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SHIBATAFENDERTEAM GROUP

GERMANY | FRANCE | AMERICAS | ASIA

Technical Presentation - 11th Southern Asia Ports, Logistics &Shipping 2016, Colombo

Presented by: Y. Agari

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CONTENT

1. **SHIBATAFENDERTEAM GROUP**

2. **TYPICAL FENDER DESIGN STEPS**

3. **REFERENCE PROJECTS**

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SHIBATAFENDERTEAM GROUP

HEADQUARTERS	Hamburg, Germany
OFFICES	Lansdowne, USA Paris, France Kuala Lumpur, Malaysia (from 01st of June 2016)
PRODUCTION	Rubber fender production in Japan and Malaysia Own steel fabrication facilities in Germany Foam Filled Fender production in Germany and the USA
TURNOVER	~ 40 Million USD
DELIVERED PROJECTS	> 2.800 worldwide since 2006
PROJECT SIZES	> 5 Million USD / project > 200 fender systems / project
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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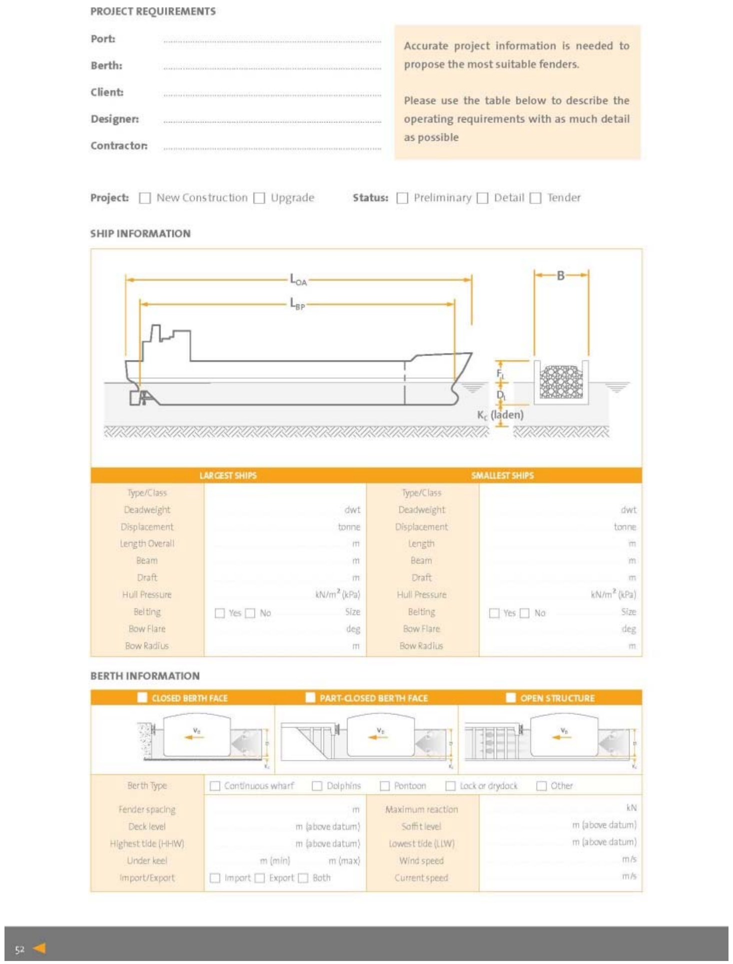
FIRST STEP – BASICS

➢ 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



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		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/m^2 (kPa)	Hull Pressure	kN/m^2 (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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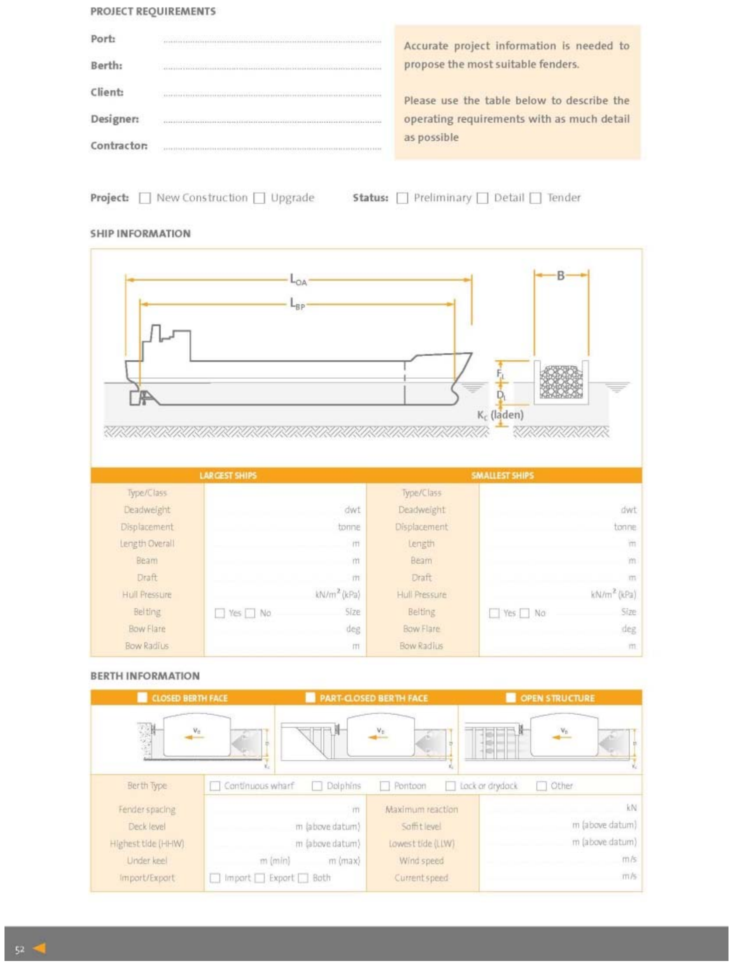
FIRST STEP – BASICS

➢ 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



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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

- PIANC 2002: 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 CALCULATIONS

- 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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E-mail: info@shibata-fender.team
Web: www.shibata-fender.team

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)	*Fine line hull*
Data Source		PIANC WG121 Tables	
Primary Dimension		Displacement	
Interpolation value		125000 t	
		Table range: 42389,0t to 190828,0t	

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	Y	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**

SFT Energy Spreadsheet REV0020

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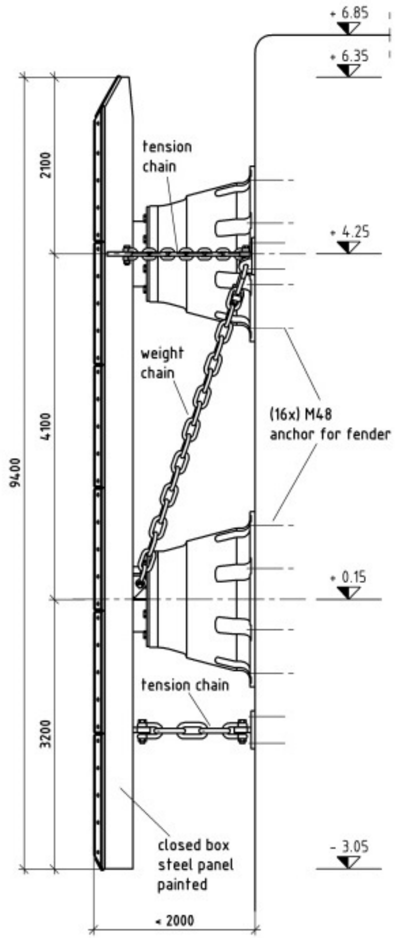
SECOND STEP – DESIGN

➢ SELECTION OF THE RUBBER FENDER UNIT

<u>Consideration of the following issues:</u>

- 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)
- Maximum stand-off distance
- Preferences of the consultant / client



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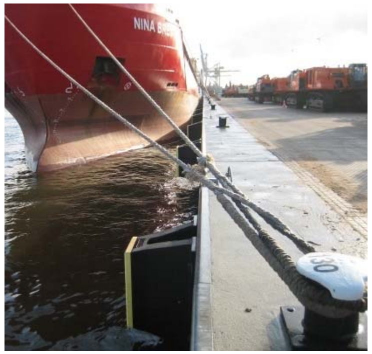
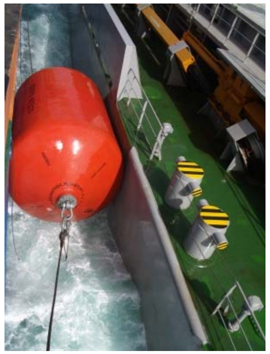
SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT

Standard types of fender units



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SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT

SPC Cone Fender

CSS Cell Fender

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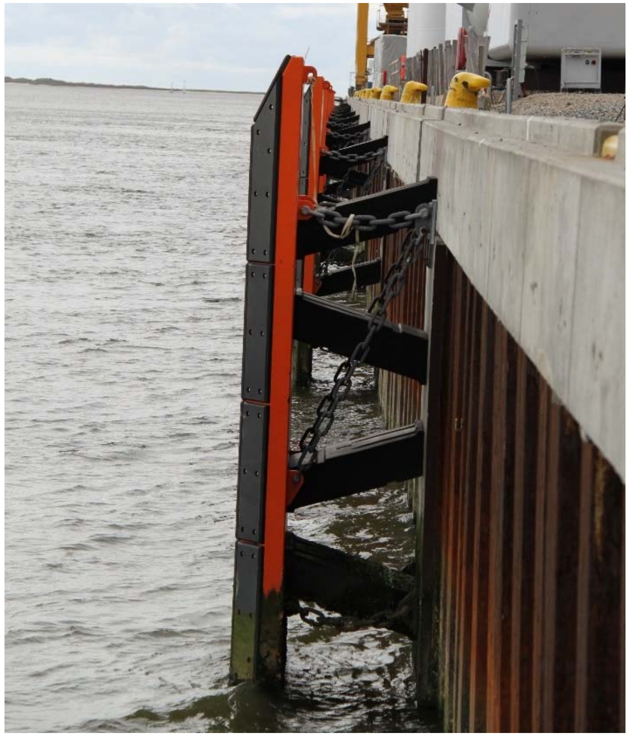
SECOND STEP – DESIGN

SELECTION OF THE FENDER UNIT

FE Element Fender



V Fender (SX / SX-P)

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SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT

Cylindrical Fender

Pneumatic Fender

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SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT

Ocean Guard

Ocean Cushion

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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

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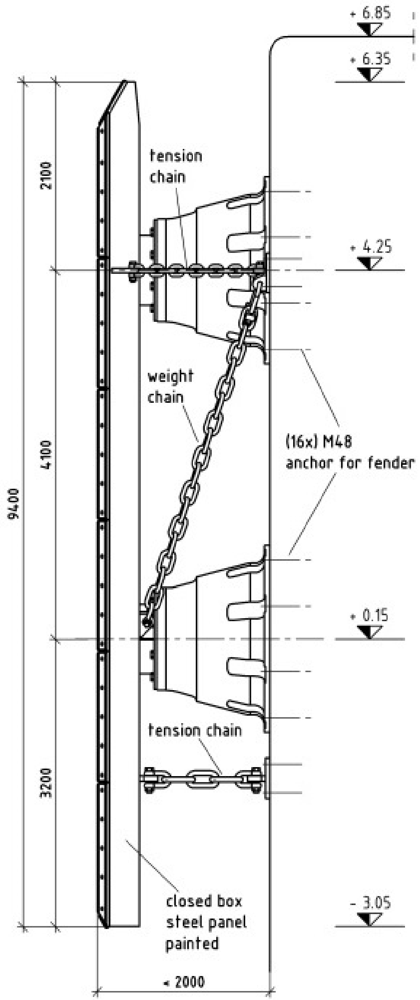
SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT



<u>Selected Fender</u>

2 nos. SPC-1300H G2.3

E = 1168 kNm * 2 = <u>2336 kNm (> 2281)</u>

R = 1705 kN * 2 = <u>3410 kN (< 3500)</u>

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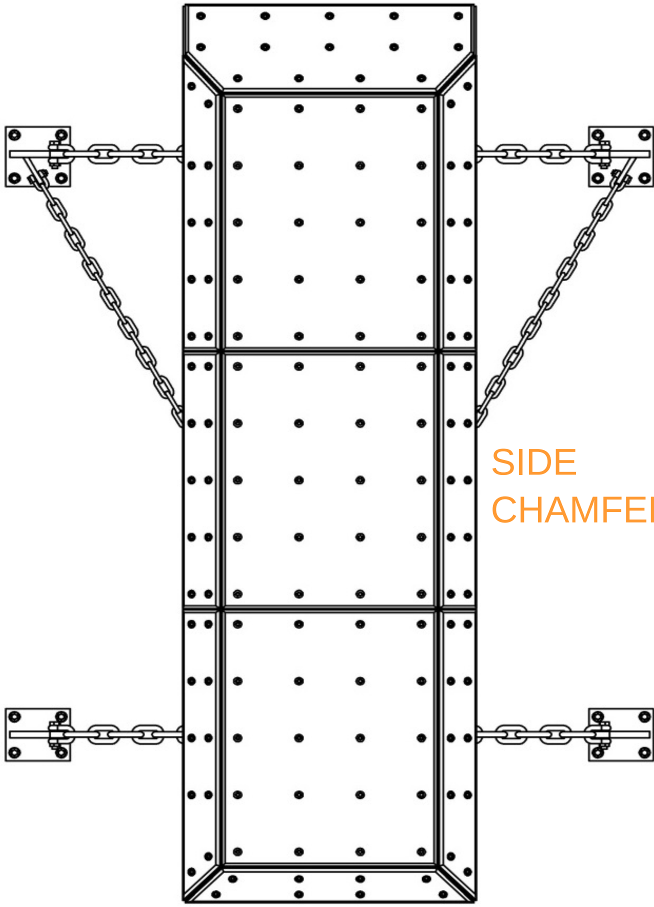
SECOND STEP – DESIGN

- **PRELIMINARY DESIGN OF THE STEEL FENDER PANEL**

Why chamfers?



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SECOND STEP – DESIGN

- **PRELIMINARY DESIGN OF THE STEEL FENDER PANEL**

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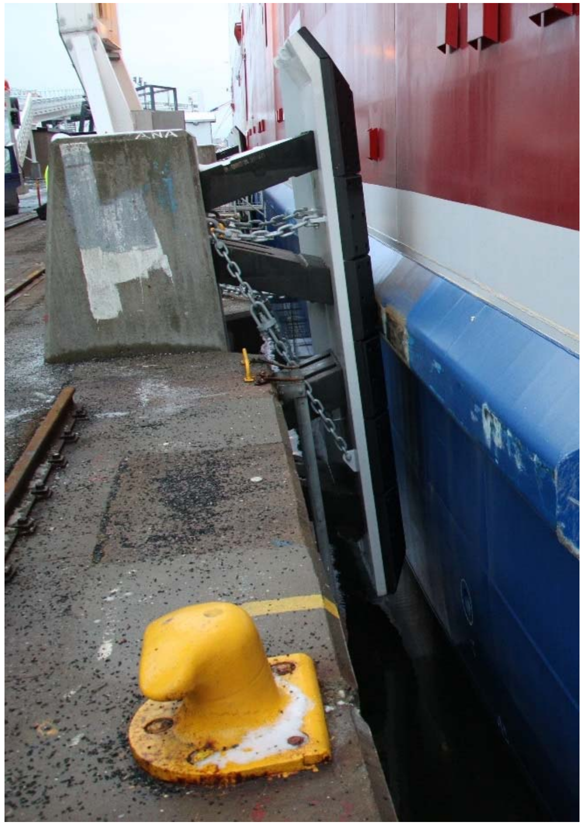

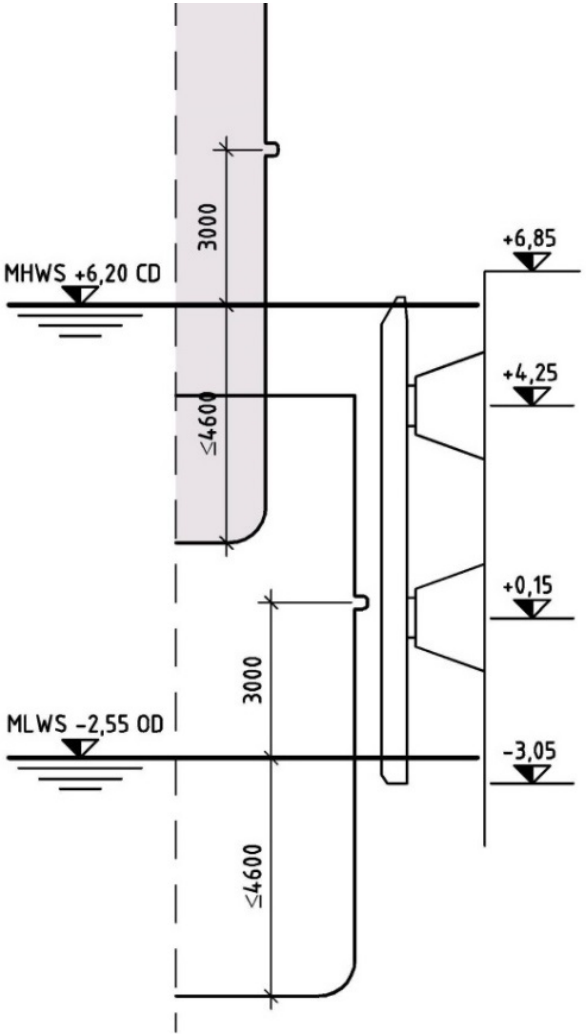

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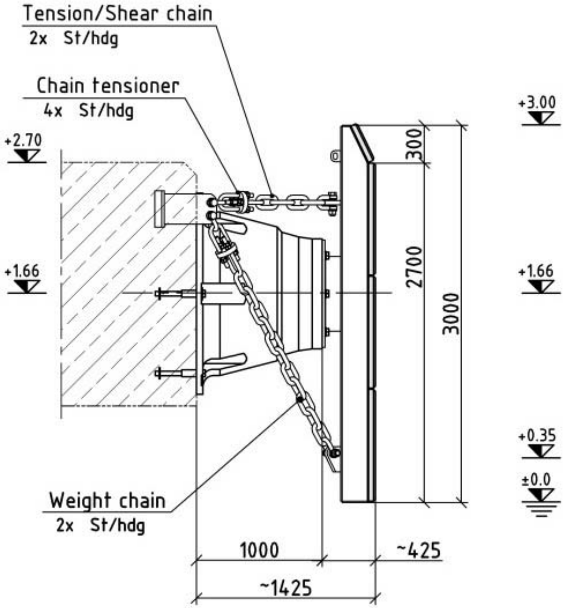
SECOND STEP – DESIGN

➢ SELECTION OF ACCESSORIES



Chain and shackle assembly

- Weight chains
- Tension chains
- Shear chains
- Chain tensioner & shackles

=> Make sure you consider angles

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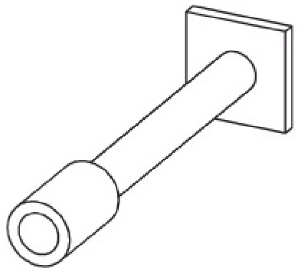
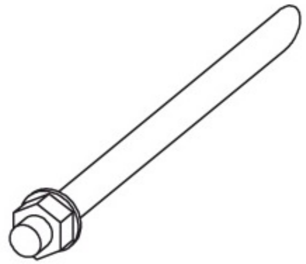
SECOND STEP – DESIGN

➢ SELECTION OF ACCESSORIES

Anchors

- Cast-in anchors (New concrete)
- Resin anchors (Existing concrete)





Chain fixation

- U-anchors
- Brackets

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SECOND STEP – DESIGN

➢ SELECTION OF ACCESSORIES

UHMW-PE Low Friction Plates

- Reclaimed (FQ Material, multicolour)
- Virgin material

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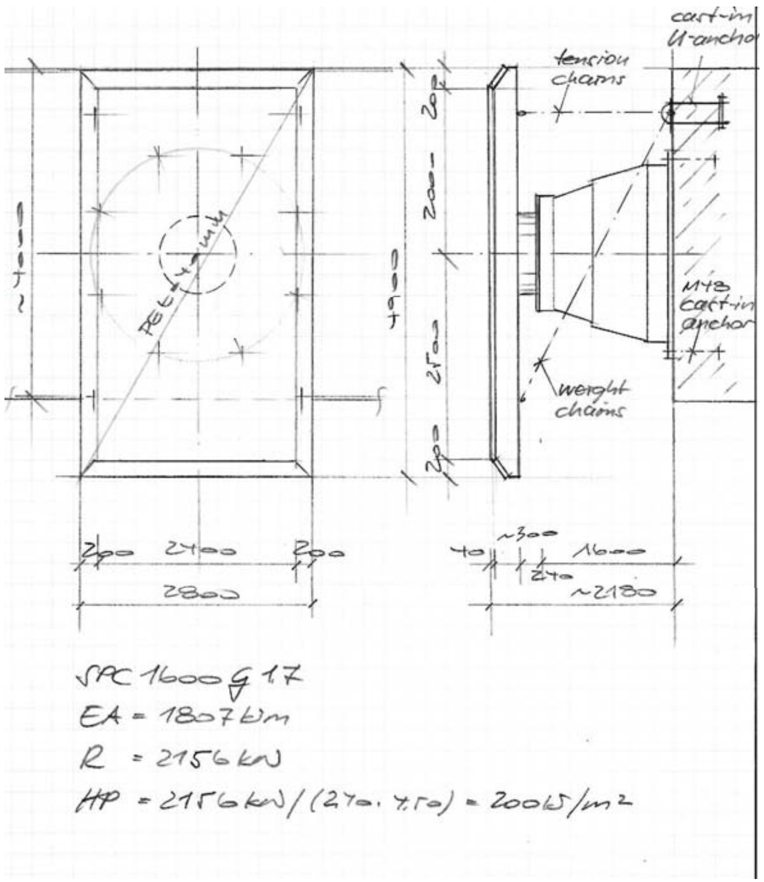
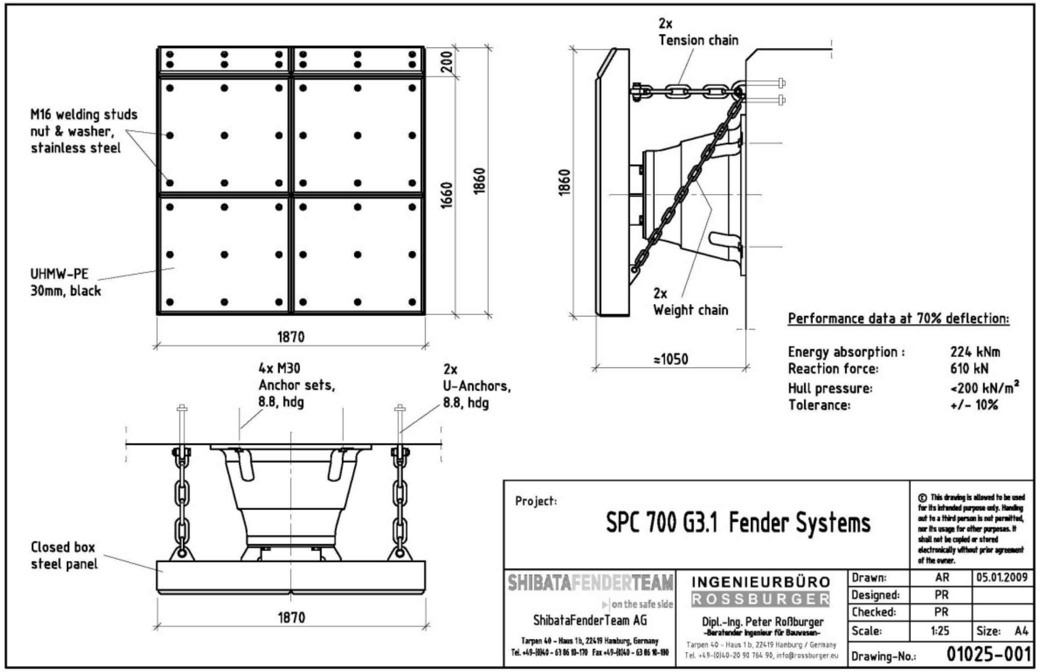
SECOND STEP – DESIGN

➢ PREPARATION AND SUBMISSION OF SKETCHES/ DRAWINGS





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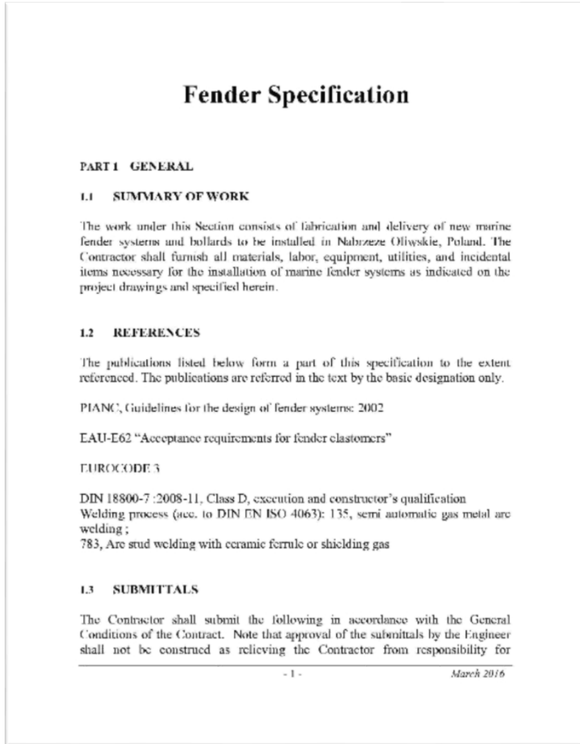
THIRD STEP – FINALISATION

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



Fender Specification

PART 1 GENERAL

1.1 SUMMARY OF WORK

The work under this Section consists of fabrication and delivery of new marine fender systems and bollards to be installed in Nabrzeze Oliwskie, Poland. The Contractor shall furnish all materials, labor, equipment, utilities, and incidental items necessary for the installation of marine fender systems as indicated on the project drawings and specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred in the text by the basic designation only.

PIANC, Guidelines for the design of fender systems: 2002

EAU-E62 "Acceptance requirements for fender elastomers"

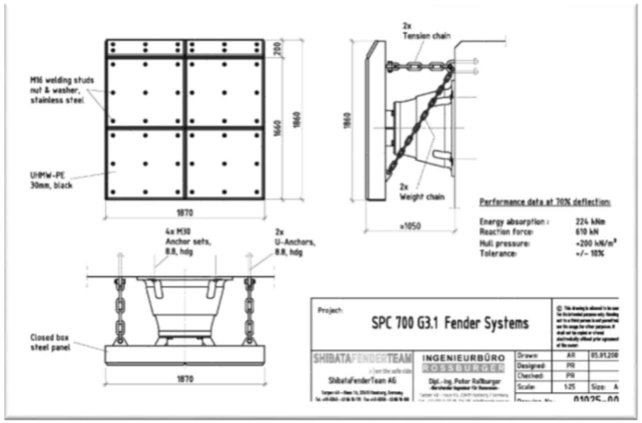
EUROCODE 3

DIN 18800-7 :2008-11, Class D, execution and constructor's qualification
Welding process (acc. to DIN EN ISO 4063): 135, semi automatic gas metal arc welding ;
783, Arc stud welding with ceramic ferrule or shielding gas

1.3 SUBMITTALS

The Contractor shall submit the following in accordance with the General Conditions of the Contract. Note that approval of the submittals by the Engineer shall not be construed as relieving the Contractor from responsibility for

- 1 - *March 2016*



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THIRD STEP – FINALISATION

The final steps in preparing a high performance fender design:

Additional requirements to allow only highly qualified bidders to participate

- PIANC Certification
- Product Liability Insurance up to 5 Million USD
- Claim free record
- Determination of panel weight range for specific project

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REFERENCE PROJECTS

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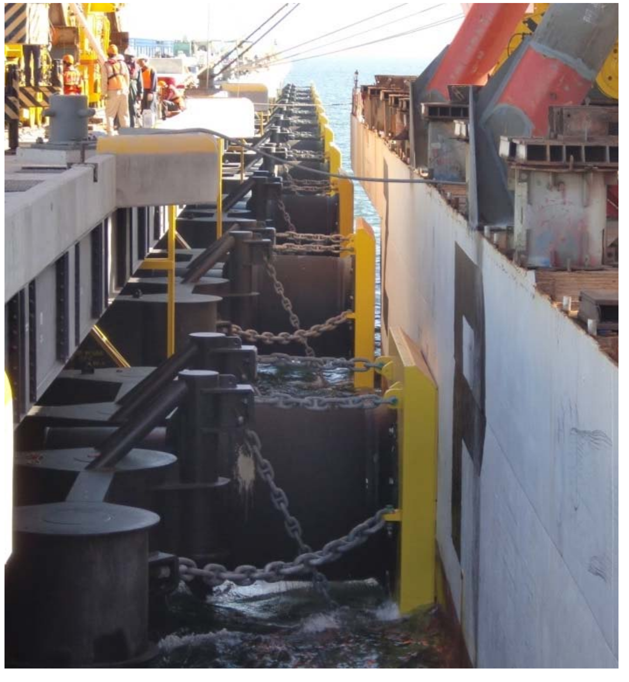
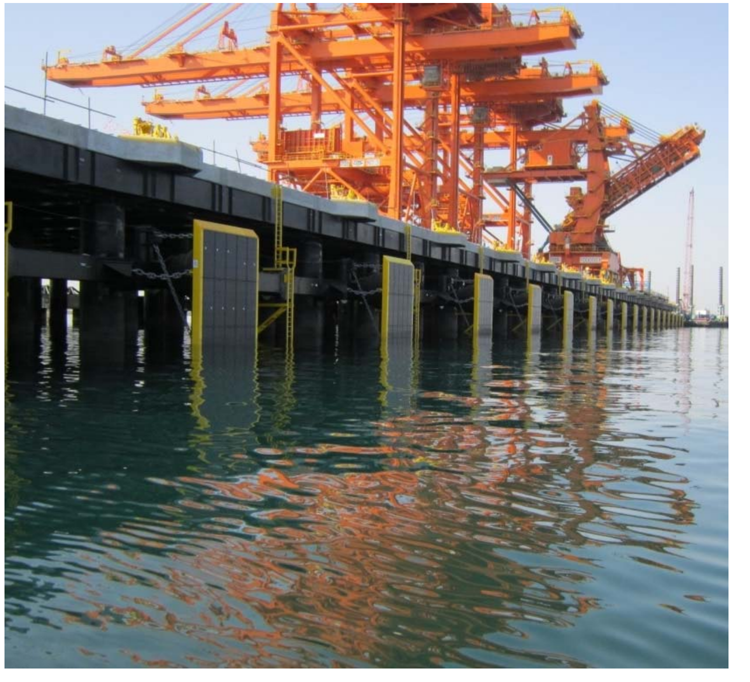
SPC/CSS Fender systems for Bulk Jetty - Sohar, Oman





CSS 3000H
E/A = 7906 kNm

SPC 2000H
E/A = 4242 kNm

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

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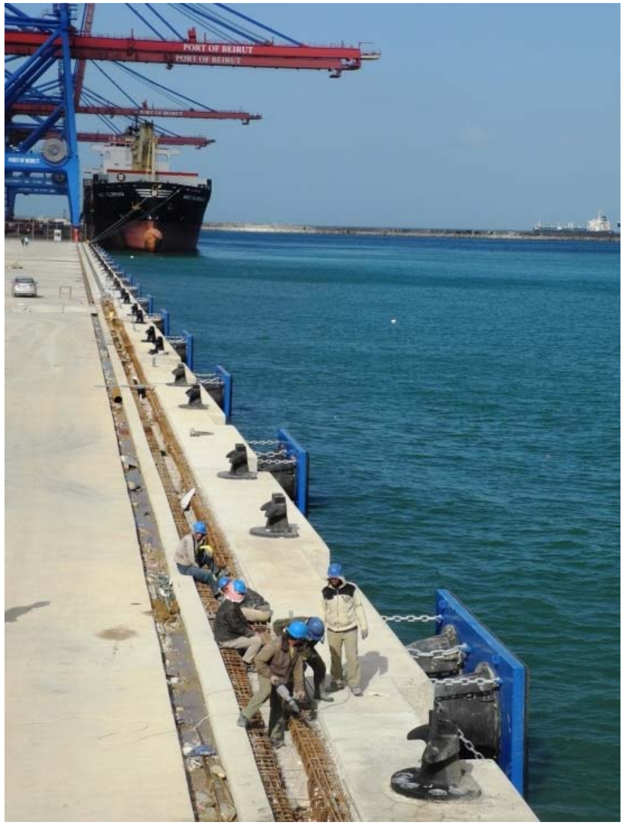
Double SPC Fender systems for Container Terminal – Port of Beirut, Lebanon



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➢ CSS Fender systems for Khalifa Port – Abu Dhabi, U.A.E

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FE Element Fender systems with Belt Deflectors – Port of Sochi, Russia

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➤ PM Fender systems for Oil Terminal - Labuan, Malaysia

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- **PM Fender systems for Ferry Terminal – Hirtshals, Denmark**

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- **60 pcs. 10’ x 16’ Ocean Guard Fenders for Container Terminal – Port of Miami, FL - USA**

© ShibataFenderTeam 2016

➢ Cylindrical Fenders for Burchardkai LP2 – Hamburg, Germany

© ShibataFenderTeam 2016

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- **128 nos. SPC Fender systems for Tema Bulk Terminal – Tema, Ghana**

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- **24 nos. SPC Fender systems for CMIT – Cai Mep, Vietnam**

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➢ 16 nos. CSS Fender systems for IRPC Wf.3 – Thailand

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Thank you for your attention!

For more information visit us at

www.shibata-fender.team

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