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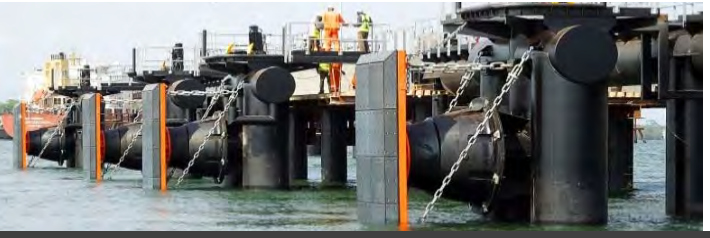
SHIBATAFENDERTEAM GROUP

GERMANY | FRANCE | AMERICAS | ASIA

Technical presentation - 14th Intermodal Africa 2015

Presented by: D. Polte



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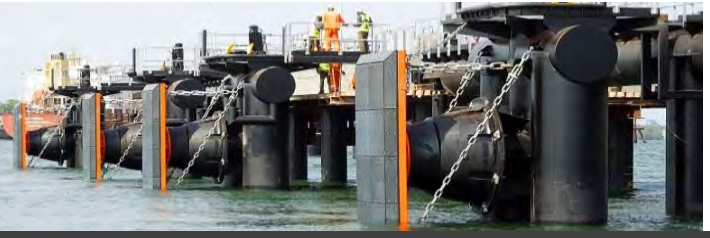

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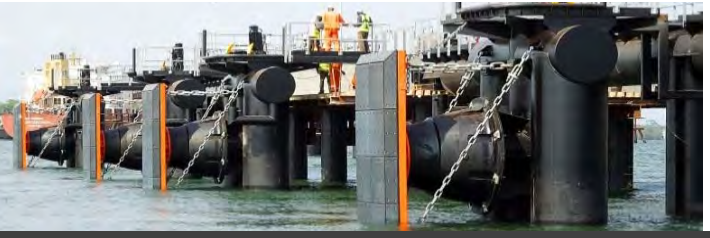
TURNOVER : ~ 40,000,000.00 EUR

DELIVERED PROJECTS: > 2,500 worldwide since 2006

PROJECT SIZES: 200+ Fender-Systems/project
>5,000,000 USD/project

PRODUCTION: Rubber Fender production in Japan and Malaysia
Steel fabrication mainly in Germany
Foam Filled Fender production in Germany and the US

ACHIEVEMENTS: ISO 9001
ISO 14001
PIANC Type Approval for std. Range



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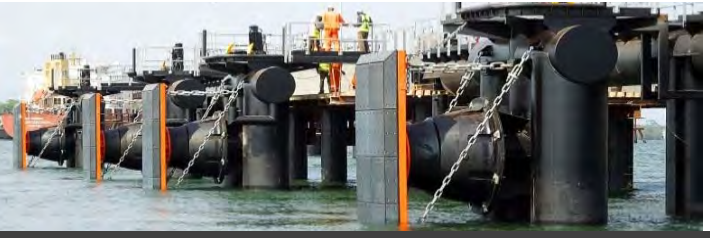
CASE STUDY

Typical steps for the design of a high performance, reliable and high quality fender system!



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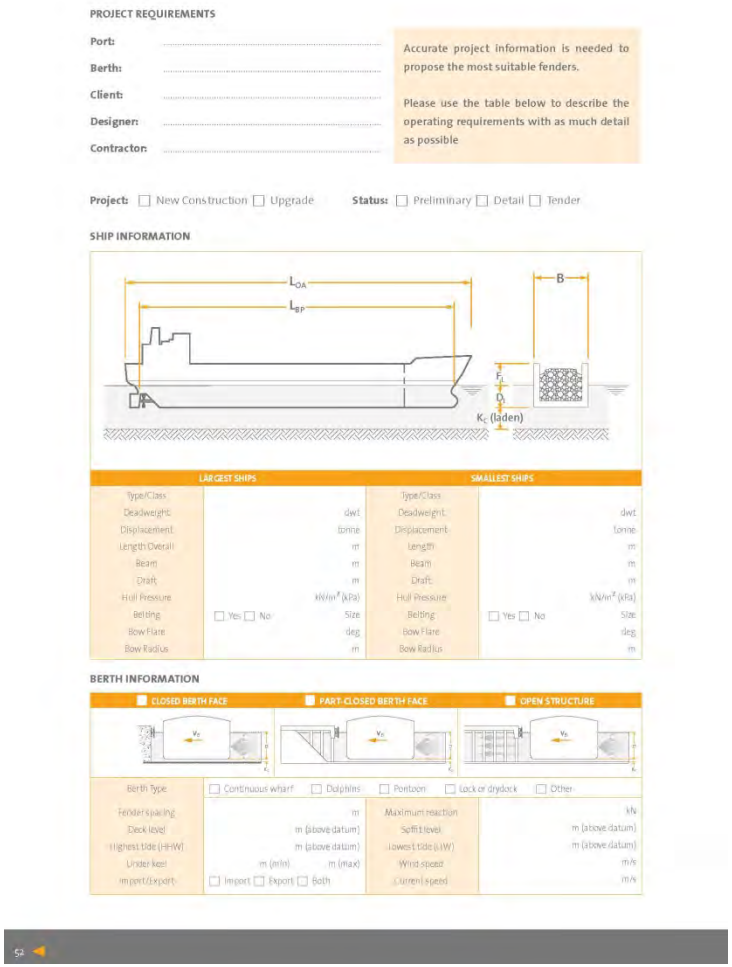
FIRST STEP - BASICS
COLLECTION OF DATA

- Reliable data is vital for a technically and economically sound Fender Design
- Use SFT questionnaire to collect all key data
- Discuss each individual fact in detail
- However, be aware which data is most important for the project and next step (next slide)



PROJECT REQUIREMENTS

Port:
Berth:
Client:
Designer:
Contractor:

Accurate project information is needed to propose the most suitable fenders.

Please use the table below to describe the operating requirements with as much detail as possible

Project: ☐ New Construction ☐ Upgrade Status: ☐ Preliminary ☐ Detail ☐ Tender

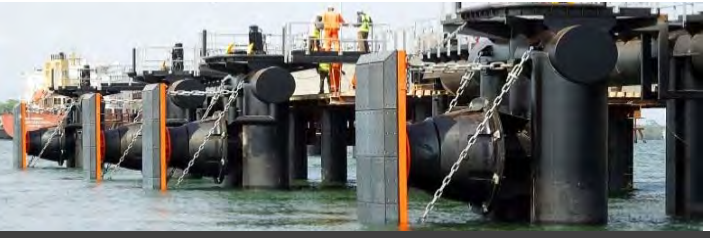
SHIP INFORMATION

	LARGEST SHIPS		SMALLEST SHIPS	
Type/Class				
Deadweight		dwt		dwt
Displacement		tonne		tonne
Length Overall		m		m
Beam		m		m
Draft		m		m
Hull Pressure		kN/m² (kPa)		kN/m² (kPa)
Belting	☐ Yes ☐ No	Size	☐ Yes ☐ No	Size
Bow Flare		deg		deg
Bow Radius		m		m

BERTH INFORMATION

☐ CLOSED BERTH FACE ☐ PART-CLOSED BERTH FACE ☐ OPEN STRUCTURE

Berth Type	☐ Continuous wharf ☐ Dolphins ☐ Pontoon ☐ Lock or drydock ☐ Other			
Fender spacing		m	Maximum reaction	kN
Deck level		m (above datum)	Soffit level	m (above datum)
Highest tide (HHW)		m (above datum)	Lowest tide (LLW)	m (above datum)
Under keel	m (min)	m (max)	Wind speed	m/s
Import/Export	☐ Import ☐ Export ☐ Both		Current speed	m/s



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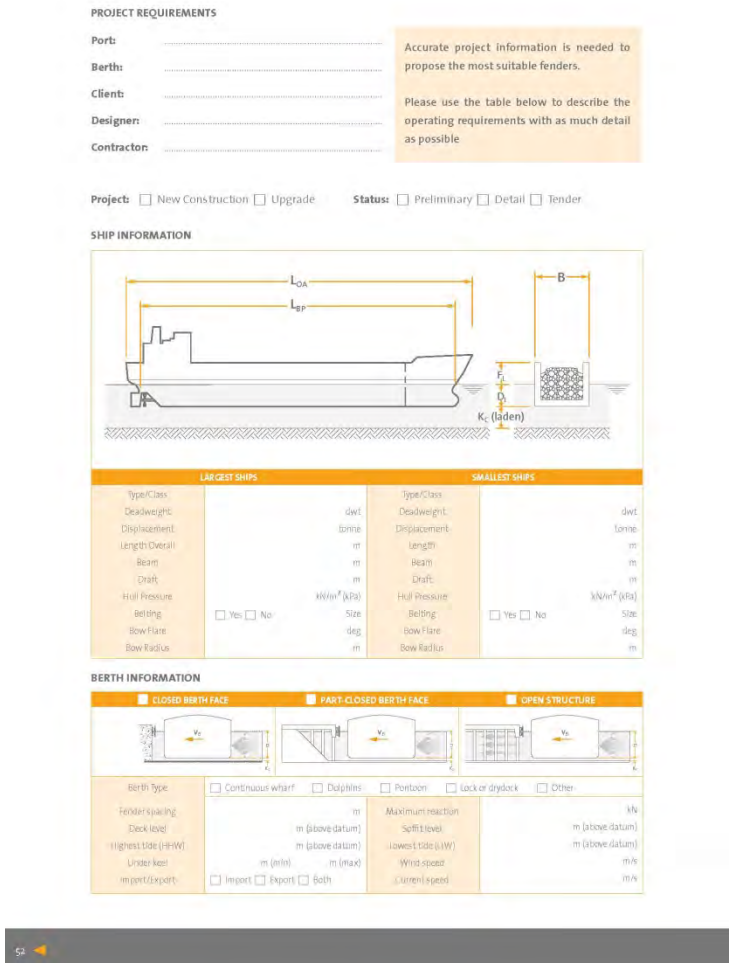
FIRST STEP - BASICS COLLECTION OF DATA

Most Important Data:

- Design Vessel / Energy Absorption
- Max. Reaction Force and Hull Pressure
- Berthing Speed and Angle
- Load Cases, Flat, Belting, Line/Point Loads
- Largest and Smallest Vessel
- Factor of Safety (FOS)
- Quay Wall Design



PROJECT REQUIREMENTS

Port:
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Accurate project information is needed to propose the most suitable fenders.

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Project: ☐ New Construction ☐ Upgrade Status: ☐ Preliminary ☐ Detail ☐ Tender

SHIP INFORMATION

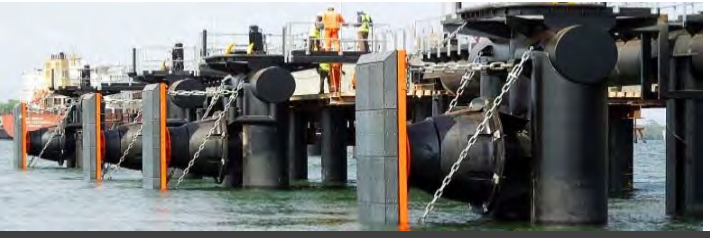
L_{OA} L_{BP} B K_c (laden)

LARGEST SHIPS			SMALLEST SHIPS		
Type/Class			Type/Class		
Deadweight		dwt	Deadweight		dwt
Displacement		tonne	Displacement		tonne
Length Overall		m	Length		m
Beam		m	Beam		m
Draft		m	Draft		m
Hull Pressure		kN/m² (kPa)	Hull Pressure		kN/m² (kPa)
Belting	☐ Yes ☐ No	Size	Belting	☐ Yes ☐ No	Size
Bow Flare		deg	Bow Flare		deg
Bow Radius		m	Bow Radius		m

BERTH INFORMATION

☐ CLOSED BERTH FACE ☐ PART-CLOSED BERTH FACE ☐ OPEN STRUCTURE

Berth Type	☐ Continuous wharf ☐ Dolphins ☐ Pontoon ☐ Lock or drydock ☐ Other		
Fender spacing	m	Maximum reaction	kN
Deck level	m (above datum)	Soffit level	m (above datum)
Highest tide (HHW)	m (above datum)	Lowest tide (LLW)	m (above datum)
Under keel	m (min) m (max)	Wind speed	m/s
Import/Export	☐ Import ☐ Export ☐ Both	Current speed	m/s



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FIRST STEP - BASICS
DETERMINATION OF APPLICABLE STANDARDS

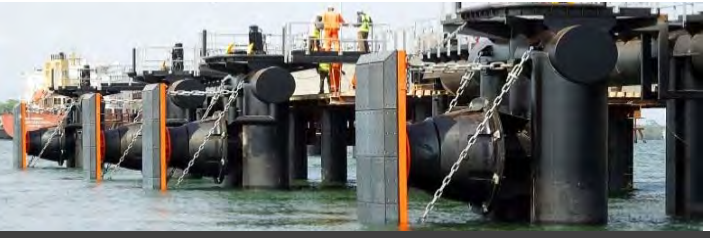
- PIANC2002: Guidelines for the Design of Fender-Systems

- British Standard 6349: Maritime Structures

- EAU 2004: Recommendations of the Committee for Waterfront Structures

- DIN 18800: Design and Construction of Structural Steelwork

- EUROCODE 3: Design and Construction of Structural Steelwork



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SECOND STEP - DESIGN PREPARE ENERGY CALCS.

- Add carefully all available data
- Adjust factors accordingly
- Be aware of the most severe factor

⟹ **Berthing velocity**

$$E = \frac{1}{2} M * v^2 * C_e * C_m * C_s * C_c$$

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Tel.: +49 (0) 40 61 86 10-0, Fax: +49 (0) 40 61 86 10-180, E-mail: info@shibata-fenderteam, Web: www.shibata-fenderteam

Project:	Fender for Lagos			Ref No:	02015
Berth:	Berth 11 - 14	Prepared:	D.Polte		
Country:	Nigeria	Date:	08-Okt-2015	Revision:	00

Metric

Design Method		PIANC WG33: 2002	
Ship Type		CONTAINER SHIP (Post-Panamax)	
Data Source		PIANC WG121 Tables	
Primary Dimension		Displacement	
Interpolation value		125000 t	

SHIP CHARACTERISTICS

Loading		Fully Laden	
Operating Deadweight		N/A DWT	
Gross Tonnage		N/A GT	
Twenty-foot Equivalent Unit		8.333 TEU	
Cubic Capacity		N/A m³	
Design Displacement	M_D	**125.000** t	
Length Overall	L_{OA}	327,332 m	
Length Between Perpendiculars	L_{BP}	312,332 m	
Beam	B	43,267 m	
Design Draft	D	13,000 m	Fully Laden
Design Freeboard	F	9,850 m	
Block Coefficient	C_B	0,694	

BERTH & APPROACH

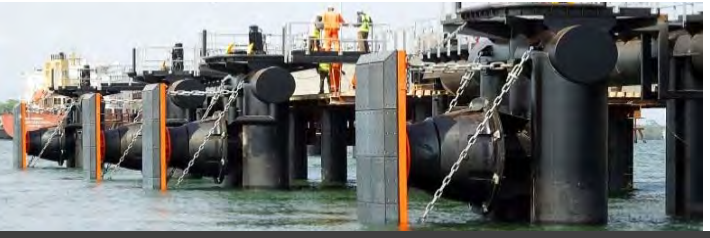
Structure Type		Closed face	
Under Keel Clearance	K_C	10% of laden draft	1,300 m
Point of Contact from Bow	x	Quarterpoint	25,0 % from bow
Eccentricity Calculation Method		Full Method	
Added Mass Calculation Method		PIANC 2002	
Seawater Density	ρ_{SW}	1,025 t/m³	

BERTHING FACTORS

Berthing Angle	α	5,00 deg	User defined value
Impact Point to Centre of Mass	R	81,025 m	
Radius of Gyration	K	75,552 m	
Velocity Vector Angle	γ	69,51 deg	
Added Mass Factor	C_M	1,800	
Eccentricity Factor	C_E	0,531	
Berth Configuration Factor	C_C	0,900	
Hull Softness Factor	C_S	1,000	

BERTHING VELOCITY

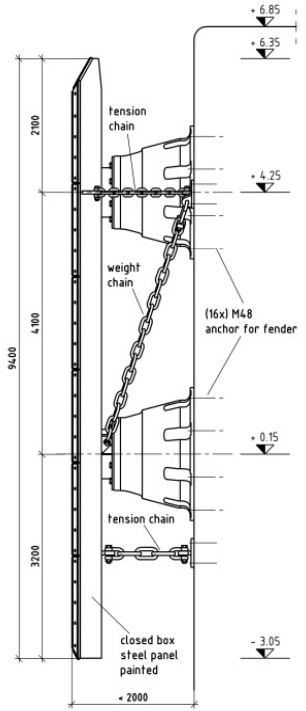
Velocity Table		PIANC WG33: 2002	
Approach Conditions		d) Good berthing, exposed	
Berthing Velocity	V_B	182 mm/s	
Normal Energy	E_N	1.783,9 kNm	
Factor of Safety	F_S	1,500	
Abnormal Energy	**E_A**	**2.675,9 kNm**	



SECOND STEP - DESIGN
SELECTION OF THE RUBBER FENDER UNIT

Consideration of the following issues:

- Quay Wall Designs
    - Sheet Pile Wall
    - Combi Wall (Sheet Pile Section with Piles, or Beams)
    - Open / Semi-Open Pile Structure
    - Concrete deep-wall
    - Gravity Structures (Caissons, Concrete Blocks)
- Max. Stand-off Distance
- Preferences of the Consultant / Client



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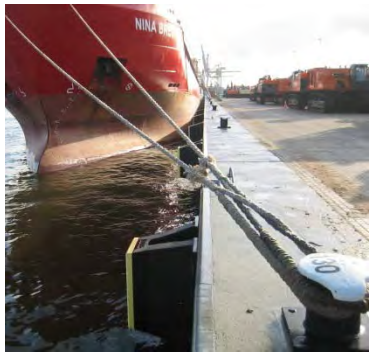
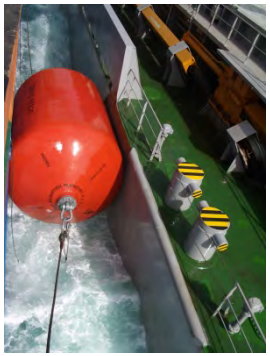
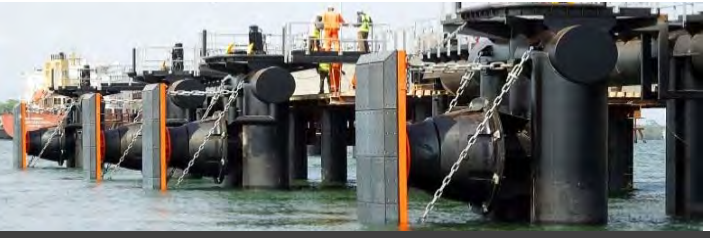
SECOND STEP - DESIGN
SELECTION OF THE RUBBER FENDER UNIT

Standard Types of Rubber Fender Units





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SECOND STEP - DESIGN
SELECTION OF THE RUBBER FENDER UNIT

Design criteria:

- Energy = 2281 kNm
- Reaction = <3500 kN
- Hull Pressure = < 250 kN/m²
- Berthing Angle = 6°
- Stand-off = <2000 mm

=> Tolerance and correction factor to be discussed!

Selected Fender: 2nos. SPC-1300H G2.3

E = 1168 kNm * 2 = 2336 kNm (>2281)

R = 1705 kN * 2 = 3410 kN (<3500)

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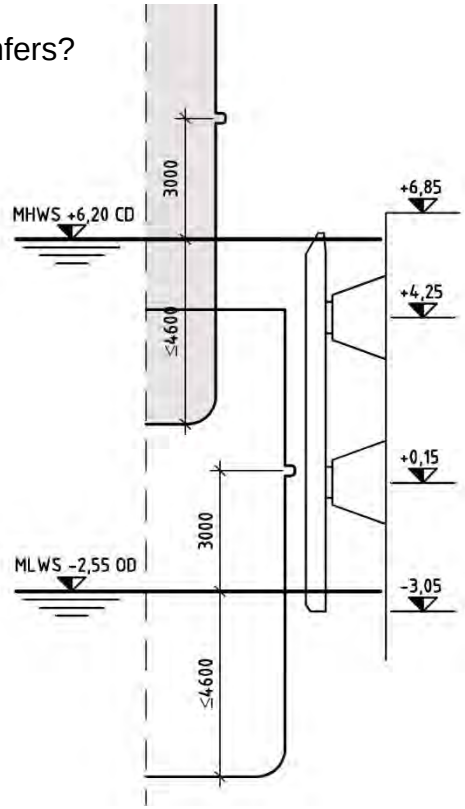
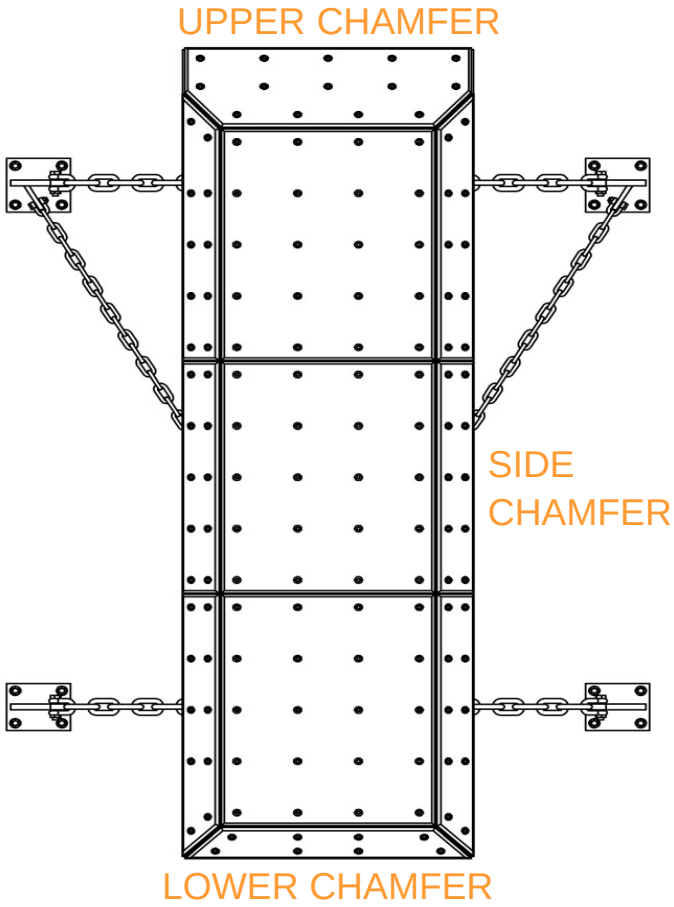
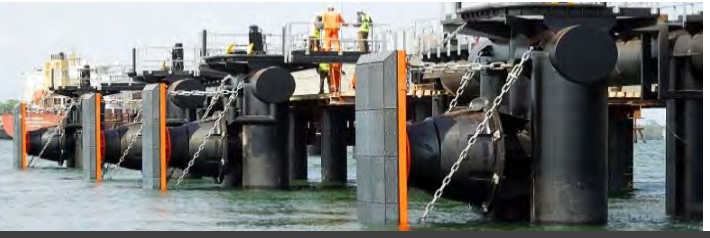
SECOND STEP - DESIGN
PRELIMINARY DESIGN OF THE STEEL FENDER PANEL

Why Chamfers?







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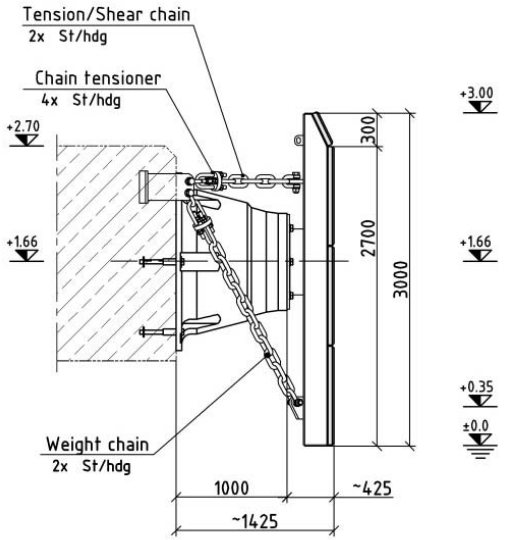
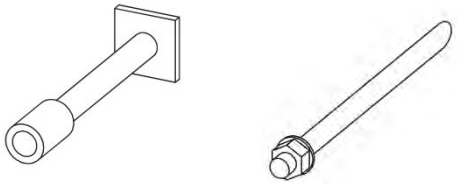
SECOND STEP - DESIGN SELECTION OF ACCESSORIES

<u>Chain and Shackle Assembly</u>
- Weight Chains
- Tension Chains
- Shear Chains
- Chain Tensioner

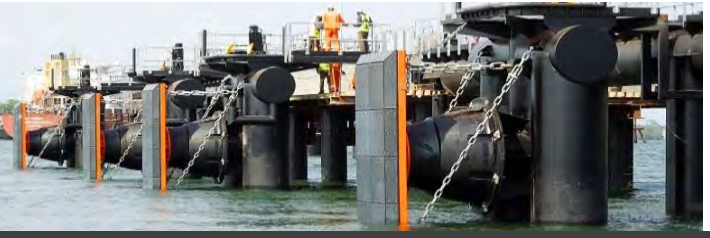
=> Make sure you consider angles!



<u>Anchors</u>
- Cast-In Anchors (New Concrete)
- Resin Anchors (Existing Concrete)



<u>UHMW-PE Low Friction Plates</u>
- Reclaimed (FQ Material, Multicolour)
- Virgin Material



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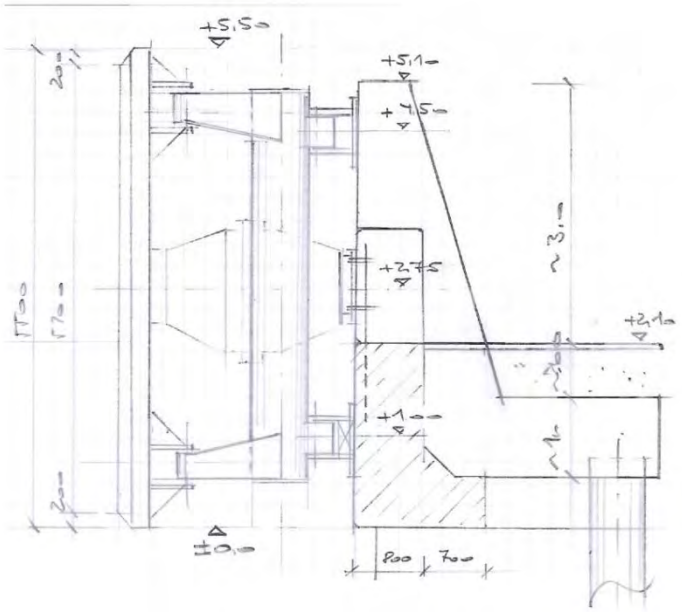
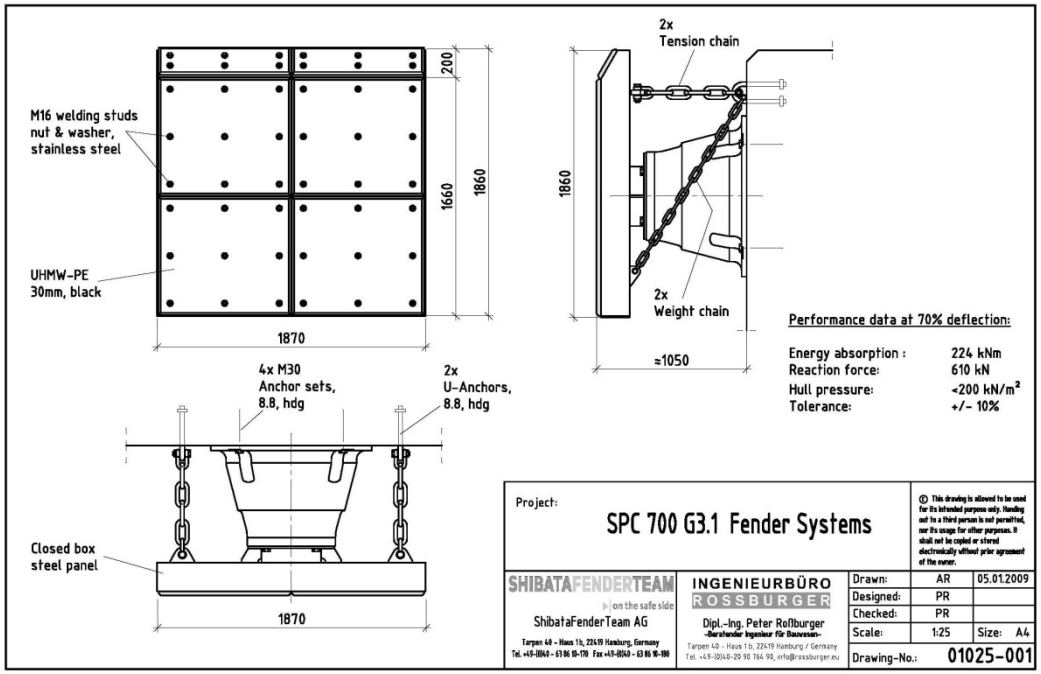
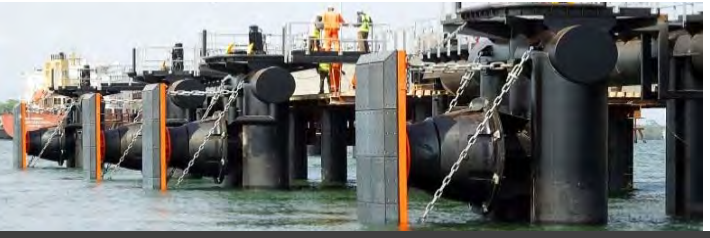
SECOND STEP - DESIGN
PREPARATION AND SUBMISSION OF SKETCHES/ DRAWINGS







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THIRD STEP - FINALISATION

The Final Steps in preparing a high performance Fender Design:

- Detailed discussion/evaluation of the submitted proposal
- Review and consideration of stakeholders' comments
- Submission of final design and drawings (dwg/pdf Files)
- Prepare specifications for high performance fenders
- Additional requirements to allow only highly qualified bidders to participate
    - PIANC Certification
    - Product Liability Insurance up to 5M USD
    - Claim free record
    - Determination of panel weight range for specific project

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REFERENCE PROJECTS

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CSS-Fender System Khalifa Port - Abu Dhabi, U.A.E

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SPC-Fender System for Bulk Terminal - Amsterdam, The Netherlands

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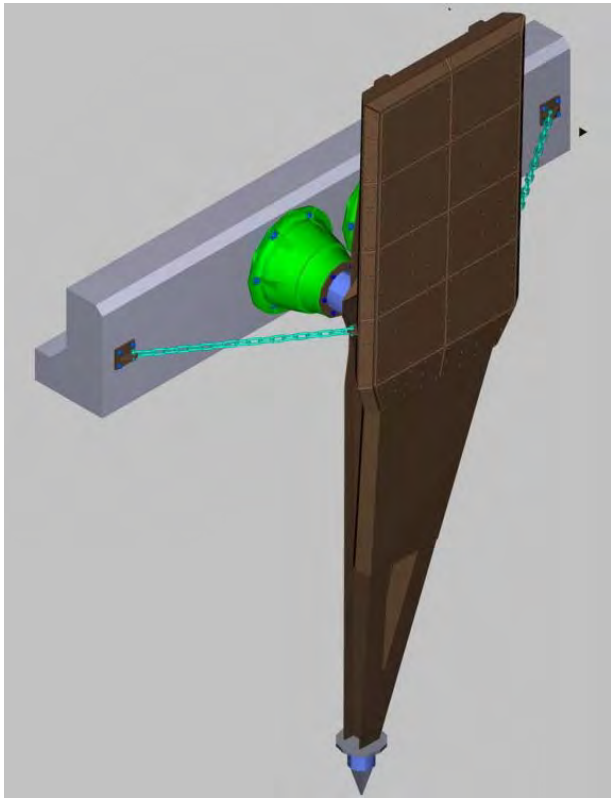
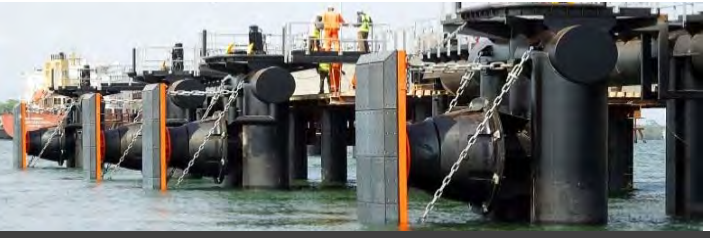
SPC Pile-Fender System for Ferry Terminal - Hirtshals, Denmark





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FE-Element Fender System for Ferry Terminal - Ystad, Sweden

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Foam / Donut and Hydro-Pneumatic Fender System for Navy Base

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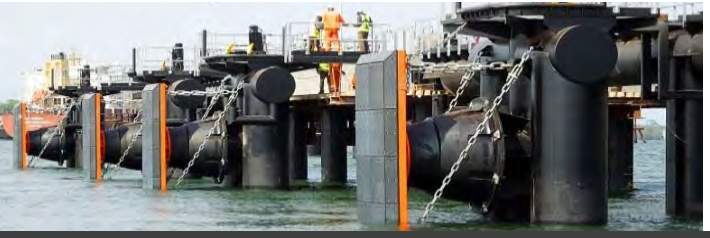
123nos. CSS-Fender System for Navy Shipyard, Chile



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Special Arch-Fender System and PMF-System - Port of Dover, UK

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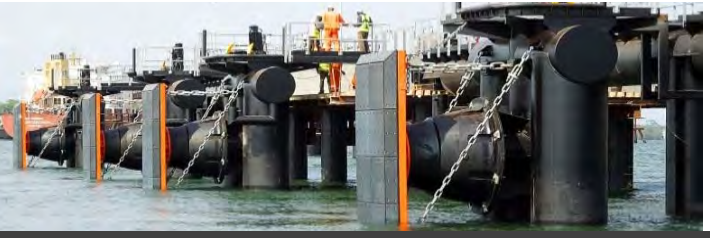
SPC-Fender System for Port of Zadar, Croatia



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Parallel Motion Fender System for Oil Terminal - Labuan, Malaysia

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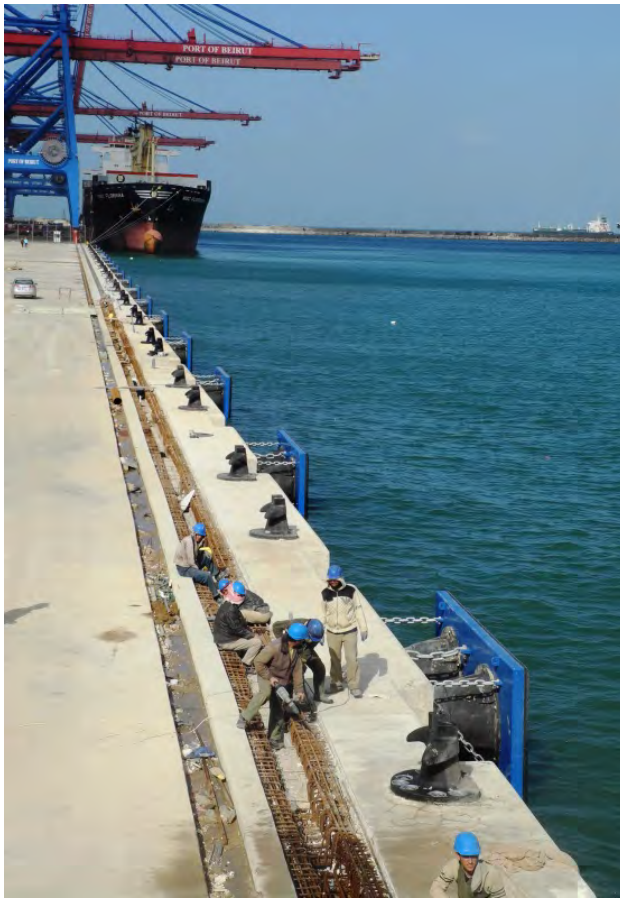
Double SPC System for Container Terminal - Port of Beirut, Lebanon



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Ship Separator (10mx7.6m) for Oil Terminal - Guatemala

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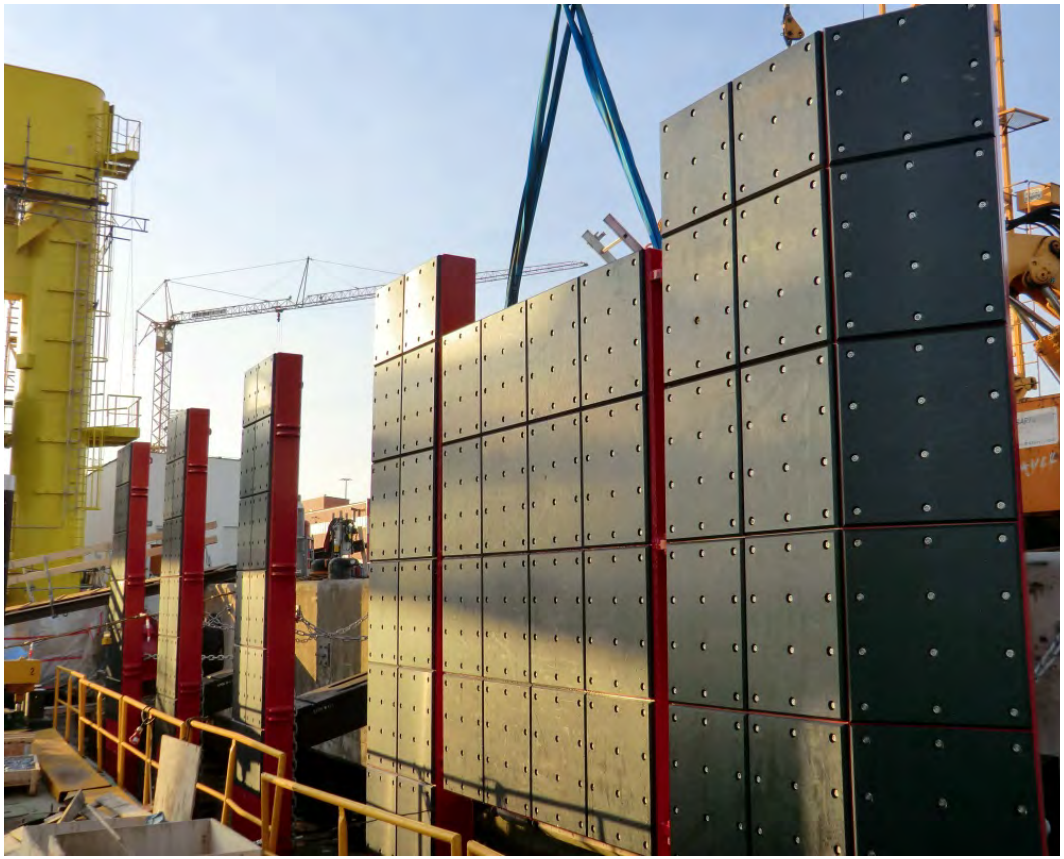
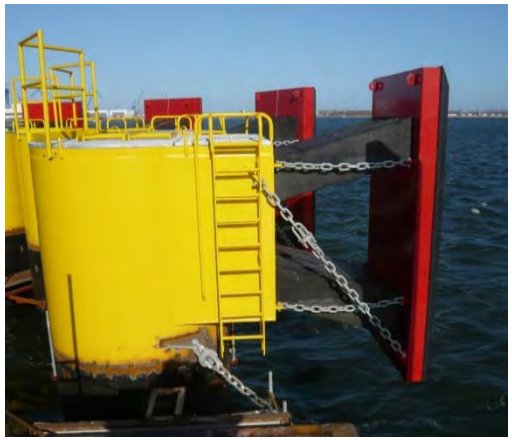
FE-Element/CSS-Cell Pile Fender System for Ferry Pier 1 - Rostock, Germany





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60pcs. 10’ x 16’ Ocean Guard Foam Filled Fender for Container Terminal - Port of Miami, FL - USA

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SPC-Fender System - Pepel Island, Sierra Leone

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Donut Fender System for Ferry Terminal - Egholm, Denmark

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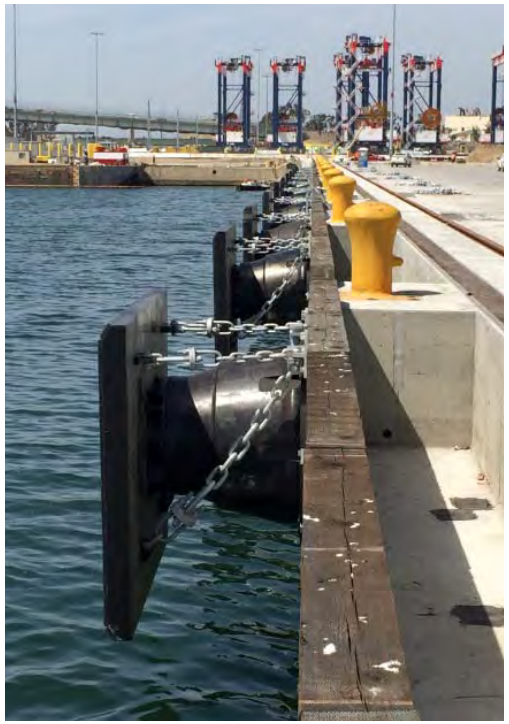
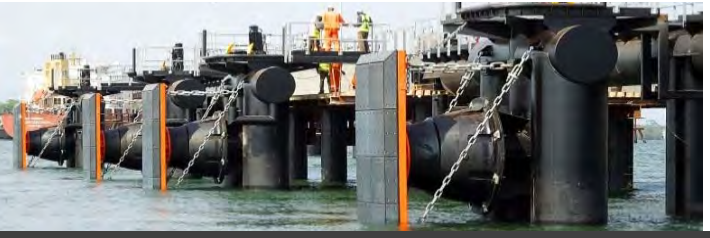
SPC-Fender System for Container Terminal - Long Beach, CA - USA





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>200nos. SPC-Fender Systems for Maasvlakte II - Rotterdam, The Netherlands

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SPC-Fender System for Fuel Terminal - Sierra Leone

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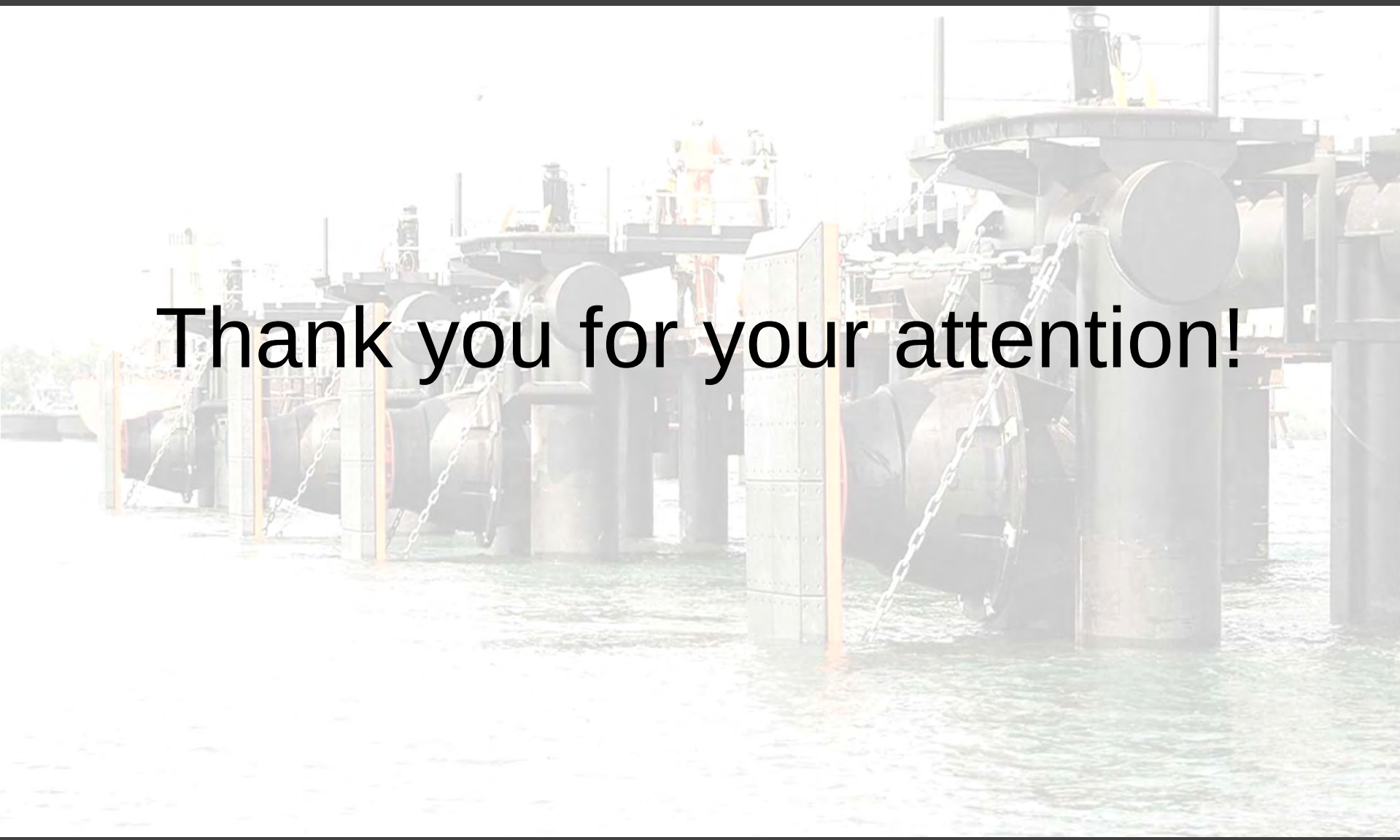

Thank you for your attention!