)	1. Re-sized the line 2. Adding white border each line component (⊦ , ⊥) 3. Line component changed to dot and line

Conclusion

KHOA has led to a symbol harmonization project to modernize existing symbol and to make new symbols for S-100 based products. For S-100 based e-Navigation services, the symbol improvement guideline will be created in this project.

Action required of NIPWG

The NIPWG is invited to note this document and request comments or feedback on the project.