

SHIBATAFENDERTTEAM GROUP

GERMANY | FRANCE | AMERICAS | ASIA

Technical Presentation - 14th ASEAN Ports&Shipping 2016

Presented by: Y. Agari



CONTENT

1. SHIBATAFENDERTEAM GROUP
2. TYPICAL FENDER DESIGN STEPS
3. REFERENCE PROJECTS





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



SHIBATA**FENDER****TEAM**

▶ | on the safe side

CASE STUDY

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



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

Name: _____
 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 SHIP		SMALLEST SHIP	
Ship Class	IMO	Ship Class	IMO
Displacement	tonne	Displacement	tonne
Length Overall	m	Length	m
Beam	m	Beam	m
Draft	m	Draft	m
Hull Form	Wind? <input type="checkbox"/> No <input type="checkbox"/> Yes	Hull Form	Wind? <input type="checkbox"/> No <input type="checkbox"/> Yes
Keel	Stab	Keel	Stab
Roaming	Stag	Roaming	Stag
Sea Pitch	m	Sea Pitch	m

BERTH INFORMATION

CLOSED BERTHFACE PARTIALLY CLOSED BERTHFACE OPEN STRUCTURE

CLOSED BERTHFACE		PARTIALLY CLOSED BERTHFACE		OPEN STRUCTURE	
Berth Type	<input type="checkbox"/> Continuous-wall <input type="checkbox"/> Quay <input type="checkbox"/> Bulkhead <input type="checkbox"/> Lock or slipway <input type="checkbox"/> Other	Maximum reaction	ton	Maximum reaction	ton
Water depth	m	Water depth	m	Water depth	m
Deck level	m (above datum)	Deck level	m (above datum)	Deck level	m (above datum)
Height to top of wall	m (above datum)	Height to top of wall	m (above datum)	Height to top of wall	m (above datum)
Under keel	m (above datum)	Under keel	m (above datum)	Under keel	m (above datum)
Height to top of fender	m	Height to top of fender	m	Height to top of fender	m
Fender type	<input type="checkbox"/> Impact <input type="checkbox"/> Impact <input type="checkbox"/> Roll	Current speed	m/s	Current speed	m/s



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

Name: _____
 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 VESSEL		SMALLEST VESSEL	
Ship Class	IMO	Ship Class	IMO
Displacement	ton	Displacement	ton
Length Overall	m	Length	m
Breadth	m	Breadth	m
Draft	m	Draft	m
Hull Pressure	Wind²/20	Hull Pressure	Wind²/20
Belting	<input type="checkbox"/> Yes <input type="checkbox"/> No	Belting	<input type="checkbox"/> Yes <input type="checkbox"/> No
Roaming	Yes	Roaming	Yes
New Fender	Yes	New Fender	Yes

BERTH INFORMATION

CLOSED BERTHFACE PARTIALLY CLOSED BERTHFACE OPEN STRUCTURE

Berth Type	<input type="checkbox"/> Continuous-wall <input type="checkbox"/> Gabion <input type="checkbox"/> Retain <input type="checkbox"/> Lock or spillway <input type="checkbox"/> Other	Maximum reaction	ton
Berth height	m	Berth base	m (above datum)
Deck level	m (above datum)	Lowest tide (LWT)	m (above datum)
Highest tide (HWT)	m (above datum)	Wind speed	m/s
Water level	m (above datum)	Current speed	m/s
Mooring layout	<input type="checkbox"/> Pier <input type="checkbox"/> Quay <input type="checkbox"/> Bulk		



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





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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Project:	Fender for Lugs	Ref No.:	02015		
Berth:	Berth 11 - 14	Prepared:	D. Polke		
Country:	Nigeria	Date:	08-Oct-2015	Revision:	00
Meta					
Design Method:	PIANC WLLS 2002				
Ship Type:	CONTAINER SHIP (Post-Panamax) <small>Free to edit</small>				
Data Source:	PIANC WLLS Tables				
Primary Dimension:	Displacement				
Interpolation value:	1.7500 <small>Value from: 200208 to 200404</small>				
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 ₀	125,000 t			
Length Overall:	L _{0A}	327,332 m			
Length Between Perpendiculars:	L ₉₀	312,332 m			
Beam:	B	43,267 m			
Design Draft:	D	13,000 m <small>Free to edit</small>			
Design Freeboard:	F	9,850 m			
Block Coefficient:	C _B	0,824			
BERTH & APPROACH					
Structure Type:	Closed face				
Under Keel Clearance:	K ₁	10% of laden draft			
Point of Contact from Bow:	α	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:	β	3,00 deg <small>Free to edit/Free to edit</small>			
Impact Point to Centre of Mass:	R	81,025 m			
Radius of Gyration:	R _G	75,552 m			
Wilcoxy Vector Angle:	T	68,51 deg			
Added Mass Factor:	C ₀	1,800			
Eccentricity Factor:	C ₁	0,533			
Berth Configuration Factor:	C ₂	0,900			
Hull Softness Factor:	C ₃	1,000			
BERTHING VELOCITY					
Velocity Table:	PIANC WLLS 2002				
Approach Conditions:	[X] Good berthing, exposed				
Berthing Velocity:	V _B	382 mm/s			
Normal Energy:	E _N	1.740,9 kNm			
Factor of Safety:	F _S	1,500			
Abnormal Energy	E_A	2.675,9 kNm			

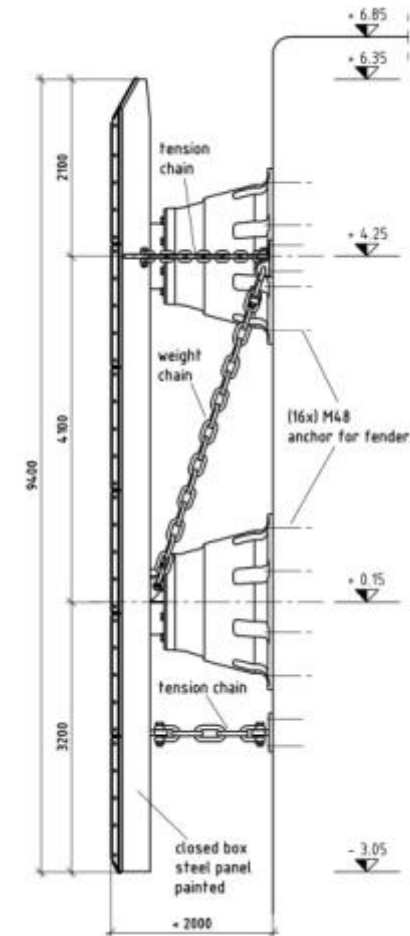


SECOND STEP – DESIGN

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





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

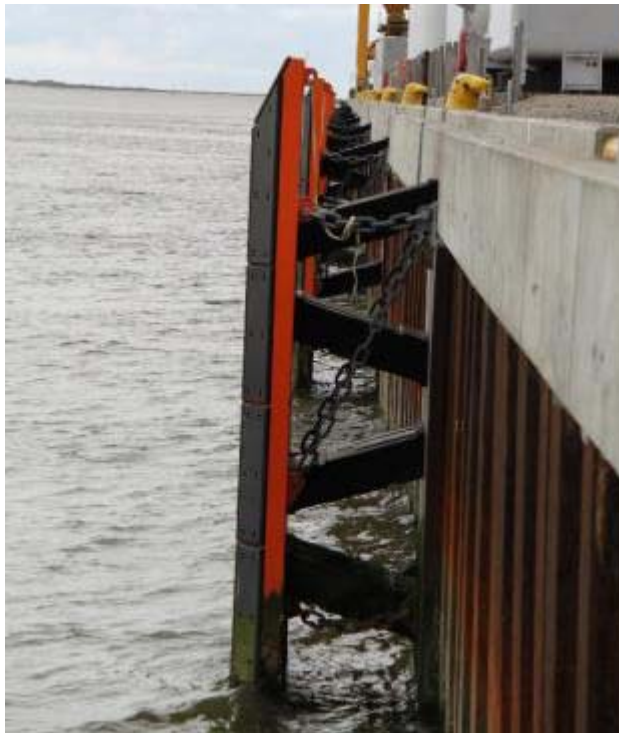




SECOND STEP – DESIGN

➤ SELECTION OF THE FENDER UNIT

FE Element Fender



V Fender (SX / SX-P)





SECOND STEP – DESIGN

➤ SELECTION OF THE FENDER UNIT

Cylindrical Fender



Pneumatic Fender





SECOND STEP – DESIGN

➤ SELECTION OF THE FENDER UNIT

Ocean Guard



Ocean Cushion





SECOND STEP – DESIGN

➤ SELECTION OF THE RUBBER FENDER UNIT

Design Criteria

Energy	=	2281 kNm
Reaction	=	< 3500 kN
Hull pressure	=	< 250 kN/m ²
Berthing angle	=	6°
Stand-off	=	< 2000 mm

=> Tolerance and correction factor to be discussed

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Project:	Fender for Lagers	Ref No.:	02015
Berth:	Berth 13 - 14	Prepared:	D. Polke
Country:	Nigeria	Date:	09-08-2015
		Revision:	00
Menu			
Design Method	PAMC W013 2002		
Ship Type	CONTAINER SHIP (Privat-Palastina) <small>Free the ship</small>		
Data Source	PAMC W013 Tables		
Primary Dimension	Displacement		
Interpolation value	1,2000 t		
	<small>Interpolation: 0,0000 in 2000,00 t</small>		
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 m ³		
Design Displacement	M _D	125,000 t	
Length Overall	L _{OP}	327,332 m	
Length Between Perpendiculars	L _{BP}	312,332 m	
Beam	B	44,267 m	
Design Draft	D	13,000 m	<small>Only Laden</small>
Design Freeboard	F	3,850 m	
Block Coefficient	C _B	0,694	
BERTH & APPROACH			
Structure Type	T-shaped face		
Under Keel Clearance	K _U	10% of fender draft	1,300 m
Point of Contact from Bow	X	Quarter point	25,0 % from bow
Eccentricity Calculation Method	Flat Method		
Added Mass Calculation Method	PAMC 2002		
Seawater Density	ρ _{sw}	1,025 t/m ³	
BERTHING FACTORS			
Berthing Angle	β	5,00 deg	<small>Use default value</small>
Impact Point to Centre of Mass	R	81,075 m	
Radius of Gyration	K	75,702 m	
Velocity Vector Angle	γ	65,51 deg	
Added Mass Factor	C ₀	1,800	
Eccentricity Factor	C ₁	0,531	
Berth Configuration Factor	C ₂	0,900	
Hull Softness Factor	C ₃	1,000	
BERTHING VELOCITY			
Velocity Table	PAMC W013 2002		
Approach Conditions	01 Good berthing exposure		
Berthing Velocity	V _B	3,67 m/s	
Normal Energy	E _N	1.760,9 kNm	
Factor of Safety	F _S	1,500	
Abnormal Energy	E_A	2.675,9 kNm	



SECOND STEP – DESIGN

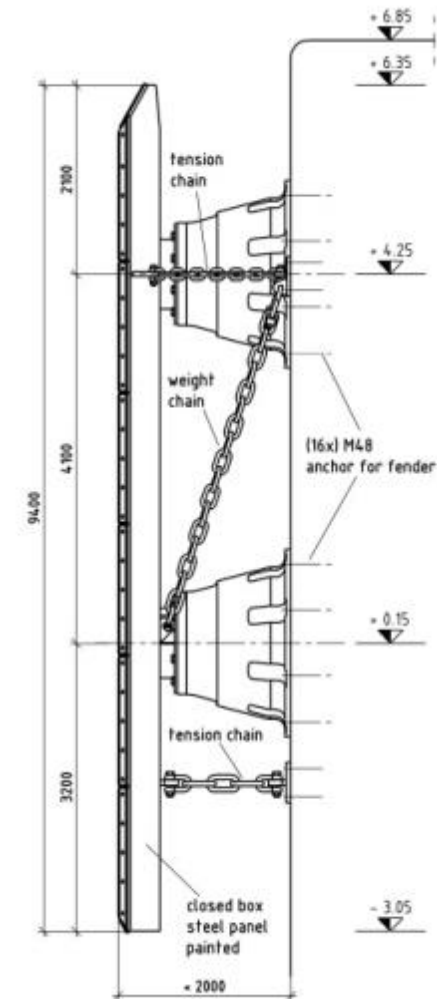
➤ SELECTION OF THE FENDER UNIT

Selected Fender

2 nos. SPC-1300H G2.3

$$E = 1168 \text{ kNm} * 2 = \underline{2336 \text{ kNm}} (> 2281)$$

$$R = 1705 \text{ kN} * 2 = \underline{3410 \text{ kN}} (< 3500)$$

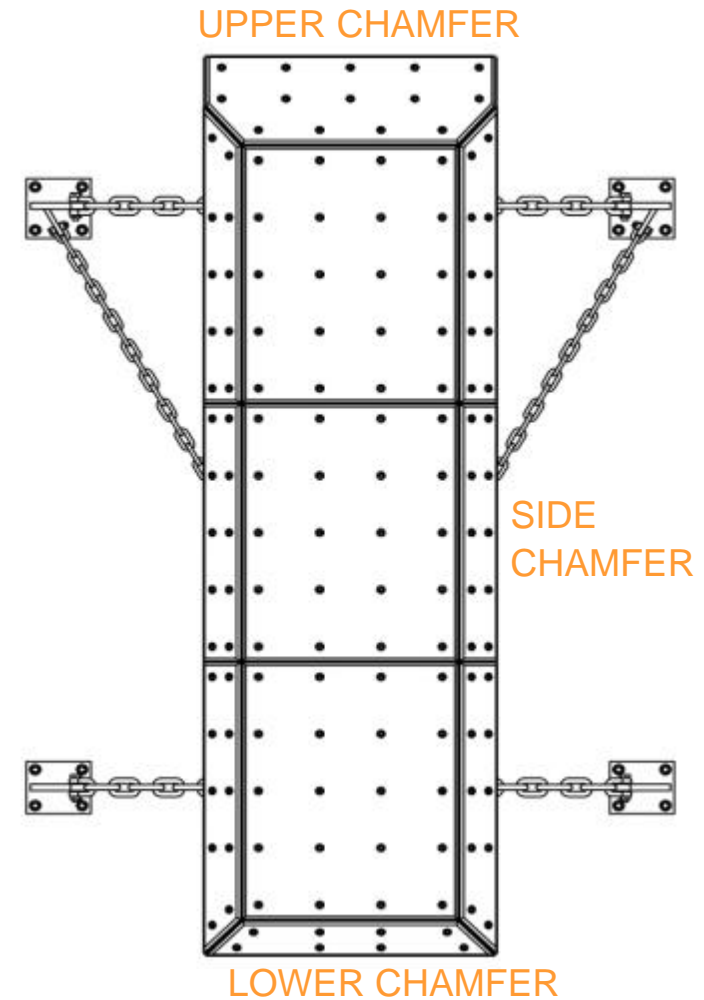




SECOND STEP – DESIGN

➤ PRELIMINARY DESIGN OF THE STEEL FENDER PANEL

Why chamfers?

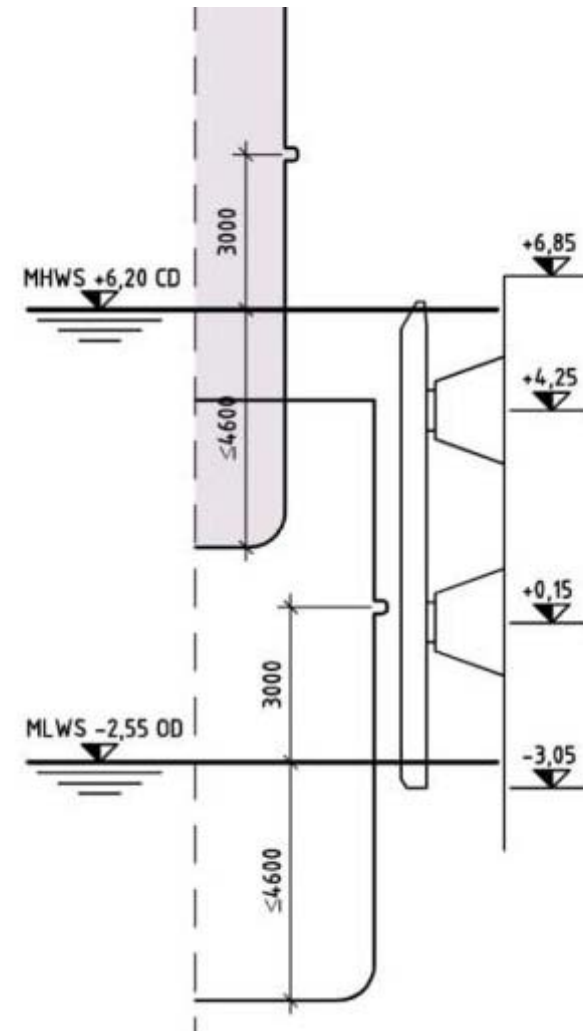




SECOND STEP – DESIGN

➤ PRELIMINARY DESIGN OF THE STEEL FENDER PANEL

Why chamfers?





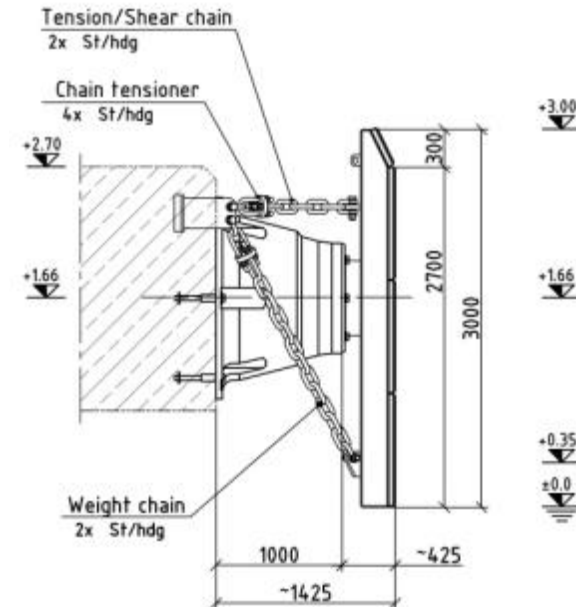
SECOND STEP – DESIGN

➤ SELECTION OF ACCESSORIES

Chain and shackle assembly

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

⇒ **Make sure you consider angles**



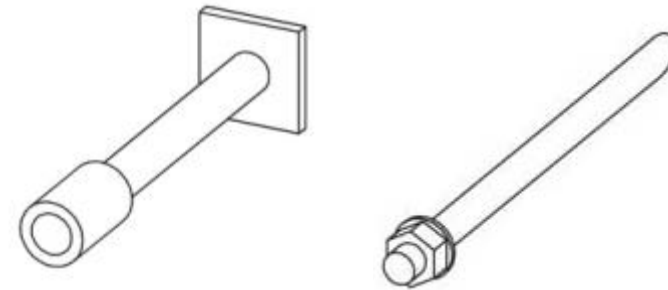


SECOND STEP – DESIGN

➤ SELECTION OF ACCESSORIES

Anchors

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



Chain fixation

- U-anchors
- Brackets





SECOND STEP – DESIGN

➤ SELECTION OF ACCESSORIES

UHMW-PE Low Friction Plates

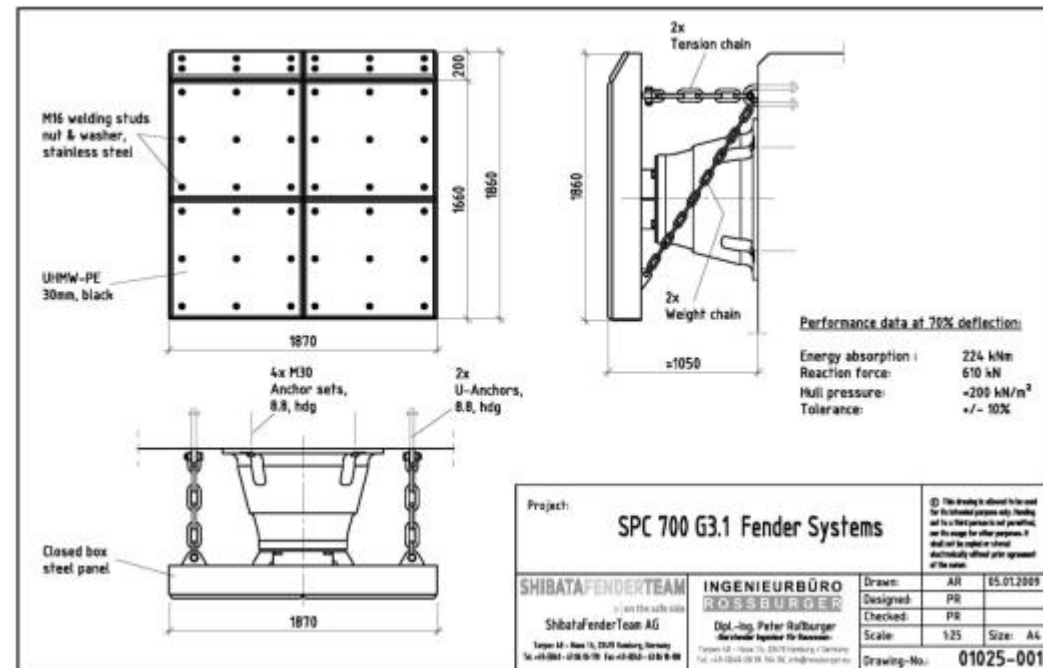
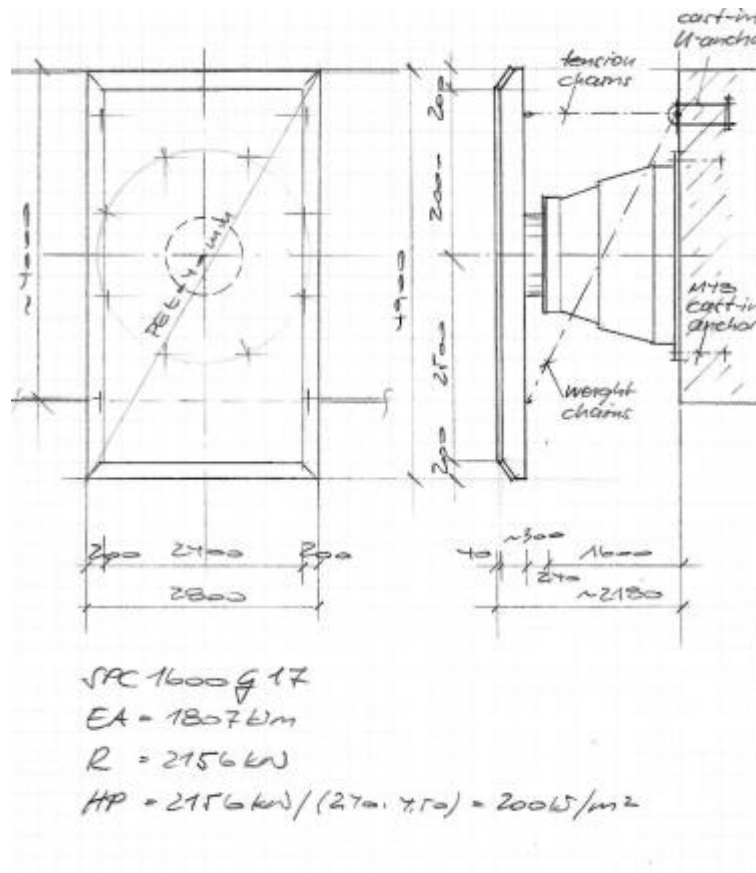
- Reclaimed (FQ Material, multicolour)
- Virgin material





SECOND STEP – DESIGN

➤ PREPARATION AND SUBMISSION OF SKETCHES/ DRAWINGS

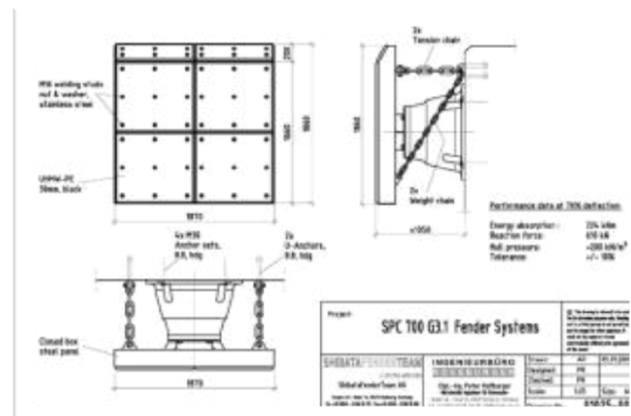




THIRD STEP – FINALISATION

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 to 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



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

GERMANY | FRANCE | AMERICAS | ASIA



➤ 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

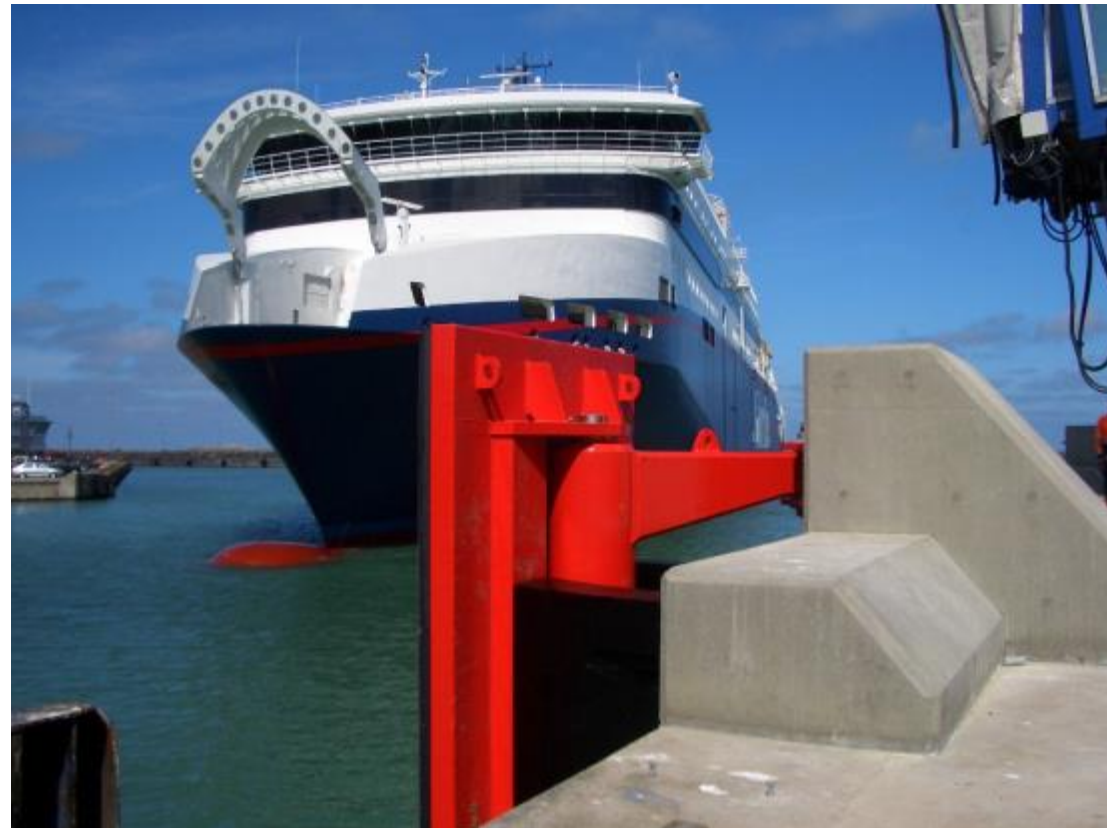




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➤ PM Fender systems for Ferry Terminal – Hirtshals, Denmark





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





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➤ Cylindrical Fenders for Burchardkai LP2 – Hamburg, Germany





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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





Thank you for your attention!

For more information visit us at
www.shibata-fender.team