ROLLDOCK

Solutions in heavy lift transport

We know how

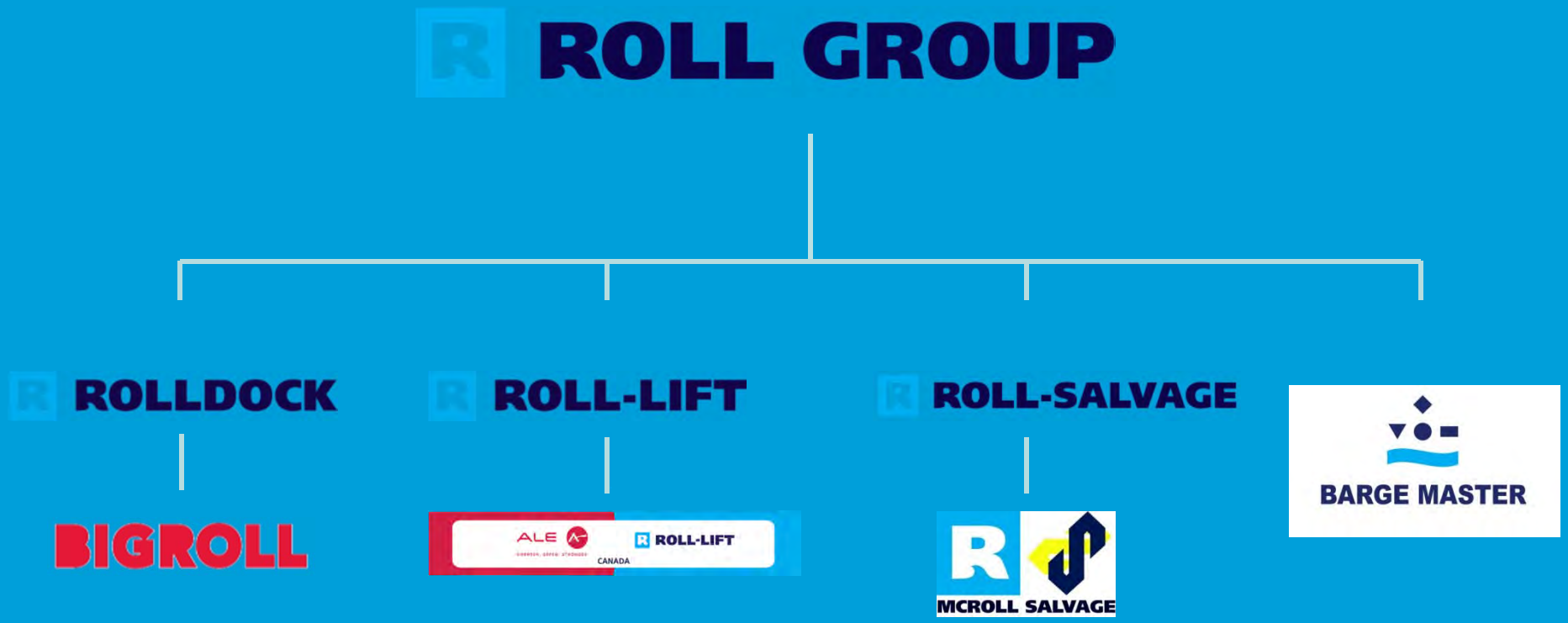
Presentation MID, Breda

1. Company profile
2. Ship introduction
3. Transport engineering
4. Questions..?

ROLLDOCK

We know how

1. Company profile



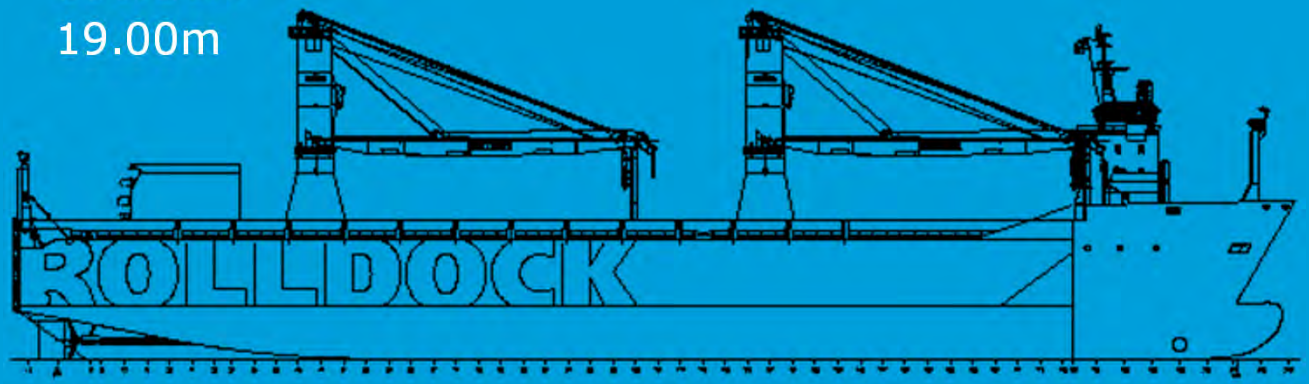
2. Ship introduction

ROLLDOCK S-CLASS

ROLLDOCK SUN

ROLLDOCK SEA

L_{oa}	142.30m
B	24.00m
T	5.67m
T_{max}	12.50m
L_{hold}	116.20m
B_{hold}	19.00m



ROLLDOCK

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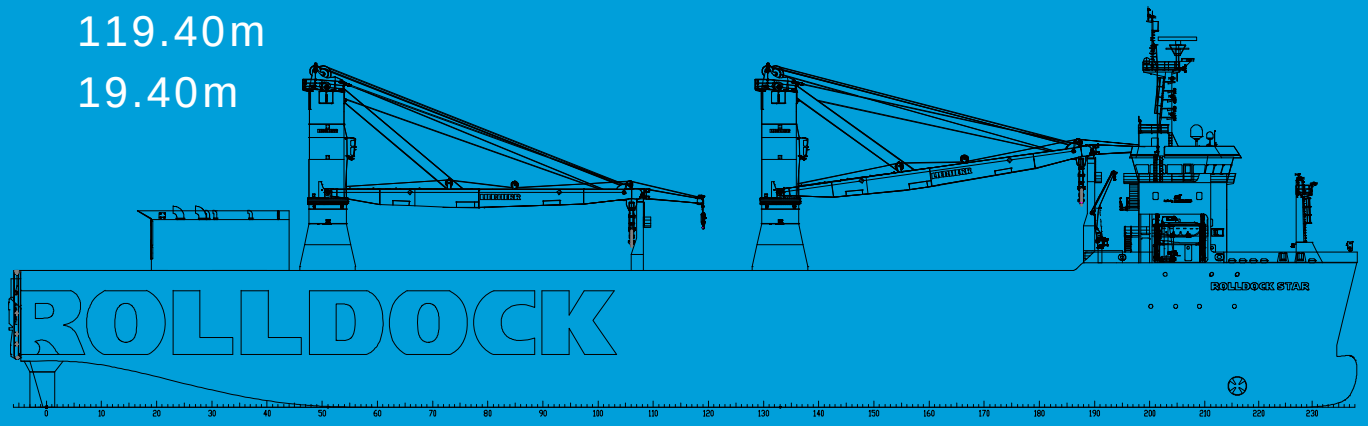
2. Ship introduction

ROLLDOCK ST-CLASS

ROLLDOCK STAR

ROLLDOCK STORM

L_{oa}	151.50m
B	25.40m
T	5.67m
T_{max}	12.50m
L_{hold}	119.40m
B_{hold}	19.40m



ROLLDOCK

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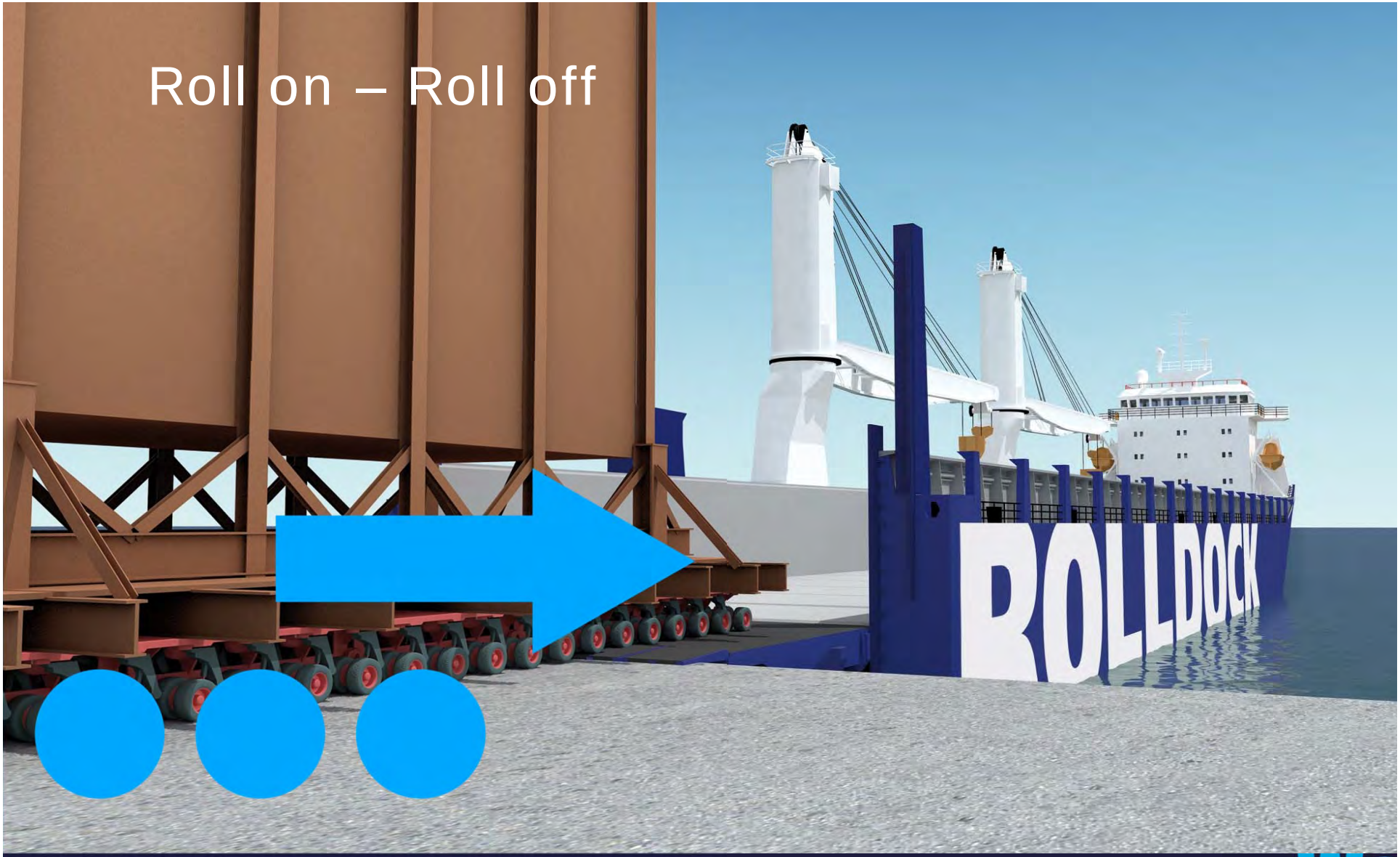
2. Ship introduction

Loading methods

ROLLDOCK

We know how

Roll on – Roll off



ROLLDOCK

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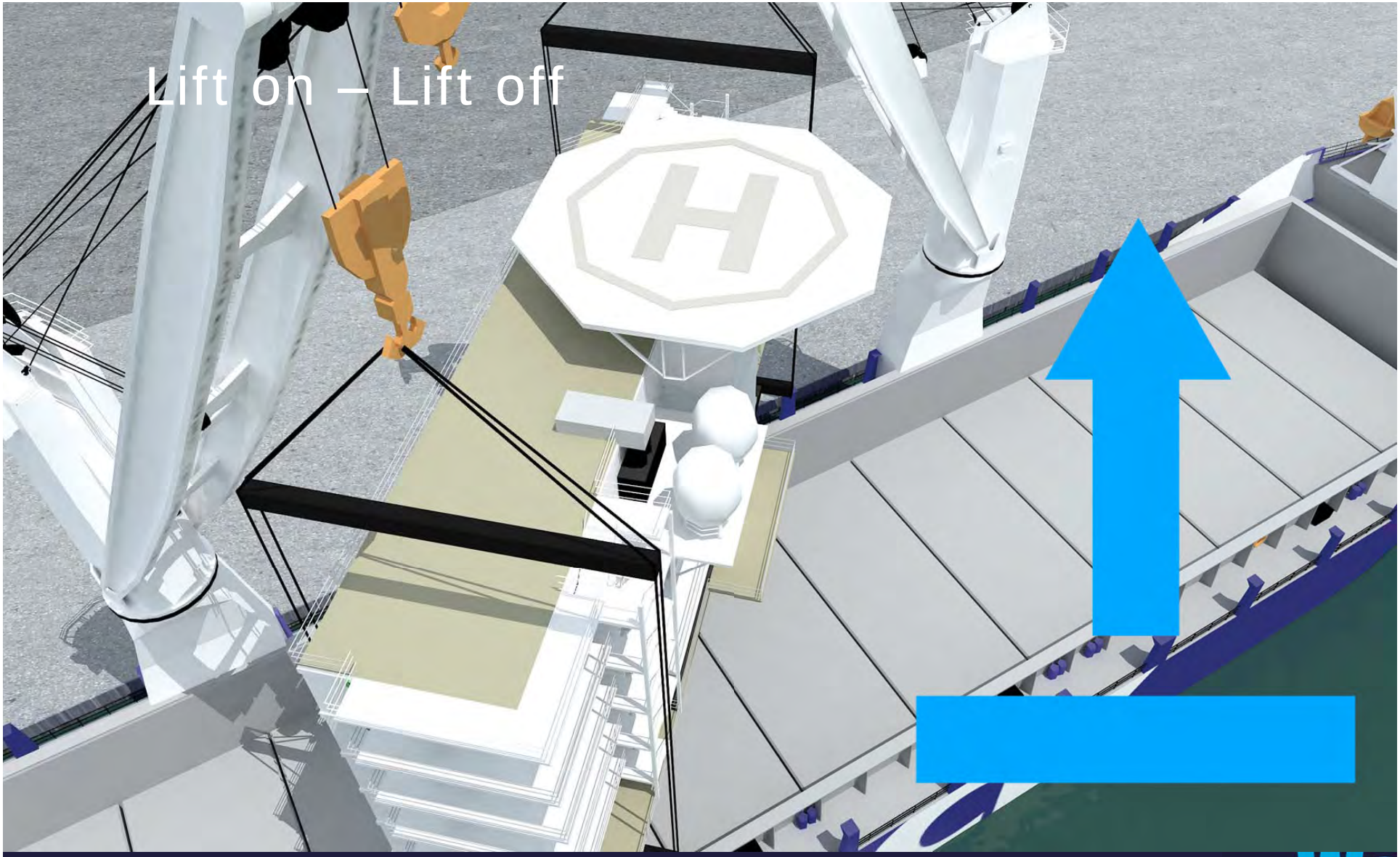
Lift on – Lift off



ROLLDOCK

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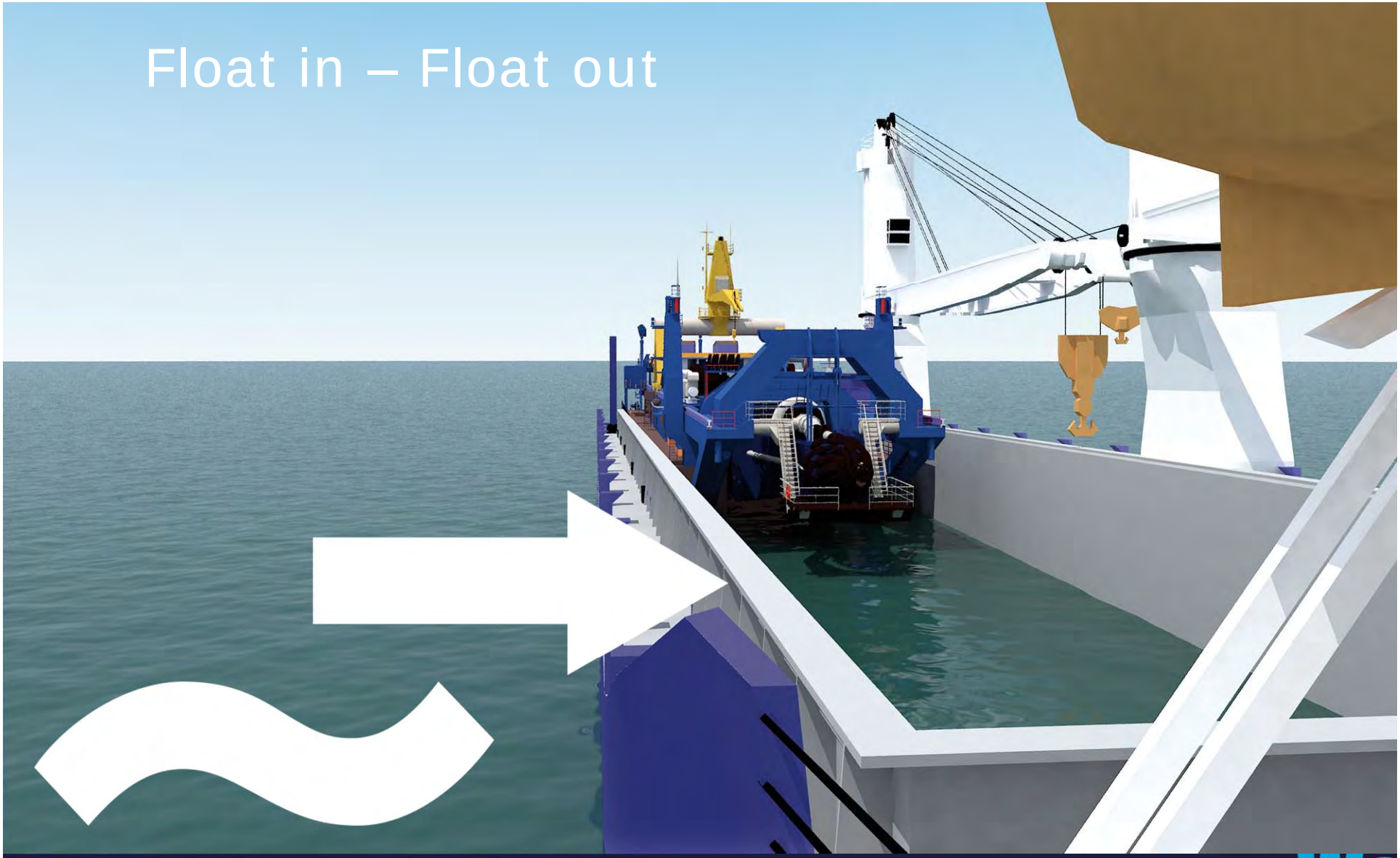
Float in – Float out



ROLLDOCK

We know how

3. Transport engineering

1. Engineering team
2. Engineering process
3. Project engineering
4. Project execution

3. Transport engineering

1. Engineering team

ROLLDOCK

We know how

3. Transport engineering

ROLLDOCK ENGINEERING

ROLLDOCK

MARINE ENGINEERING

-STABILITY ANALYSIS
-MOTION ANALYSIS
-SEAFASTENING DESIGN
-MOORING ANALYSIS
-RO-RO OPERATIONS
-LO-LO OPERATIONS
-FLO-FLO OPERATIONS

ROLL-LIFT

TRANSPORT/LIFTING ENGINEERING

-TRANSPORT ANALYSIS
-LIFTING ANALYSIS
-STRUCTURAL DESIGN
-LIFTING EQUIPMENT
-SUPPORT/LOADSPREADING EQUIPMENT
-SKIDDING OPERATIONS
-JACKING OPERATIONS

PROJECT TEAM

ROLLDOCK

We know how

3. Transport engineering

1. Engineering team
2. Engineering process

ROLLDOCK

We know how

3. Transport engineering

COMMERCIAL → ENGINEERING → OPERATIONS

ENQUIRY → FIXTURE

- DIMENSIONAL CHECK
- STABILITY CHECK
- LOAD/DISCHARGE CHECK
- LONGITUDINAL STRENGTH

ENGINEERING

- STOWAGE PLAN
- STABILITY CHECK
- MOTION ANALYSIS
- DESIGN LOADS
- SEAFASTENING DESIGN
- CRIBBING DESIGN
- STRUCTURAL ANALYSIS
- LOAD/DISCHARGE PLANS
- TRANSPORT MANUAL
- CONTIGENCY PLANS

EXECUTION

- LOADING PLAN
- BALLAST PLAN
- DISCHARGE PLAN
- SEAFASTENING INSTALLATION PLAN
- CRIBBING INSTALLATION PLAN
- MOORING PLAN
- PREPERATION BEFORE LOADING
- METHOD STATEMENTS

3. Transport engineering

1. Engineering team
2. Engineering process
3. Project engineering

ROLLDOCK

We know how

3. Transport engineering

PROJECT DESCRIPTION

Cargo: Backhoe dredger

L_{oa}	47.50m
B	15.00m
T	3.00m

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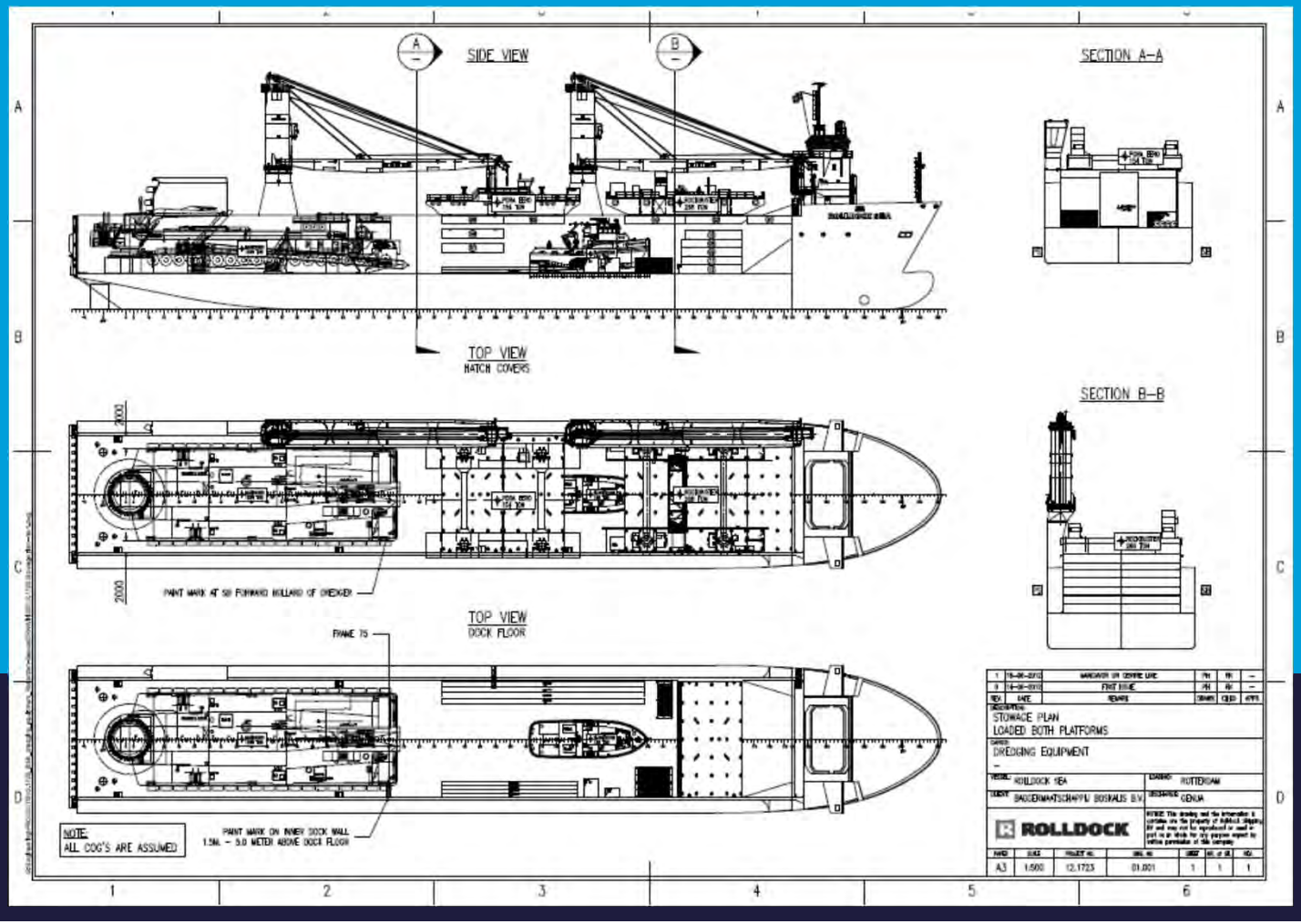
3. Transport engineering

STOWAGE PLAN

DIMENSIONAL CHECK IF CARGO CAN BE LOADED.

LOADING SEQUENCE.



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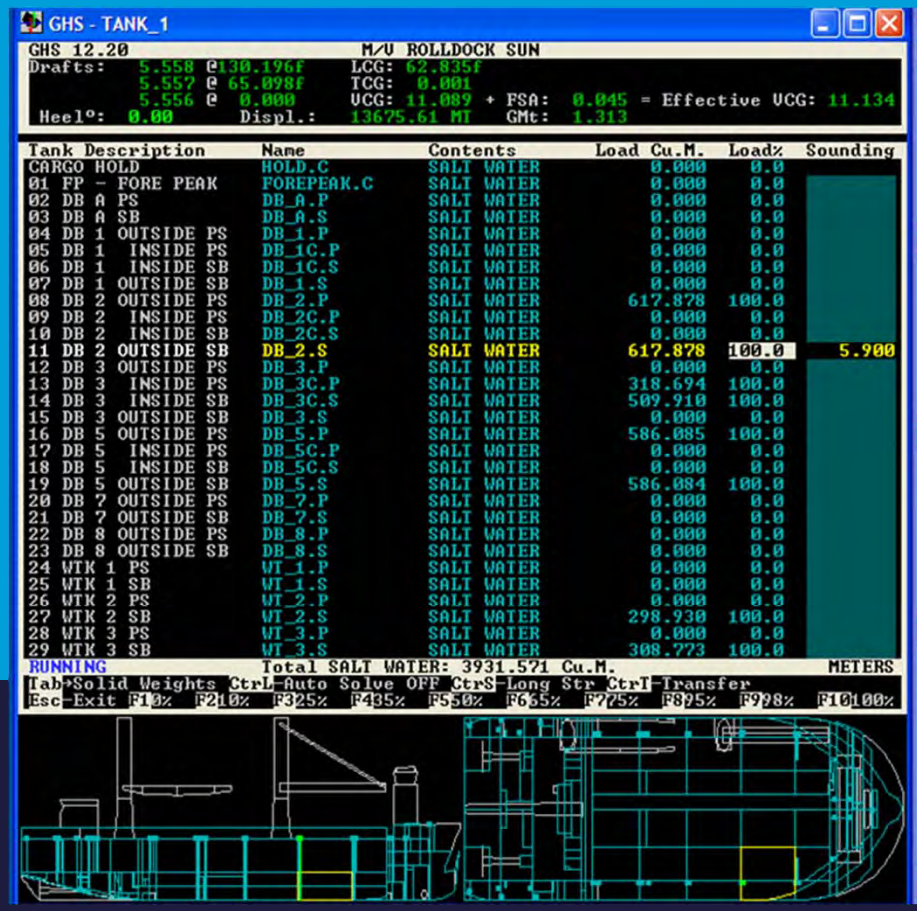
3. Transport engineering

STABILITY ANALYSIS

GHS STABILITY SOFTWARE → OFFICE

GLM LOADING COMPUTER → ON BOARD

FLEXIBILITY TO CONFIGURATE LOAD CASES FOR STABILITY



3. Transport engineering

MOTION ANALYSIS

Design criteria

General accepted criteria
- GL Noble Denton Guidelines for Marine transports 0030
- DNV Marine operations

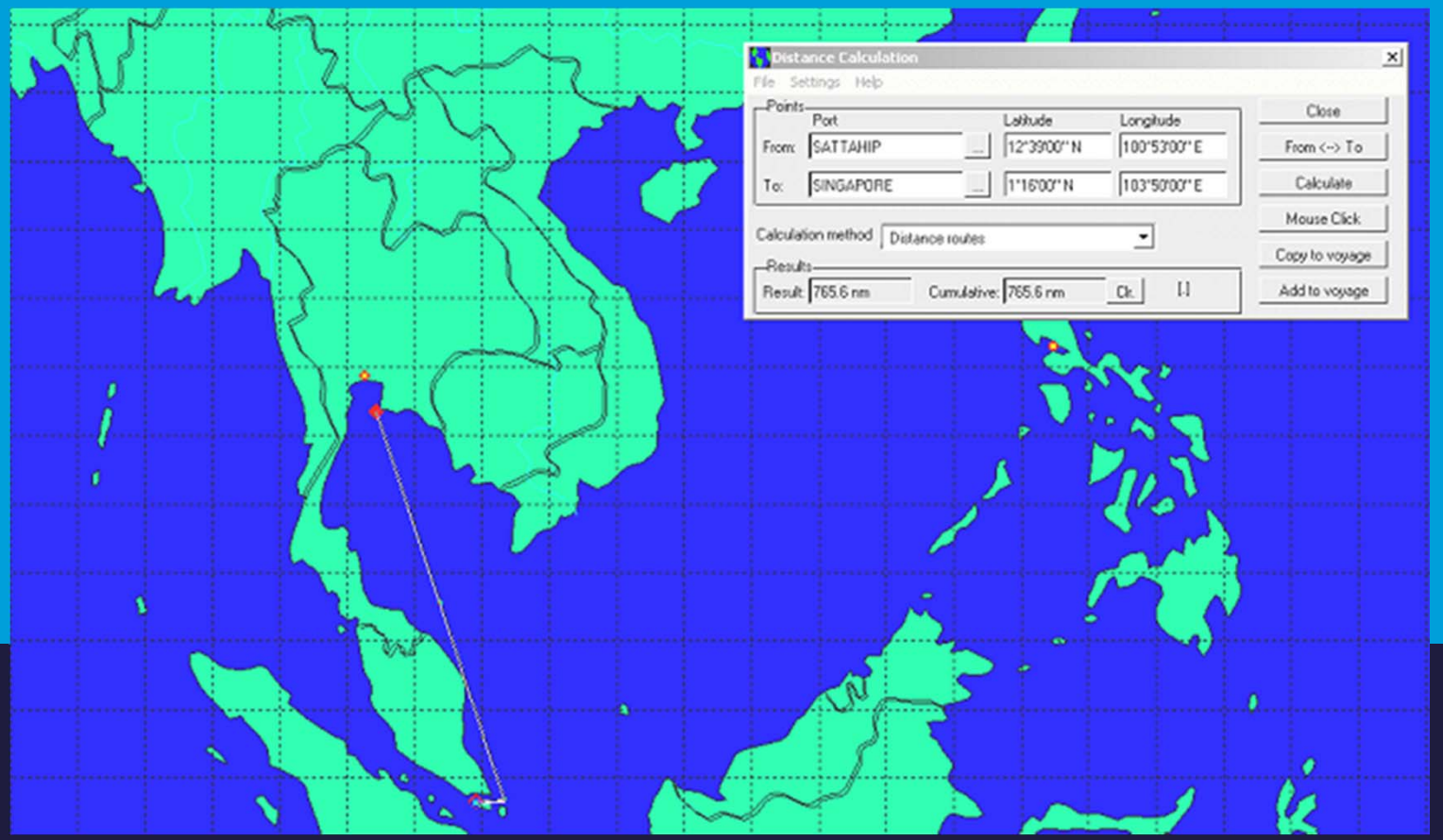
Motion alalysis
- Amarcon Octopus
- Marin SafeTrans

3. Transport engineering

MOTION ANALYSIS

INPUT DATA

- ROUTE DEFINITION
- VESSEL STABILITY AND BALLAST CONDITION



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3. Transport engineering

MOTION ANALYSIS

INPUT DATA

- ROUTE DEFINITION
- VESSEL STABILITY AND BALLAST CONDITION

MAIN PARTICULARS

Project name	BSK dredging equipment	**Revision no.**	0
Project no.	12.1723	**Revision date**	6/14/2012
Client:	Boskalis	**Author**	PH

Description	Value	
Length between perpendiculars	130.20	[m]
Breadth	24.00	[m]
Mean draft	4.90	[m]
Displacement	11288.10	[m^3]
Block coefficient	0.70	[-]
Midship section coefficient	1.00	[-]
Longitudinal center of buyoancy	62.90	[m]
Vertical center of buoyancy	2.70	[m]
Transverse BM	10.70	[m]
Waterline area	2771.00	[m^2]
Longitudinal metacentric height	294.00	[m]
Transverse metacentric height	4.50	[m]
Free surface correction	0.00	[m]
Transverse radius of inertia for roll	9.10	[m]
Longitudinal radius of inertia for pitch	32.80	[m]
Longitudinal radius of inertia for yaw	33.00	[m]
Longitudinal center of gravity	62.90	[m]
Transverse center of gravity	0.00	[m]
Vertical center of gravity	8.80	[m]

3. Transport engineering

MOTION ANALYSIS

OUTPUT DATA

- DESIGN ACCELERATIONS
- X, Y, Z-DIRECTION (COMBINATION OF HEAVE+PITCH OR ROLL+PITCH)

RESULTS DESIGN VALUES

Project name	BSK dredging equipment	**Revision no.**	0
Project no.	12.1723	**Revision date**	6/14/2012
Client:	Boskalis	**Author**	PH

ID	Signal	# Oscilations	MPM for 10 voyages ~10N oscillations	
1	motion x COG	78326	6.5	[m]
2	motion y COG	74599	3.66	[m]
3	motion z COG	77065	4.15	[m]
4	motion roll COG	85589	17.26	[deg]
5	motion pitch COG	81515	5.1	[deg]
6	motion yaw COG	80646	5.65	[deg]
7	motion x Bow	77848	6.52	[m]
8	motion y Bow	78114	7.54	[m]
9	motion z Bow	78824	7.59	[m]
10	acceleration z Bow	108293	5.67	[m/s²]
11	relative water motion Bow	112696	9.15	[m]
12	relative water motion Station 10 P	117767	8.64	[m]
13	relative water motion Station 10 SB	115007	9.65	[m]
14	Roll acceleration	114064	6.57	[deg/s²]
15	Pitch acceleration	114502	3.9	[deg/s²]
16	Axx_Maricavor	105828	0.69	[m/s²]
17	Ayy_Maricavor	97860	3.56	[m/s²]
18	Azz_Maricavor	116739	3.05	[m/s²]
19	Axx_Rockbuster	104455	1.17	[m/s²]
20	Ayy_Rockbuster	100276	4.43	[m/s²]
21	Azz_Rockbuster	102983	3.46	[m/s²]
22	Axx_Pora Eero	104505	1.15	[m/s²]
23	Ayy_Pora Eero	99960	4.31	[m/s²]
24	Azz_Pora Eero	104835	2.56	[m/s²]
25	Axx_Rijnstroom	105911	0.67	[m/s²]
26	Ayy_Rijnstroom	99232	3.51	[m/s²]
27	Azz_Rijnstroom	97739	2.82	[m/s²]
28	wave height	91697	5	[m]

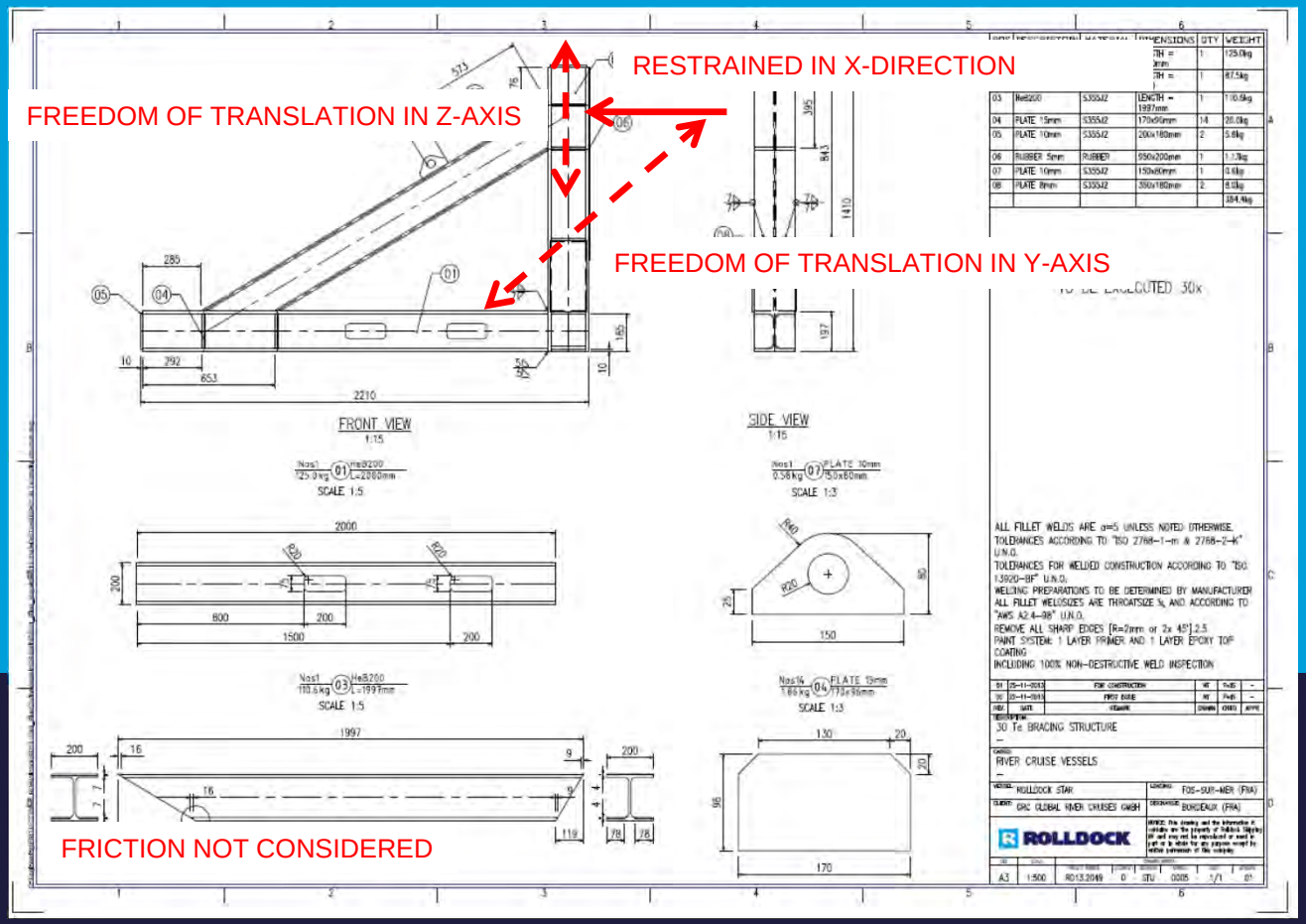
3. Transport engineering

SEAFASTENING DESIGN

DESIGN ACCELERATIONS FROM SAFETRANS

SEPERATION OF FORCES IN X, Y AND Z DIRECTION

NO COMBINATION OF HARD AND SOFT SEAFASTENINGS



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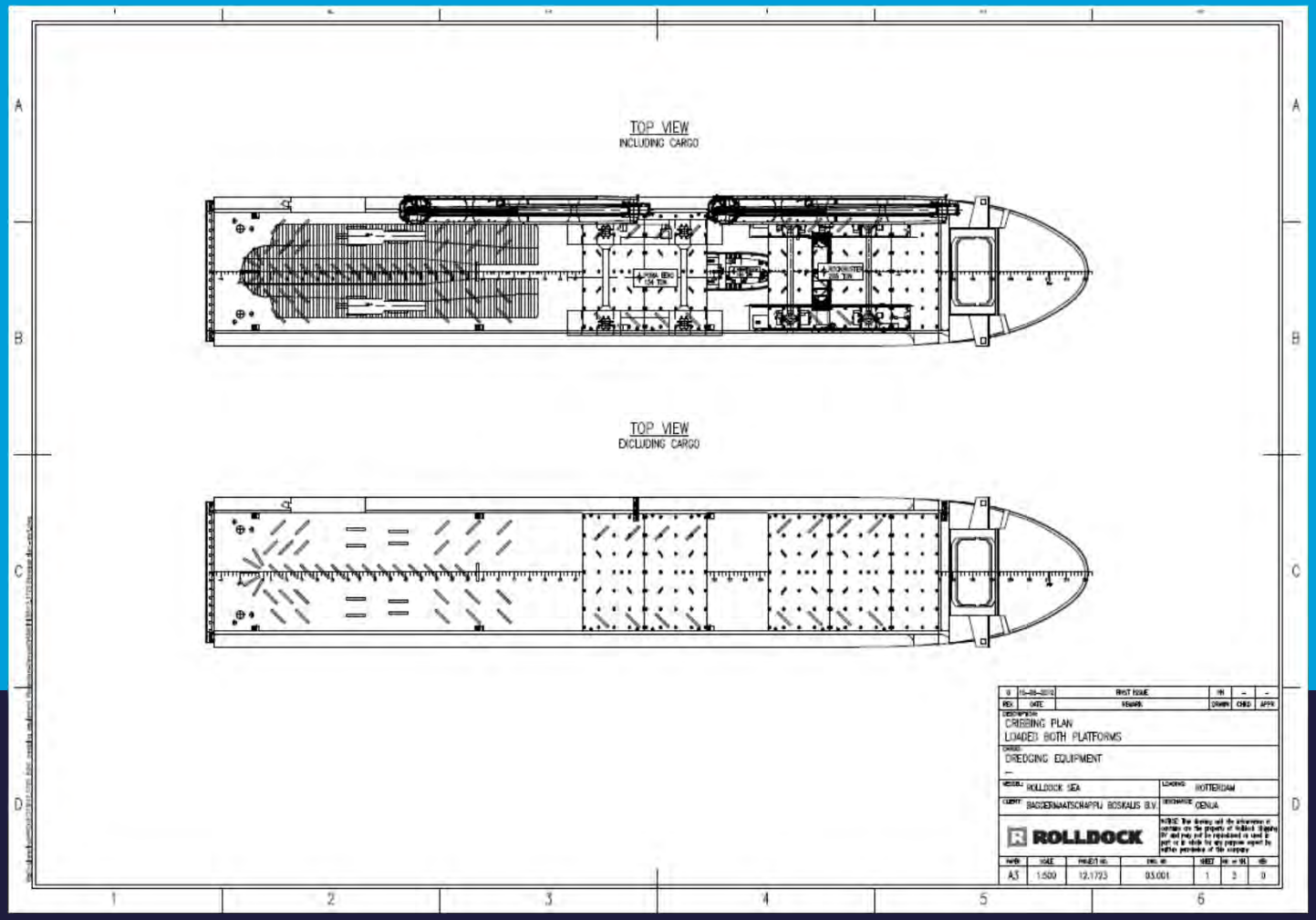
CRIBBING DESIGN

DESIGN ACCELERATIONS FROM SAFETRANS

WOOD FISH BONE DESIGN FOR BEST LOAD INTRODUCTION



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3. Transport engineering

STRUCTURAL ANALYSIS

LOCAL STRENGTH ANALYSIS

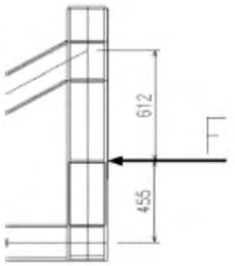
APPENDIX : D2

ROLLDOCK

Member A / Loadcase 2:

LoadIntroduction into HeB200:

Load introduction over width of HeB200		200	mm
Stiffener plate thickness in HeB200	t =	15	mm



Normal stress	fa =	100	N/mm²	UCb = fa/0,60Fy =	0.47	OK

Normal stress in HeB200 beam:

Max. horizontal load	F =	300	kN
Angle between brace and horizontal	γ =	14	°
Normal force in HeB200	$F_{Normal} = \tan\alpha \cdot F$ =	75	kN
Normal stress beam	fa =	10	N/mm²

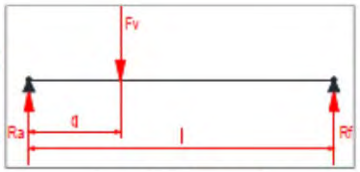
UCb = fa/0,60Fy = 0.04 OK

General bending & shear:

Beam properties

Designation		HeB200		Moment of inertia strong axis	Iy =	56960000 mm4
Height	h =	200	mm	Section modulus strong axis	Wy =	569600 mm3
Width	b =	200	mm	Shear area webs	As =	1800 mm2
Flange thickness	tf =	15	mm			
Web thickness	tw =	9	mm			

Maximum load	Fv =	300	kN			
Distance between supports	l =	1067	mm			
Distance from support to to load introduction	a =	612	mm			
Reaction loads	Ra =	128	kN			
	Rb =	172	kN			
Max. bending moment in member A	M =	78	kNm			
Max. shear force in member A	D =	172	kN			



Bending stress	fb =M/Sy =	137	N/mm²	UCb = fb/0,66Fy =	0.59	OK
Normal stress	fa =	10	N/mm²	UCb = fa/0,60Fy =	0.04	OK
	fb + fa =	147	N/mm²	UCb = fc/0,60Fy =	0.69	OK
Shear stress	fs =D/As =	96	N/mm²	UCs = fs/0,40Fy =	0.67	OK

ROLLDOCK

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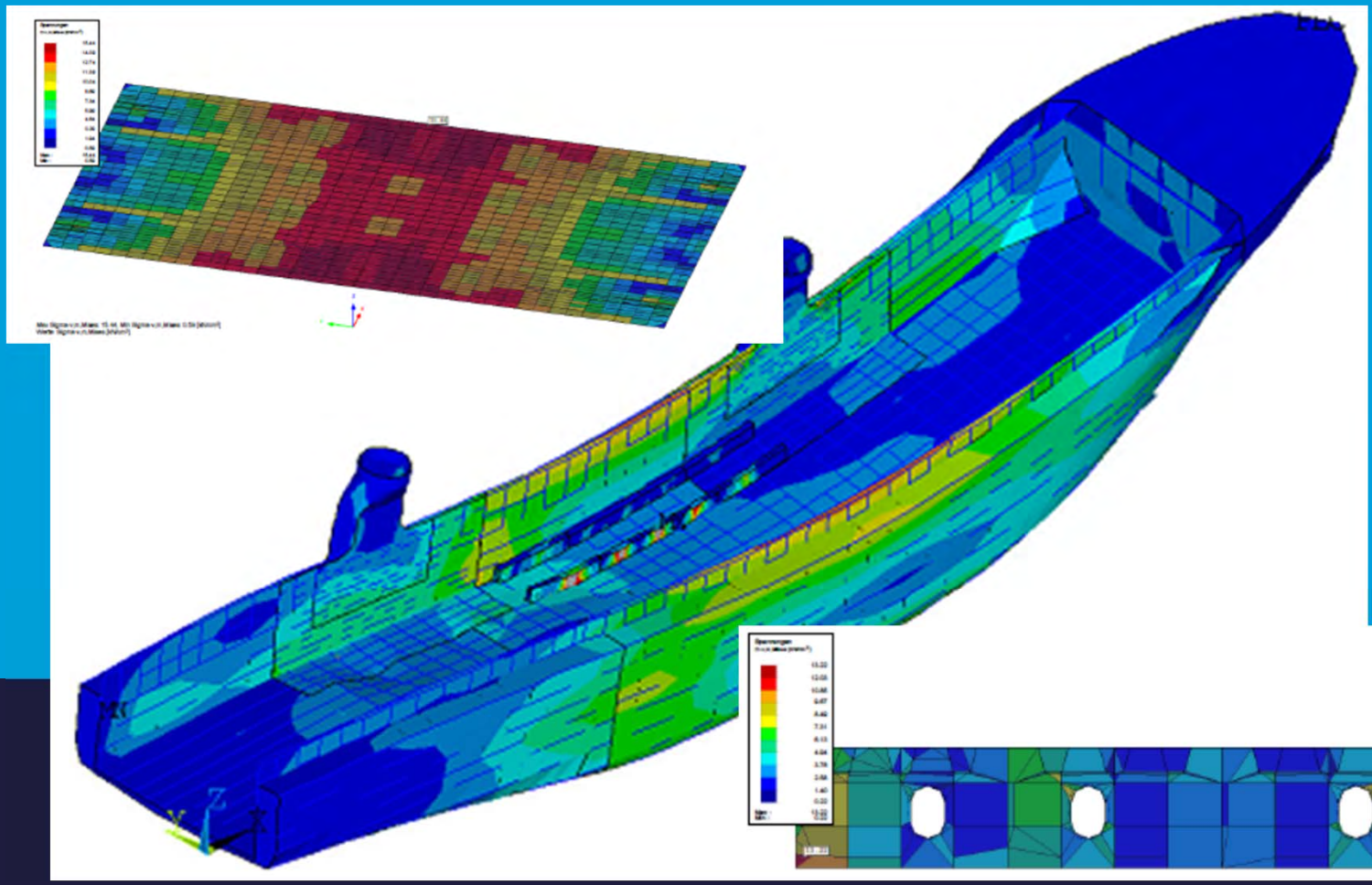
3. Transport engineering

STRUCTURAL ANALYSIS

LOCAL STRENGTH ANALYSIS

GLOBAL STRENGTH ANALYSIS



3. Transport engineering

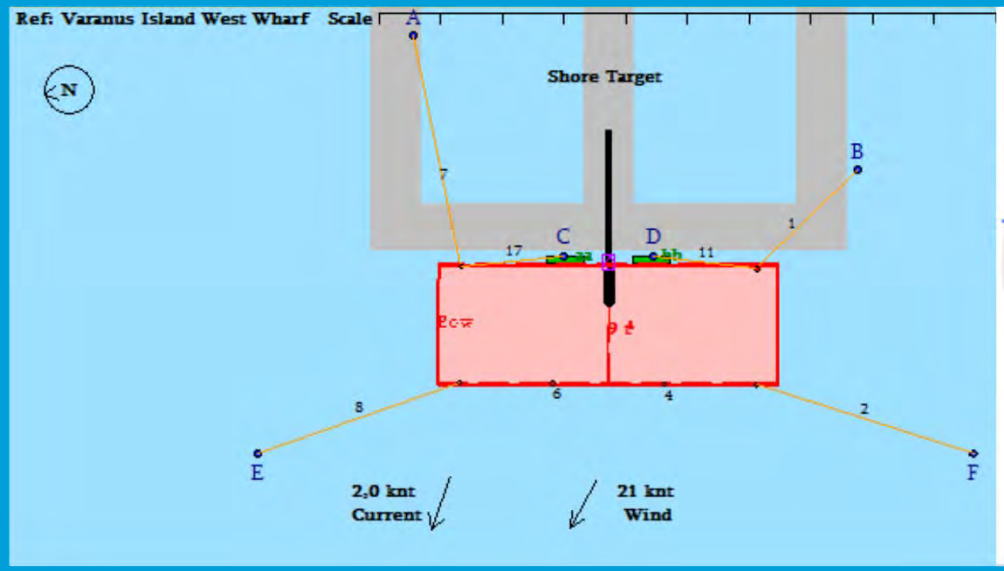
MOORING ANALYSIS

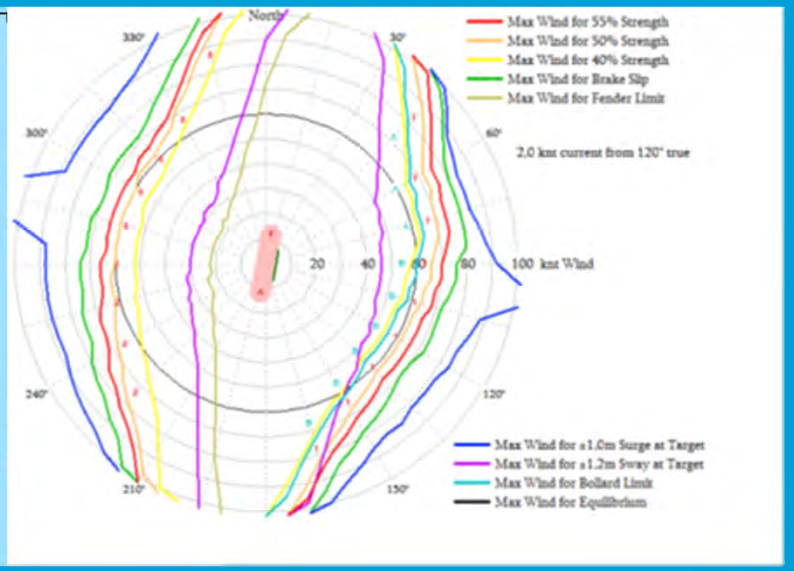
BASED ON MOORING LAYOUT

CURRENT DIRECTION

360DEGREE WIND SWEEP

MOORING LINE CONFIGURATION





ROLLDOCK

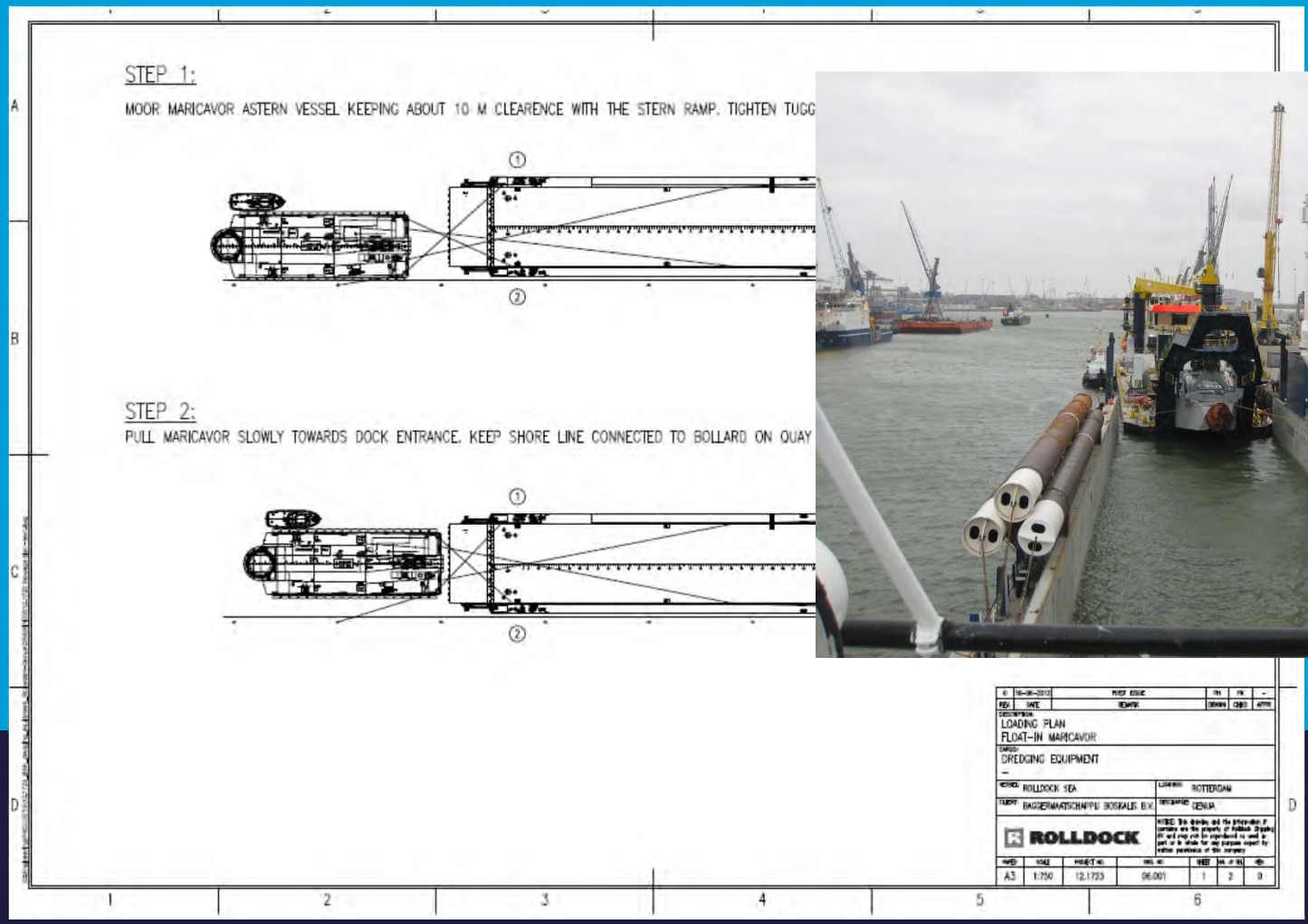
We know how

3. Transport engineering

1. Engineering team
2. Engineering process
3. Project engineering
4. Project execution

3. Transport engineering

LOADING SEQUENCE



We know how

3. Transport engineering

INSTALLATION OF SEAFASTENINGS

ROLLDOCK

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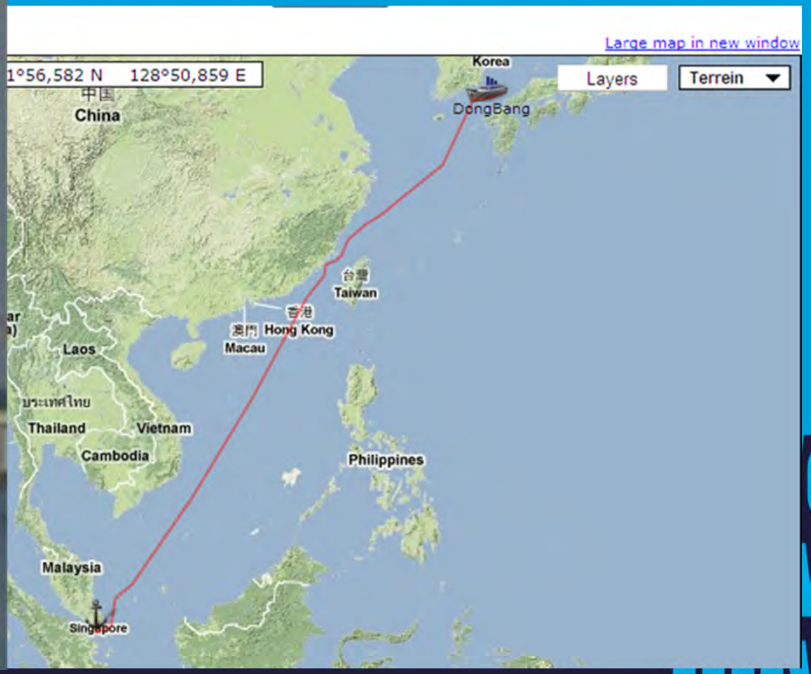
3. Transport engineering

VOYAGE MONITORING, LOGING AND MONITORING OCTOPUS ON BOARD

On-line vessel monitoring

Vessel acceleration forecasting

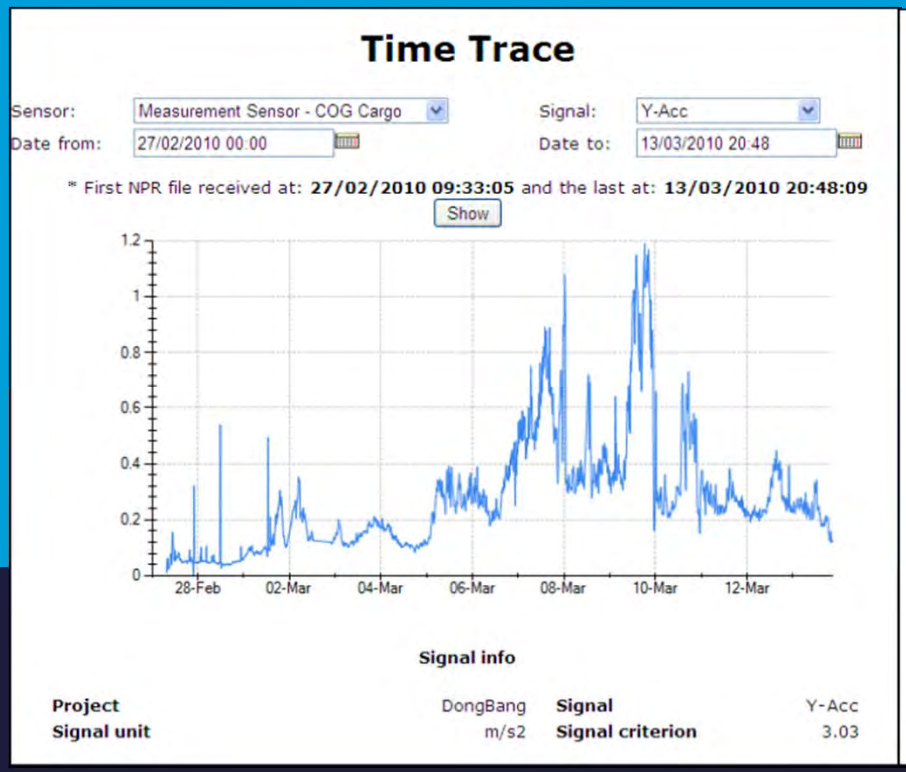


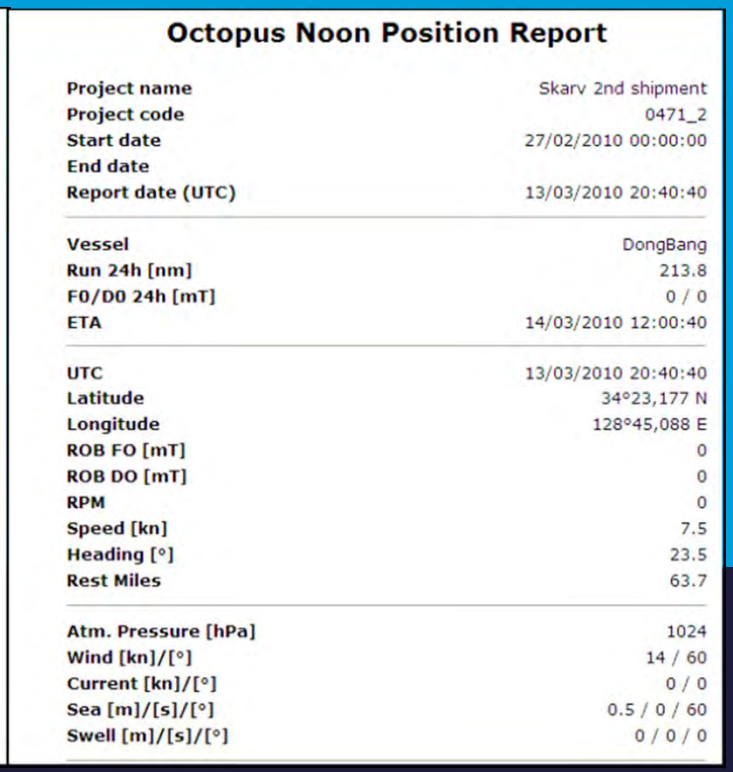
3. Transport engineering

VOYAGE MONITORING, LOGING AND MONITORING OCTOPUS ON BOARD

On-line vessel monitoring

Vessel acceleration forecasting





3. Transport engineering

CHALLENGES DURING A PROJECT

-DIMENSIONAL ACCURACY OF DREDGING EQUIPMENT (SUBJECT TO MANY CHANGES PROJECT BASED).

-ACCURATE DESCRIPTION OF PROTRUTIONS.

-CARGO WEIGHT, MASS DISTRIBUTION AND CoG.

-DRAWINGS AND DOCUMENTATION OF CARGO.

4. QUESTIONS...?

ROLLDOCK

We know how