

OCX APPLICATION IN INTEGRATED MODEL

NEW COOPERATION WAY FOR TOMORROW

O P E N C L A S S 3 D E X C H A N G E

1. INTRODUCTION OF MARIC
2. INTEGRATED MODEL REVIEW
3. EXTEND OCX SCHEMA
4. SUMMARY AND FUTURE PROSPECT

IT DEPT.
VICE DIRECTOR
HAIYING ZHANG

CONTENTS 目录



1 MARIC INTRODUCTION

2 INTEGRATED MODEL REVIEW

3 EXTEND OCX SCHEMA

4 SUMMARY AND PROSPECT





- CHEMICAL
- HANDY
- MR
- PANAMAX
- AFRAMAX
- SUEZMAX
- VLCC

- FEEDER
- MEDIUM
- LARGE
- ULTRA
- LARGE

- HANDYMAX
- KAMSARMAX
- CAPESIZE
- NEWCASTLEMAX
- VLOC

- LPGC/MGC/VLGC/VLAC
- LEGC/VLEC/ULEC
- LNG CARRIER
- LCO2 CARRIER
- H2 CARRIER
- BUNKERING VESSEL
- OFFSHORE (FLNG/FSRU)

- RO-RO
- PCC/PCTC
- CRUISE SHIP
- PASSENGER SHIP
- TRAIN FERRY
- PASSENGER/CAR FERRY
- HEAVY LOAD CARRIER

- RESEARCH VESSEL
- ICEBREAKER
- PUBLIC AFFAIR VESSEL
- HIGH SPEED CRAFT



MARIC INTRODUCTION

BRIEF INTRODUCTION



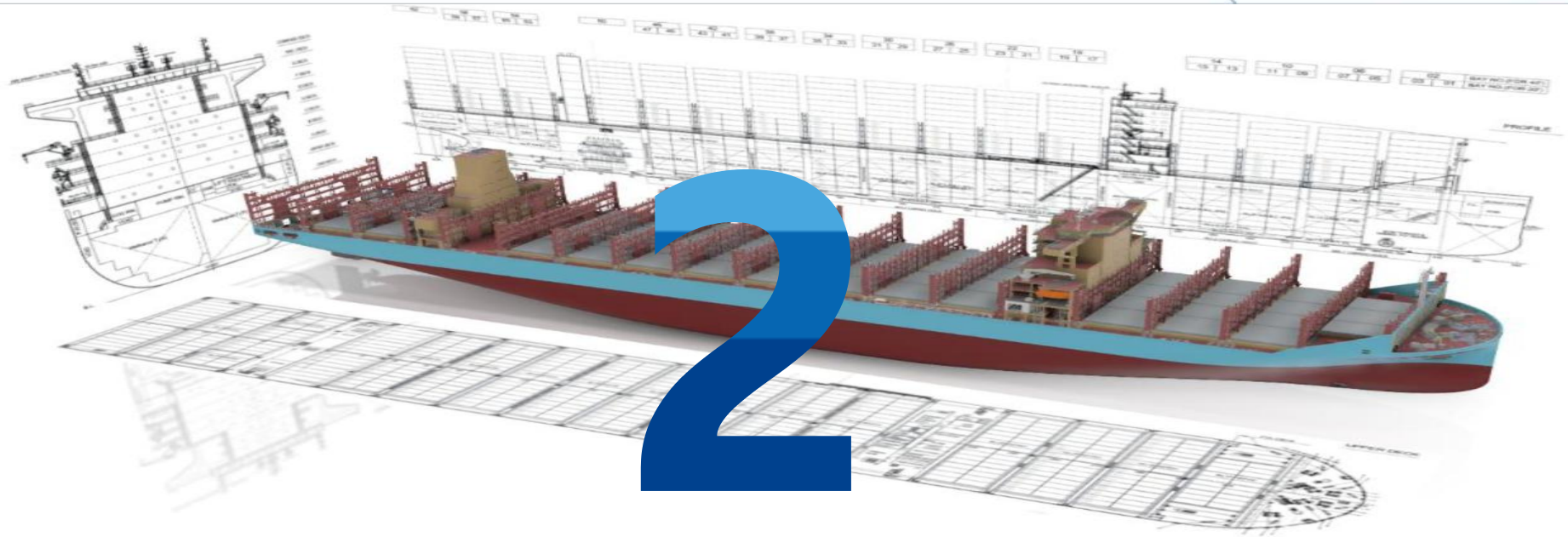
1. MARIC INTRODUCTION



MERCHANT RESEARCH INSTITUTE OF CHINA(MARIC)

- The first design institute of merchant ships and offshore engineering in China.
- Subsidiary of China State Shipbuilding Corp (CSSC)
- Member of the International Ship Structure Committee (ISSC)
- Member of the International Towing Tank Committee (ITTC)
- Education and Research Program for Master and PHD in Marine Structure and Hydrodynamics





INTEGRATED MODEL REVIEW

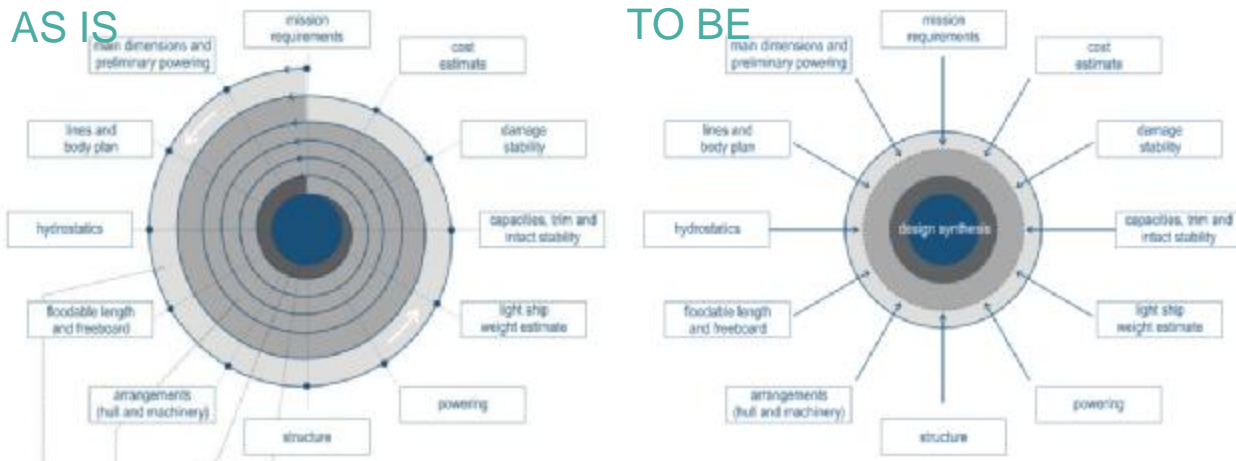
CHALLENGES FACED

2. INTEGRATED MODEL REVIEW

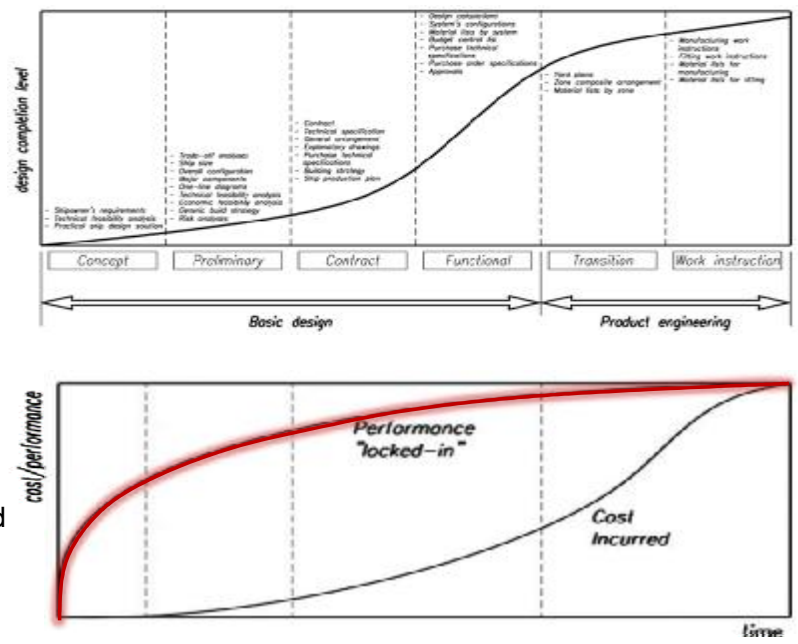


INTEGRATED SHIP DESIGN TO INCREASE CERTAINTY

U. La Monaca, S. Bertagna, A. Marinò, and V. Bucci, 'Integrated ship design: an innovative methodological approach enabled by new generation computer tools', Int J Interact Des Manuf, vol. 14, no. 1, pp. 59–76, Mar. 2020



S. Harries, F. Tillig, M. Wilken, G. Lloyd, and G. Zaraphonitis, 'An Integrated Approach for Simulation in the Early Ship Design of a Tanker',



CHALLENGE TO DESIGN OFFICE



RICHER NEEDS



HIGHER COMPLEXITY



SHORTER SCHEDULE



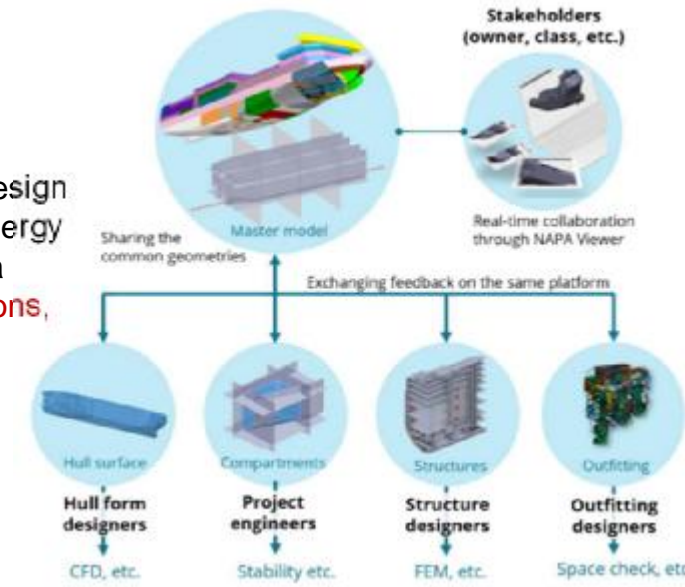
STRICTER RULES

2. INTEGRATED MODEL REVIEW



SINGLE SOURCE TRUTH BASED ON THE 3D MODEL

“ In the early design phase, which includes the development of new design concepts and the basic design process around contracts, it is necessary to study a variety of design options targetting improved energy efficiency, weight reduction, improved payload capacity etc. to achieve a competitive design within a limited design time frame. **The process is very complicated because of frequent hull form modifications, compartment arrangement changes etc.** Furthermore, when it comes to innovative designs such as vessels applying new fuels, many uncertainties make it more challenging to make decisions with confidence. ”



Collaborative Single Model Design Platform for Ships of Tomorrow

Takayoshi Masui, NAPA Japan Ltd., Kobe/Japan, takayoshi.masui@napa.fi
 Tapio Seppälä, NAPA Ltd., Helsinki/Finland, tapio.seppala@napa.fi
 Myeong-jo Son, NAPA Ltd., Helsinki/Finland, myeong-jo.son@napa.fi
 Janne Huotari, NAPA Ltd., Helsinki/Finland, janne.huotari@napa.fi 3D x SHIP

Reducing Detail Design and Construction Work Content by Cost-Effective Decisions in Early-Stage Naval Ship Design

Robert G. Keane, Jr.,¹ Laurent Deschamps,² and Steve Maguire³
¹Ship Design USA, Inc., 4913 Reed Hill Rd, Koolesville, MD 21756
²SPAR Associates, Inc., 607 West Street #101, Annapolis, MD 21401
³First Marine International, 33 St. James' St., London SW1A 1JD, United Kingdom



International Journal on Interactive Design and Manufacturing (IJDeM)
<https://doi.org/10.1007/s12008-019-00612-4>

ORIGINAL PAPER

Standalone Intelligent General Arrangement Tool for Holistic Basic Design

Madalina Florean, CADMATIC, Groningen/The Netherlands, madalina.florean@cadmatic.com
 Verónica Alonso de los Ríos, CADMATIC, Madrid/Spain, veronica.alonso@cadmatic.com
 Juan Prieto, CADMATIC, Groningen/The Netherlands, juan.prieto@cadmatic.com
 Ludmila Seppälä, CADMATIC, Turku/Finland, ludmila.seppala@cadmatic.com 3D x SHIP

Shipbuilding 3D CAD Tools as an Integrated Solution from Concept to Product

La herramienta CAD 3D para la construcción naval como solución integrada desde el concepto hasta la producción

DOI: <https://doi.org/10.25043/19098642.220>

Jaime Pérez-Martínez¹
 Rodrigo Pérez²

Integrated ship design: An innovative methodological approach enabled by new generation computer tools

Ubaldo la Monaca¹ · Serena Bertagna¹ · Alberto Marino¹ · Vittorio Buccì¹

Received: 31 May 2019 / Accepted: 19 September 2019
 © Springer-Verlag France SAS, part of Springer Nature 2019

2. INTEGRATED MODEL REVIEW



SINGLE SOURCE TRUTH BASED ON THE 3D MODEL IN MARIC

DESIGN ACTIVITIES

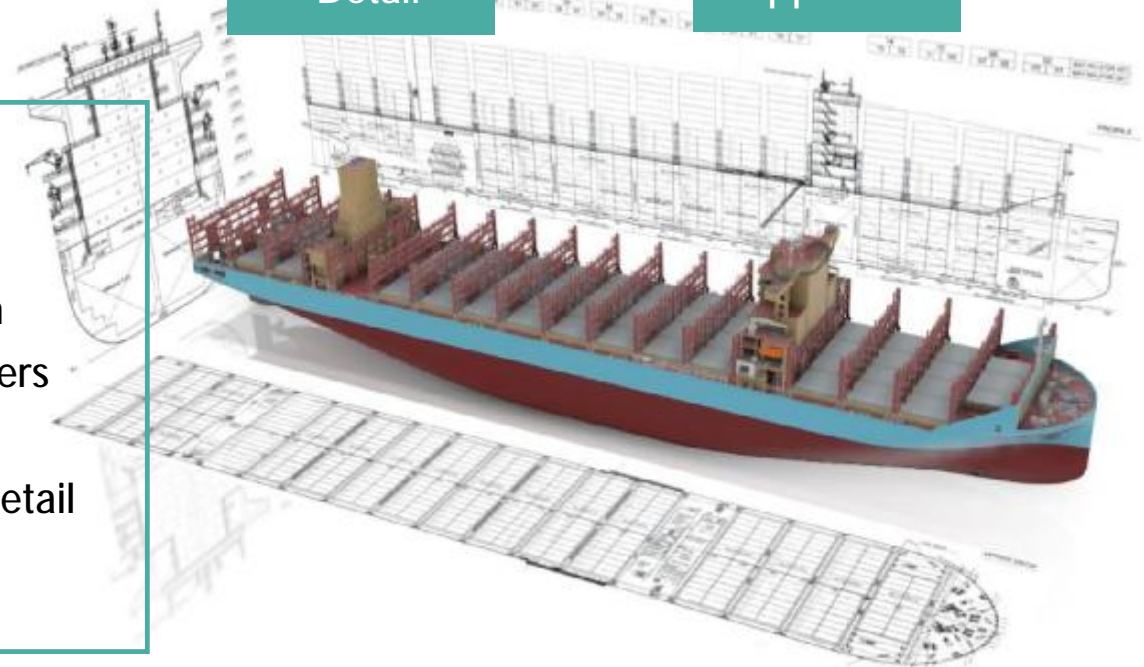
Concept

Integrated

Detail

Approval

- Respond to needs of customers
- Express design intent
- Take the lead in the implementation of integration
- Reduce the cost of communication with stakeholders
- Early identification of design risks
- Reduce the workload of the structure during the detail design phase



2. INTEGRATED MODEL REVIEW



SINGLE SOURCE TRUTH BASED ON THE 3D MODEL IN MARIC

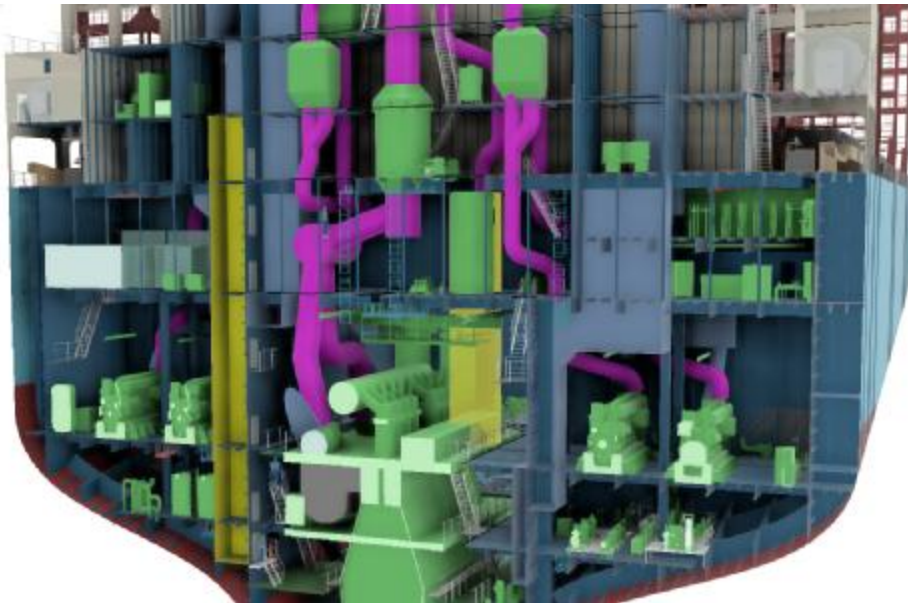
DESIGN ACTIVITIES

Concept

Integrated

Detail

Approval

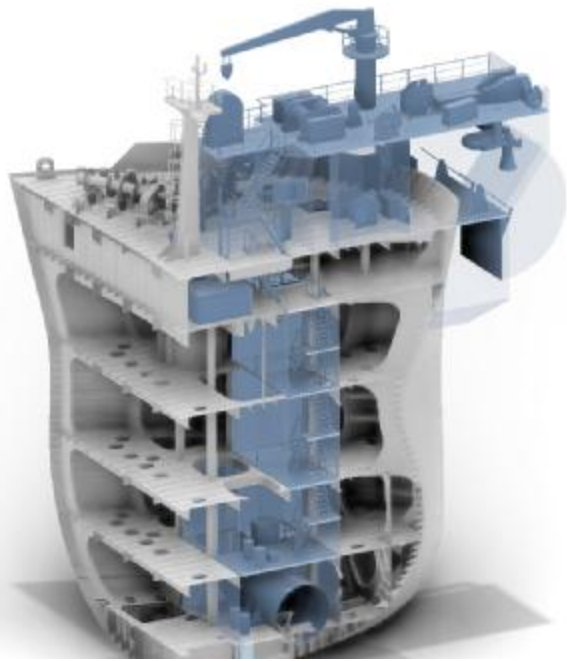


- A more comprehensive model
- Less drawings
- Good design results based on rules driven design tools
- Reliability of CAE models on consistency with design
- Tight approval schedule based on reasonable decomposition
- Fast closed comments based on less misunderstanding

2. INTEGRATED MODEL REVIEW

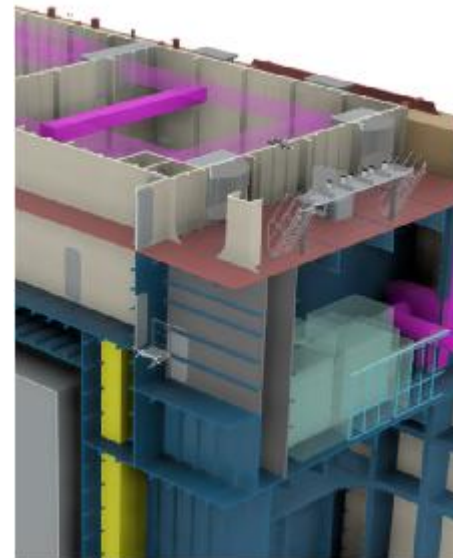
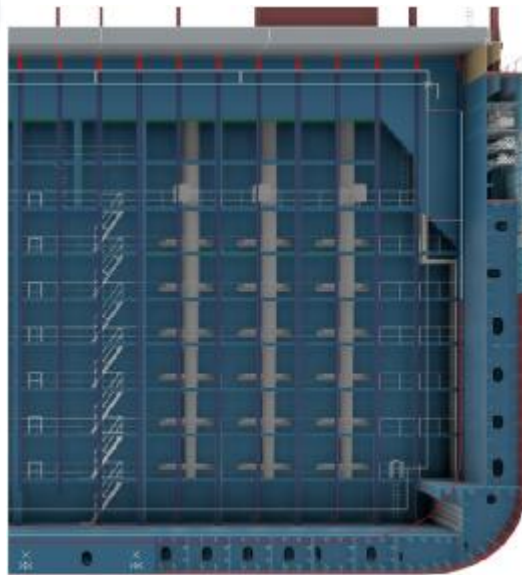


TYPICAL INTEGRATED DESIGN REVIEW SCENARIO



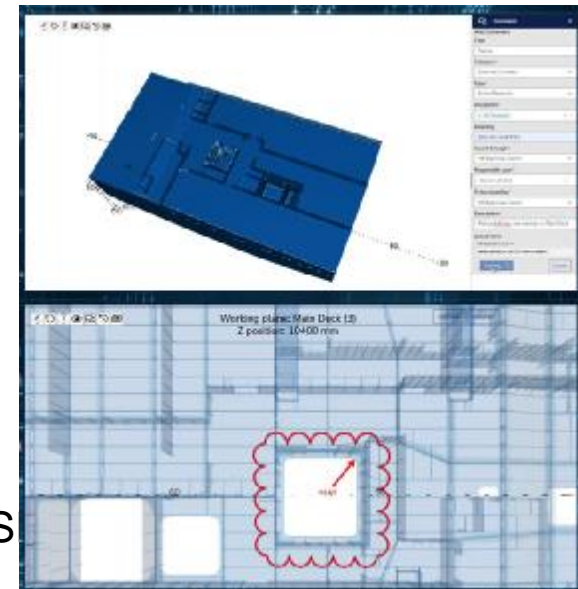
RETROFIT ASSESMENT

SAFT REGULATION VERIFICATION



HAZARDOUS ANALYS

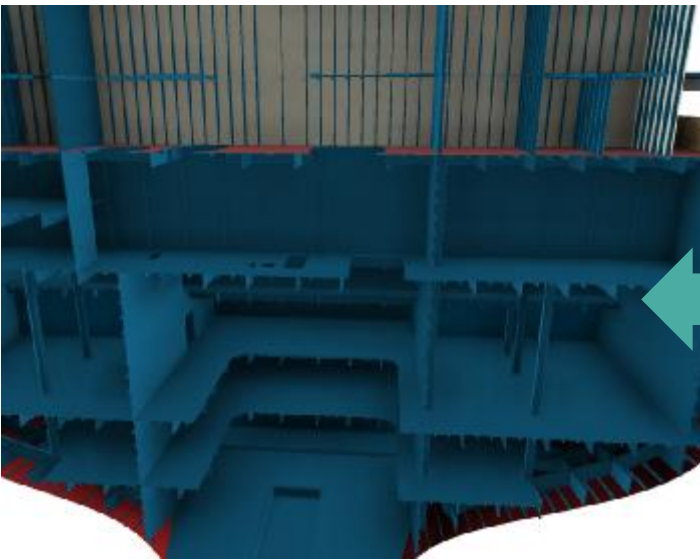
REFERENCE FOR 3D APPROVAL



2. INTEGRATED MODEL REVIEW



CONVERGENCE KEY ISSUES: DATA EXCHANGE FOR INTEGRATED MODEL

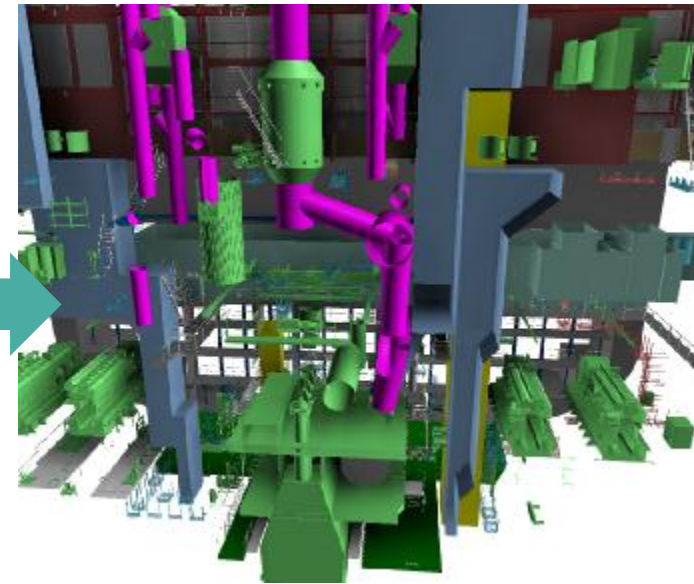
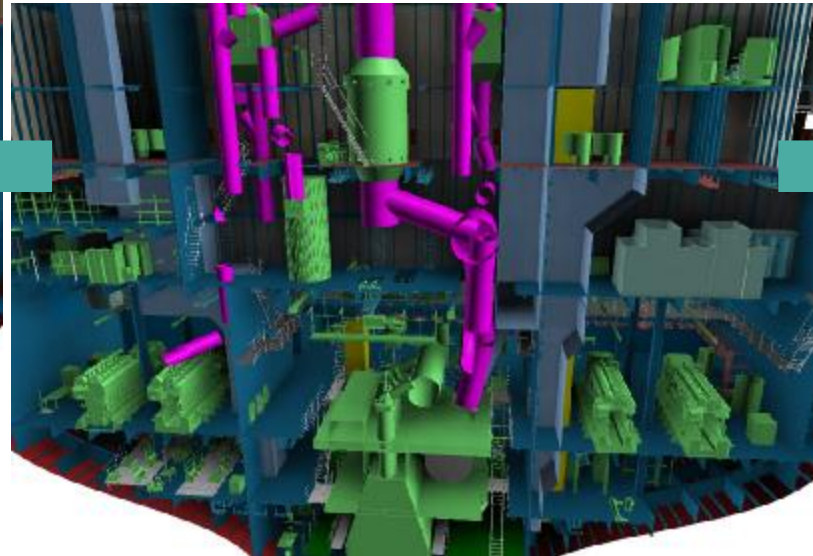


STRUCTURAL OBJECTS



CURRENT OCX SCHEMA ✓

INTEGRATED MODEL



NON-STRUCTURAL OBJECTS



EXTEND OCX SCHEMA



MARIC 3D rudder model displayed in Sesam Insight

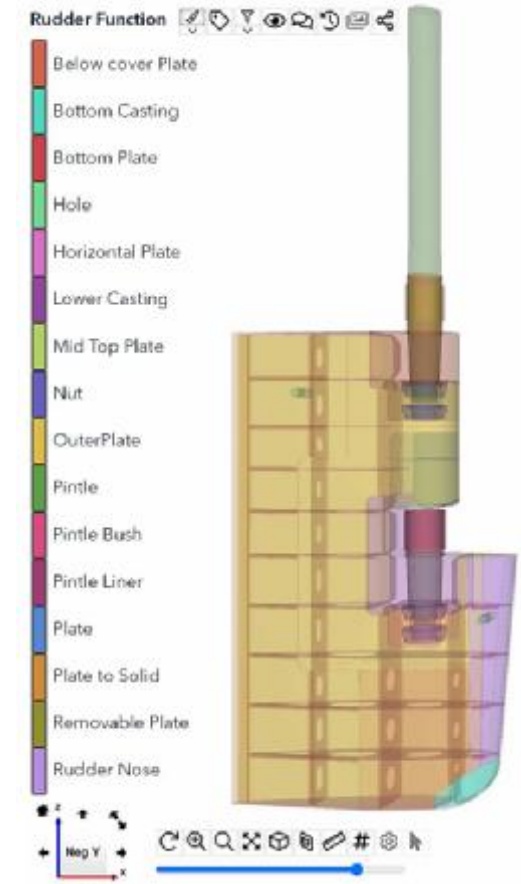
3



EXTEND OCX SCHEMA

BASED ON CURRENT FRAMEWORK

START WITH A SIMPLE DESIGN

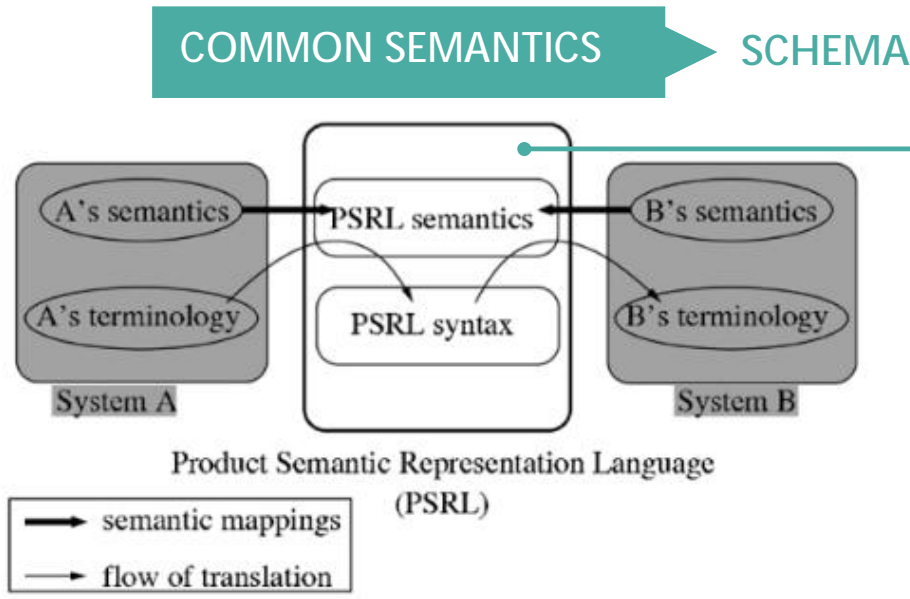


3. EXTEND OCX SCHEMA

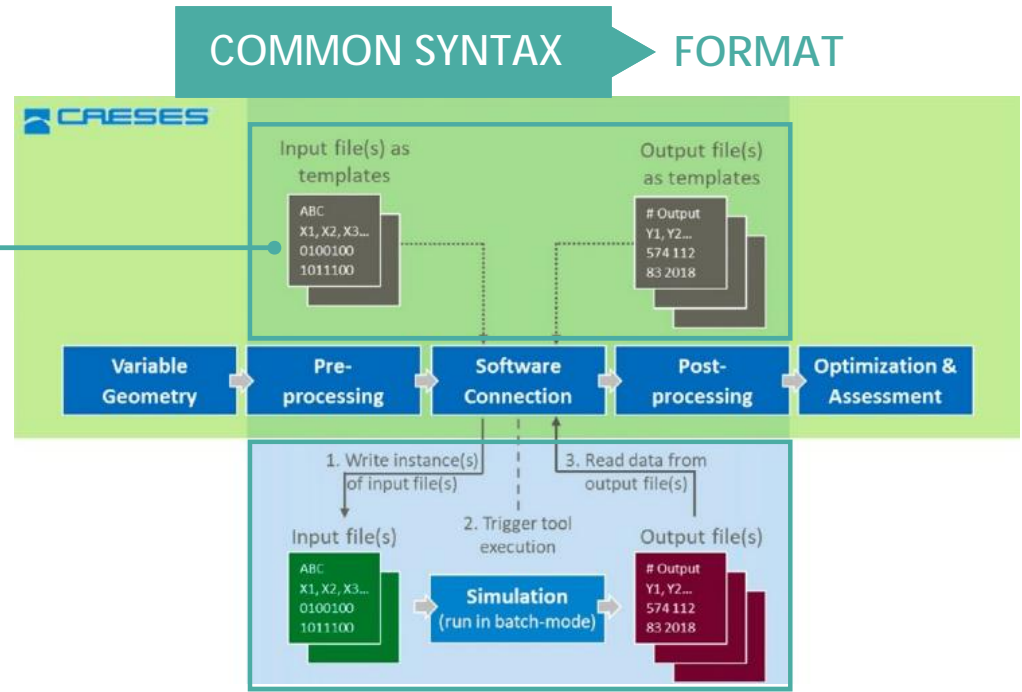


Understanding of heterogeneous software interoperability

To establish the mapping relationship between two different expressions describing the same design object.



L. Patil D. Dutta R. Sriram. Ontology-Based Exchange of Product Data Semantics. IEEE Transactions on Automation Science and Engineering, 2(3):213225, 2005.



OCX

A holistic approach to ship design[M]. New York, NY: Springer Berlin Heidelberg, 2019.

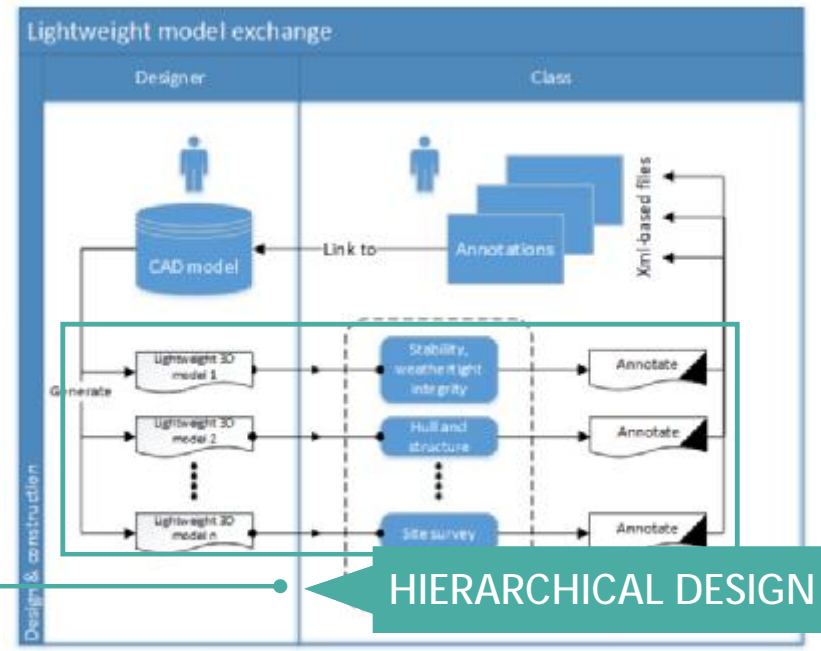
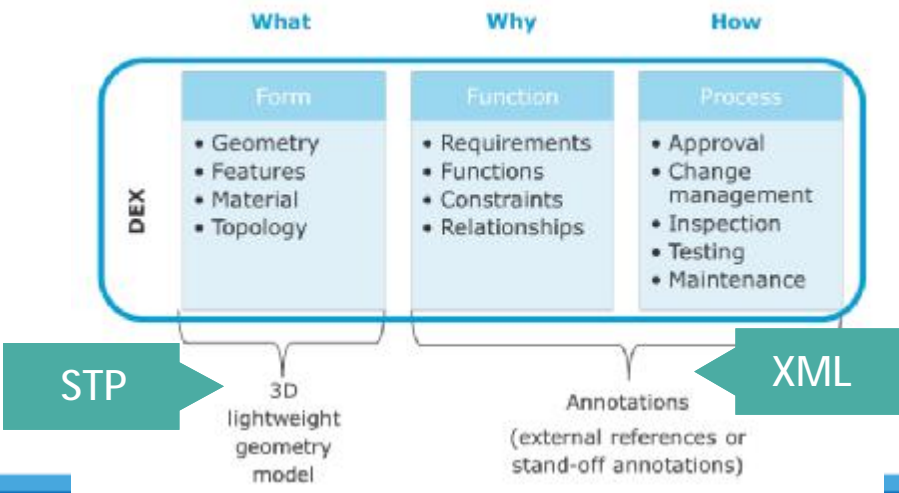
3. EXTEND OCX SCHEMA



Implementation path applicable to MARIC startup



Modeling mechanism



HIERARCHICAL DESIGN

3. EXTEND OCX SCHEMA

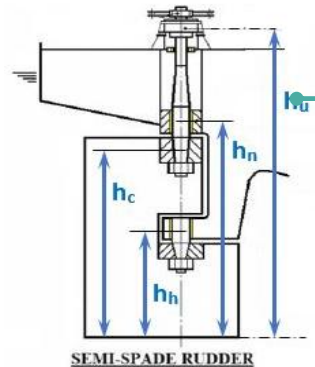


Identify verification information beyond geometry

- Defined the inclusion of 3D model review information with attached PDF, not overly pursuing full 3D

Description	rule reference	set	how info. to be included	value	list of values if applicable	note
Descriptive information Exchange						
Background Rudder						
Set 1: The descriptive information for rudder to be exchanged in OCX data						
Set 2: All descriptive information required for rudder class approval, other than the information in Set 1.						
Rule reference: DNV-RU-SHIP July 2007 Part 3 Ch 8 Sec 1, unless otherwise specified.						
Maximum specified service speed ahead, V_{max} in knots	(1.1.1) (1.2.1) (1.3.1)	Set 1	OCX_general	03	number ≥ 0	
Maximum specified service speed astern, V_{max} in knots	(1.1.2) (1.1.1)	Set 1	OCX_general	not applicable	number ≥ 0 Not Applicable	
ICE position	Part 3 Ch 8 Sec 1 (1.1.1)	Set 1	OCX_general	not applicable	ICE (A-C) ICE (D-C) ICE (A) ICE (D) ICE (C) ICE (C)	Local scantling of rudder as required in Part 3 Ch 8 Sec 1 (1.1.1) is not covered.
Service speed ahead in ice, V_{max} in knots	(1.1.1) (1.2.1) (1.3.1)	Set 1	OCX_general	not applicable	number ≥ 0	
Service speed astern in ice, V_{max} in knots	(1.1.2) (1.1.1)	Set 1	OCX_general	not applicable	number ≥ 0	
Rudder profile type	(1.1.1) Table 8	Set 1	OCX_general	WALD, AS, BULLHEAD		
Rudder arrangement	(1.1.1)	Set 1	OCX_general	INTERNAL		
Rudder type	(1.1.1) Figure 1	Set 1	OCX_general	SEMI-SPADE RUDDER		
Upper bearing height above rudder bottom, h_u in mm	Appendix A Figure 1	Set 1	OCX_general	3200		
Next bearing height above rudder bottom, h_n in mm	Appendix A Figure 1	Set 1	OCX_general	2150		
				7480		
				4000		

Review the checklist



- 3D model contains as much comprehensive component design information as possible.
- For layout & technology, 2D PDF are used as support materials

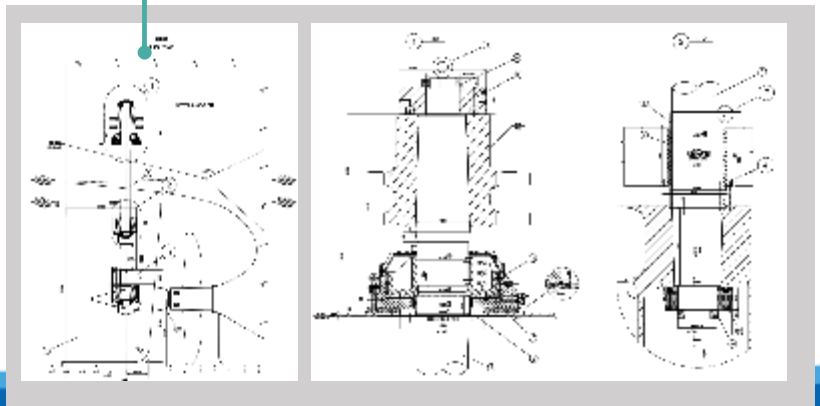
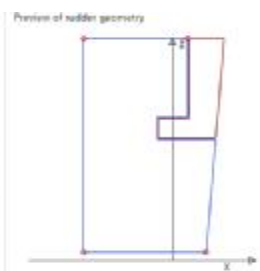
Rudder coordinates. Center of rudder stock is at X=0.

X (mm)	Z (mm)	Center profile
-3200	300	<input checked="" type="checkbox"/>
-3200	8150	<input checked="" type="checkbox"/>
330	8150	<input checked="" type="checkbox"/>
330	5250	<input type="checkbox"/>
-350	5250	<input type="checkbox"/>
-350	4400	<input type="checkbox"/>
1544	4400	<input type="checkbox"/>
1000	380	<input type="checkbox"/>

Form coordinates

X (mm)	Z (mm)
1850	8150
7550	4500
-800	4500
-800	5280
800	5280
800	8150

form profile bearing



3. EXTEND OCX SCHEMA



Decomposing information in CATIA

- MARIC adjusted the model architecture based on the consultation results

Parameters

- Ch01-船舶基本参数
- Ch02-船形式及尺寸
- Ch03-船数据-自动计算
- Ch04-舵力及舵杆扭矩-手动确认
- Ch05-舵叶受力分析
 - CR=2441.4
 - QR=1036.7
 - F1=967.6
 - F2=1473.8
 - L10=4.55m
 - L20=3.3m
 - L30=0.485m

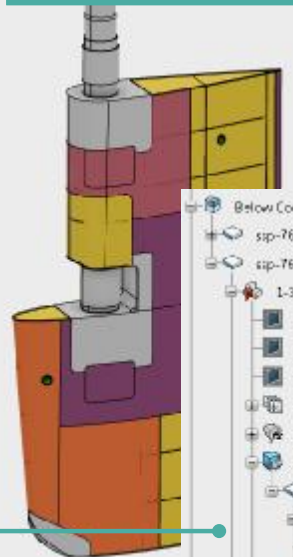
RUDDER SEMI BALANCE R6.1 A.1

- 型值 A.1
- 舵计算及框架 A.1 (舵计算及框架.1)
- Rudder A.1
 - xy plane
 - yz plane
 - zx plane
 - External Parameters
- Parameters
- 舵计算及框架 A.1 (舵计算及框架.1)
- Rudder A.1
- Drawing0015966 A.1
- RUDDER EBOM A.1 (RUDDER EBOM.1)
- RUDDER A.1 (RUDDER.1)
- RUDDER STOCK A.1 (RUDDER STOCK.1)
- NUT A.1 (NUT.1)
- PINTLE A.1 (PINTLE)
- PINTLE LINER A.1 (PINTLE LINER.1)
- PINTLE BUSH A.1 (PINTLE BUSH.1)
- STOCK LINER A.1 (STOCK LINER.1)
- STOCK BUSH A.1 (STOCK BUSH.1)

- Bottom Casting A.1 (End Casting.1)
- Top Plate A.1 (顶板.1)
- Bottom Plate A.1 (底板.1)
- Mld Top Plate A.1 (中部顶板.1)
- Rudder Naca A.1 (舵板.1)
- Plate to Solid A.1 (舵板.1)
- Outer Plate A.1 (地板.4)
- Outer Plate A.1 (地板.5)
- Outer Plate A.1 (地板.6)
- Removable Plate A.1 (可拆地板.1)
- Tail A.1 (尾板.1)
- Vertical Plate A.1 (垂直隔板.1)
- Vertical Plate A.1 (垂直隔板.2)
- Vertical Plate A.1 (垂直隔板.3)
- Vertical Plate A.1 (垂直隔板.4)
- Vertical Plate A.1 (垂直隔板.5)
- Vertical Plate A.1 (垂直隔板.6)
- Vertical Plate A.1 (垂直隔板.7)
- Upper Cover Plate A.1 (上盖板.1)
- Below Cover Plate A.1 (下盖板.1)
- Horizontal Plate A.1 (水平隔板.1)

HIERARCHICAL DESIGN

=> STP



DESIGN FEATURE

=> XML

Access key information

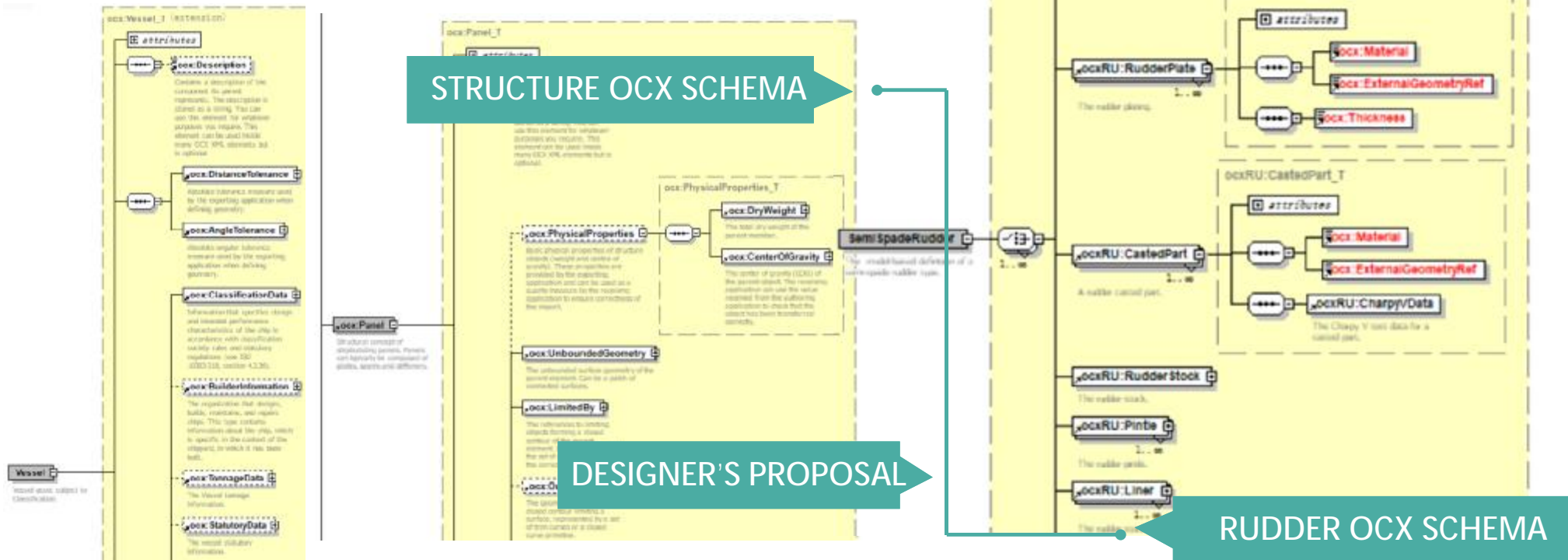
- Below Cover Plate A.1 (下盖板.1)
- ssp-76377.78-00466952 A.1 (1-Symmetry_4_34mm_GR...
- ssp-76377.78-00466936 A.1 (1-COVER PLATE_34mm_0...
- 1-3D Shape00788223 A.1
 - xy plane
 - yz plane
 - zx plane
 - External Parameters
 - Relations
 - Part Body
 - COVER PLATE_34mm_GRADE D
 - Delimited moldec surface.1
 - Thickness=14mm= External Parameter0...
 - Offset=Cmm
 - External References
 - Materials
 - GRADE D A.1 (ssp-76177178-00466936 A.1)

3. EXTEND OCX SCHEMA



Create new special schema

- DNV extended the existing OCX schema based on the negotiation results and the sample XML submitted by MARIC.
- A special schema on rudder design has been established

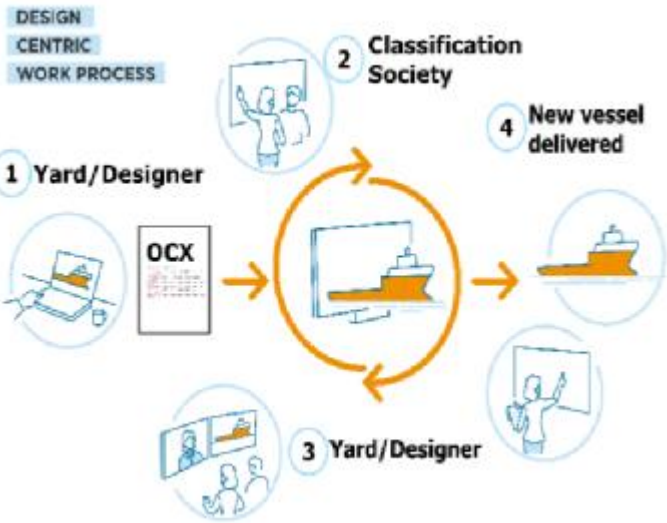


3. EXTEND OCX SCHEMA



Upload the OCX file

Process of 3DMBA



PAVING THE WAY FOR 3D MODEL-BASED CLASS APPROVAL. DNV 2023

Comments from surveyor

NEWBUILDING PROJECT
Design: P46183

Documentation

Free text filter: Type to filter

Status filter: Select...

Applicable documents: Select...

Clear all filters

0 selected | 2/2 documents

Description	Revision	Status	Sent	Received
Project Documents				
← K90105-001: 3D_Rudder	A1	AP	2023-11-10	2023-11-22
← k90105-002: 2D Rudder	A	FI	2023-10-04	2023-11-22

Upload OCX and pdf

NEWBUILDING PROJECT
Design: P46183

Comments

Free text filter: Type to filter

Status: Select to filter

Action needed by: Select to filter

Comment type: Select to filter

Discipline: Select to filter

To be closed by: Select to filter

Hide title

Import Export

Status	Comment id	Title
Q2	P46183-3	Material grade of outer plate over 25 mm
Q2	P46183-4	Material grade of horizontal plate of 26mm
Q2	P46183-6	Material grade of vertical plate over 30 mm
Q2	P46183-10	Material of casting and rudder stock
Q2	P46183-11	Welding
	P46183-9	Review basis
	P46183-2	Approval scope
	P46183-3	Discarded reason
	P46183-1	Discarded reason

Comment

P46183-5 MATERIAL GRADE OF OUTER PLATE OVER 25 MM

Discipline: H1 Issued by: Wen, Xin (WENX)

Material grade of outer plate over 25 mm

Please apply material grade D for outer plate over 25mm, and grade E for plate over 30 mm.

Replies

2023-11-23
Wen, Xin (WENX)

P46183-5,2 Noted, thanks.

2023-11-22
hastong, Yaan (YUANHATONG)

P46183-5,1 Agree. Apply material grade D for outer plate over 25mm, and grade E for plate over 30 mm.

3. EXTEND OCX SCHEMA



Model in the seasam insight viewer

- ▼ Rudder
 - > Casting
 - ▼ Rudder plating
 - ssp-76377178-0046689!
 - ssp-76377178-0046689!
 - ssp-76377178-0046689!
 - ssp-76377178-0046689!
 - ssp-76377178-0046690!
 - ssp-76377178-0046690!
 - ssp-76377178-0046690!
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 - ssp-76377178-0046691!
 - ssp-76377178-0046691!
 - ssp-76377178-0046691!
 - ssp-76377178-0046691!

Plate Thickness

- 16 mm
- 22 mm
- 26 mm
- 28 mm
- 30 mm
- 34 mm
- 35 mm
- 42 mm
- 54 mm
- N/A

Pos Y, Z, y

Document

K90105-001-3D_RUDDER

Document no. K90105-001 #

Type Drawing

Applicable for DNV (Applicable)

Document details

Document & file details	Status	Sent	Revision
K90105-001-3D_Rudd4_A1-3d.docx		2023-11-03	A1
K90105-001-3D_Rudd4_A_20230702-3d.docx	DI	2023-07-02	A

Asset name: P46183
Workspace name: P46183-1 (V2)
Property: Plate Thickness
Multiple properties selected

WENX 2 day(s) ago

P46183-6 Actions -

Material grade of vertical plate over 30 mm

WENX 2 day(s) ago

Status: Open

Type: Action Required

Category: External Comment

Discipline: H1 Structural

Rule/Reg: DNV RU-SHIP July 2022 Pt.3 Ch.14

Issued through: NB Approval Expert

Responsible user: WENX

To be closed by: NB Approval Expert

Please apply material grade E for vertical plate over 30 mm.

Add Reply Show Replies

Linked parts (4)

- ssp-76377178-00466907
- ssp-76377178-00466925
- ssp-76377178-00466952
- ssp-76377178-00466958

Select all Save View

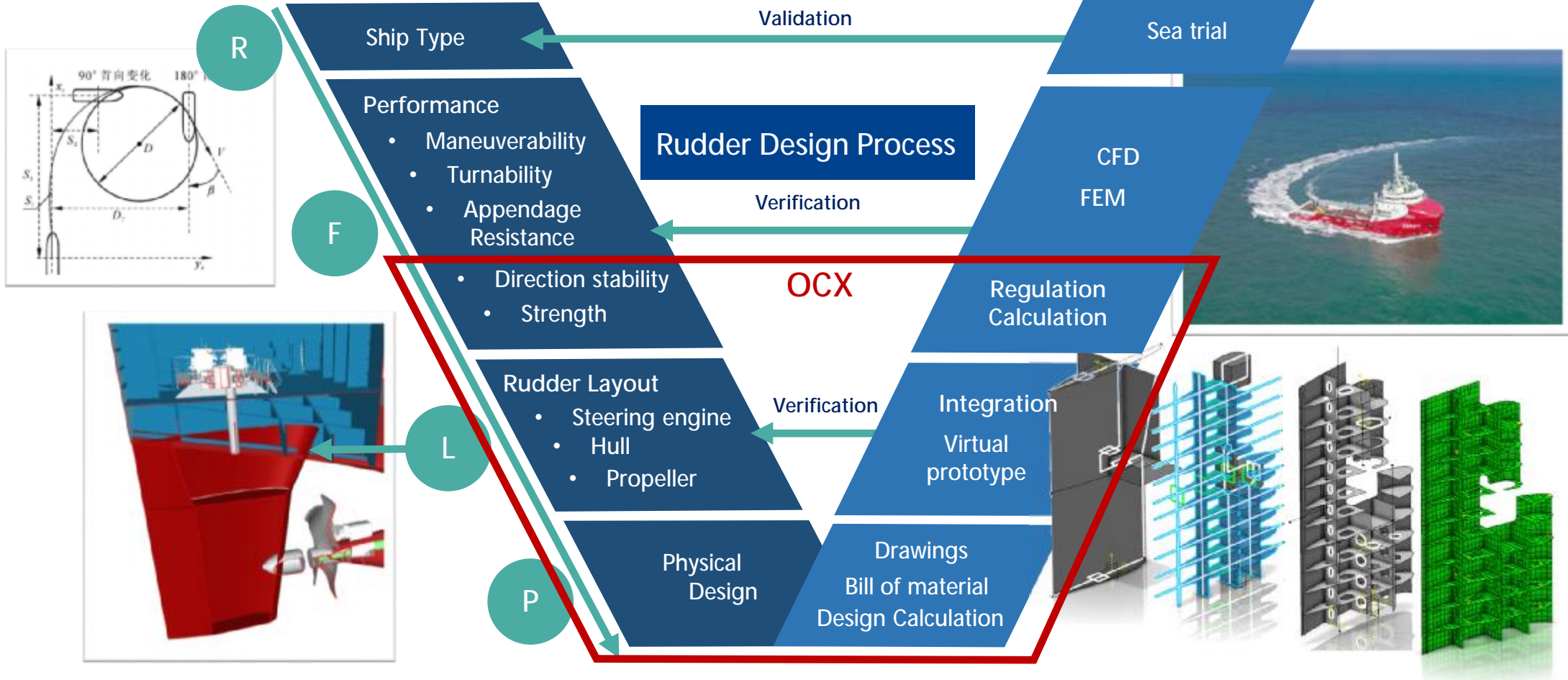
P46183-5 Actions -

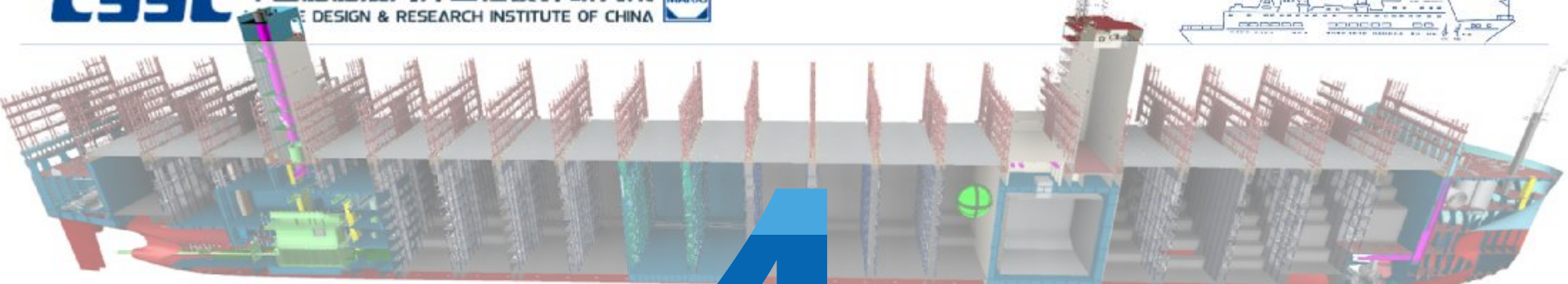
Material grade of outer plate over 25 mm

WENX 2 day(s) ago

3. OCX IN DESIGN PROCESS

The position of 3D approval in the rudder design process





4



SUMMARY & FUTURE PROSPECT

READY FOR MORE SCENARIOS

4. SUMMARY



CONTRIBUTION OF RUDDER 3D APPROVAL

CONCLUSION1: Extend OCX schema based on consensus between designer and surveyor

STEP + XML

CONCLUSION2: STEP with XML is a cost-effective and straightforward technical approach for extracting data from CAD systems.



4. SUMMARY



CONTRIBUTION OF RUDDER 3D APPROVAL

```
66 <ocx:DistanceTolerance numericvalue="1E-06" unit="uMeter" />
67 <ocx:AngleTolerance numericvalue="0.00872665" unit="uRadians" />
68 <ClassificationData nlsociety="DNV GL" societyName="Det Norske Veritas" nlsupplier="BuildingSo
95 <BuilderInformation yard="Newport News Shipbuilding" designer="Gibbs amp; Cox" owner="US
96 <ImageData xmlns="http://data.dnvgl.com/Schemas/ocxXMLSchema">
100 <StatutoryData portRegistration="Norfolk" flagstate="USA" xmlns="http://data.dnvgl.com/S
101 <ocx:CoordinateSystem id="id2" name="CS 0" ocx:GUIDRef="{000450E7-3000-3000-3000-300000000000}"
151 <ocx:Panel ocx:functionType="TRANSVERSAL_BULKHEAD" id="id17" name="F1-17BH-1" ocx:GUIDRef
153 <ocx:Description />
154 <ocx:PhysicalProperties>
155 <ocx:DryWeight numericvalue="2009.9713193621" unit="uKG" />
156 <ocx:CenterOfGravity>
157 <ocx:X numericvalue="0.739608036147957" unit="uMeter" />
158 <ocx:Y numericvalue="-0.0202064703775613" unit="uMeter" />
159 <ocx:Z numericvalue="0.793756567168416" unit="uMeter" />
160 </ocx:CenterOfGravity>
161 </ocx:PhysicalProperties>
162 <ocx:UCoordinateSystem>
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164 <ocx:Description>F1-17BH-1-103</ocx:Description>
165 <ocx:PhysicalProperties>
166 <ocx:DryWeight numericvalue="351.490661087963" unit="uKG" />
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172 </ocx:PhysicalProperties>
173 <ocx:PlateMaterial localRef="id549" ocx:refType="ocx:Material">
174 <ocx:Thickness numericvalue="0.012" unit="uMeter" />
175 </ocx:PlateMaterial>
176 <ocx:ExternalGeometryRef ocx:externalRef=".\\Auxiliary_Files\\OpenCRMidships_202005
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178 <ocx:Plate id="id5955" name="alt:B0agt;-1WB.4-1" ocx:GUIDRef="(0010A20F-0000-0000-45
179 <ocx:Plate id="id5968" name="alt:B0agt;-1WB.2-1" ocx:GUIDRef="(0010A20F-0000-0000-37
180 <ocx:Plate id="id5983" name="alt:B0agt;-1WB.1-1" ocx:GUIDRef="(0010A20F-0000-0000-30
228 </ocx:Composed0E
229 </ocx:Composed0E
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More focus on the expression of design information

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Description of geometry based on OCX

Subject to the constraints of the software vendor.

The file content is greatly simplified by external reference STEP files.

4. FUTURE RESPECTS

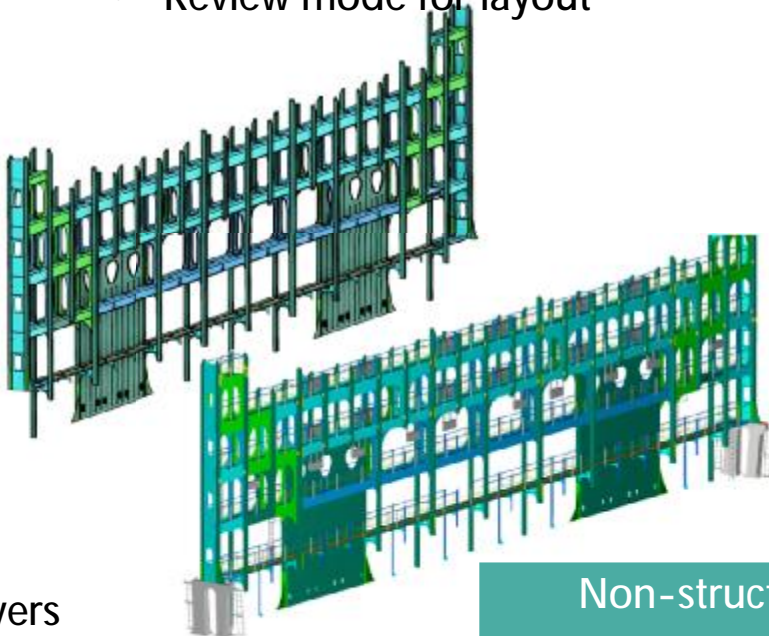


NEXT STEP

Challenge

- Outfitting's representation
- Review mode for layout

- IKnowledge Engineering Specification Phy
- Relations
- Parameters
- 1立柱 200x225x10 A.1 (1立柱 200x225x10.1)
- 1格栅支撑 -100x10 A.1 (1格栅支撑 -100x10.1)
- 1立柱 200x225x14 A.1 (1立柱 200x225x14.1)
- 1-GRP格栅平台 t=25 A.1 (1-GRP格栅平台 t=25)
- 1-剪力墙 t=10 A.1 (1-剪力墙 t=10.1)
- 1-剪力墙厚度 t=12 A.1 (1-剪力墙厚度 t=12.1)
- 1-格栅 -8x10 A.1 (1-格栅 -8x10.1)
- 1-平台 t=6 A.1 (1-平台 t=6.1)
- 1-平台 t=6 A.1 (1-平台 t=6.2)
- 1-平台 t=6 A.1 (1-平台 t=6.3)
- 1-平台下加强 Type1 t=8 A.1 (1-平台下加强 Type1 t=8)
- spp-76377178-0048943 A.1 (图2_Bמר)
- spp-76377178-0048943 A.1 (图2_Bמר)
- spp-76377178-0048943 A.1 (图2_Bמר)
- spp-76377178-0048943 A.1 (图2_Bמר)
- spp-76377178-0048943 A.1 (图2_Bמר)
- spp-76377178-0048943 A.1 (图2_Bמר)
- spp-76377178-0048943 A.1 (图2_Bמר)
- spp-76377178-0048943 A.1 (图2_Bמר)



- Handrails
- Ladders and covers
- Eye plates
- Lashing Rod stack

Non-structural components ?

DNV Assets My Uploads Project Groups

My Uploads > File: LashingBridgeOCXTest.zip

filter...

- > 1-平台下加强 Type5 t=8
- > 1-踢脚板 -200x6
- > 1-肘板 Type1 t=6
- > 1-肘板 Type2 t=6
- > 1-肘板 Type3 t=10
- > 1-肘板 Type4 t=16
- > 1-肘板 Type5 t=16
- > 1-GRP格栅平台 t=25
- > 1-格栅支撑 -100x10
- > 1立柱 200x225x10

Points of interest (0)

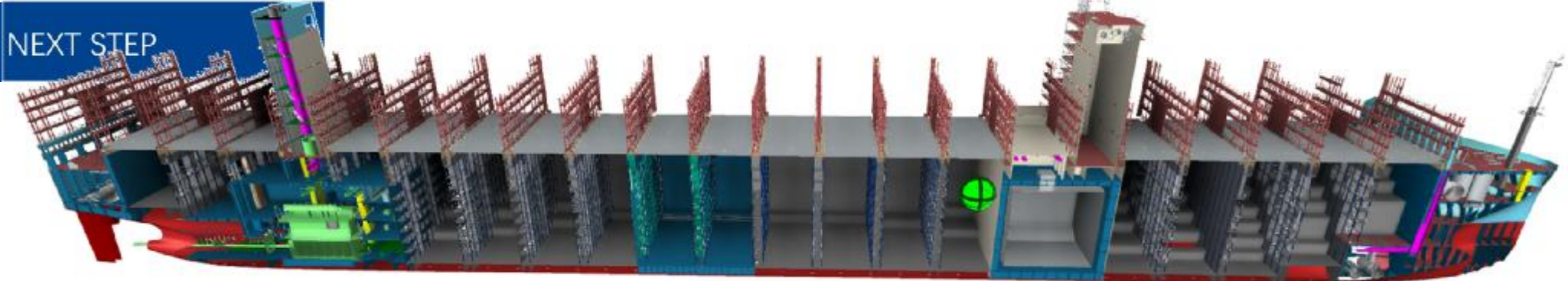
Properties

- > Function Type (1)
- > Material (3)
- > Material Grade (1)
- > Material Grade/Thickness (1)
- > Section/Material Grade (6)
- > Tightness (2)
- > Yield Stress (1)

Plate Thickness

- 6 mm
- 8 mm
- 10 mm
- 12 mm
- 14 mm
- 16 mm
- 25 mm
- N/A

4. FUTURE RESPECTS



- n Basic design
- n Detail design
- n Structural components
- n Non-Structural
 - Space allocation
 - Equipment
 - Outfitting
 - General information

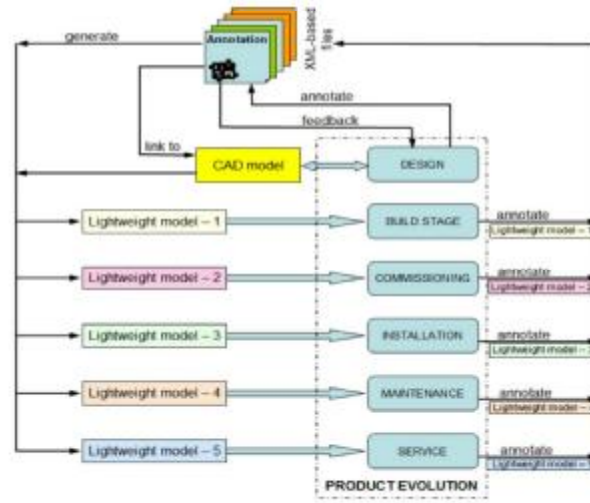


Figure 14: Light weight models with multi-layered annotations [23]

1. Enhance the usability of the OCX validator to assist customers in conducting independent verifications.
2. Strengthen support for the STEP/XML format to mitigate the impact of geometric complexity on OCX descriptions.
3. Accelerate the expansion of support for non-structured object types.

THANKS

31, Oct, 2024