SHIBATAFENDERTEAM GROUP

GERMANY | FRANCE | AMERICAS | ASIA

Technical Presentation - 15th Intermodal Africa 2016

Presented by: J. Richter

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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

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

BERTH INFORMATION

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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

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Berth:

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SHIP INFORMATION

BERTH INFORMATION

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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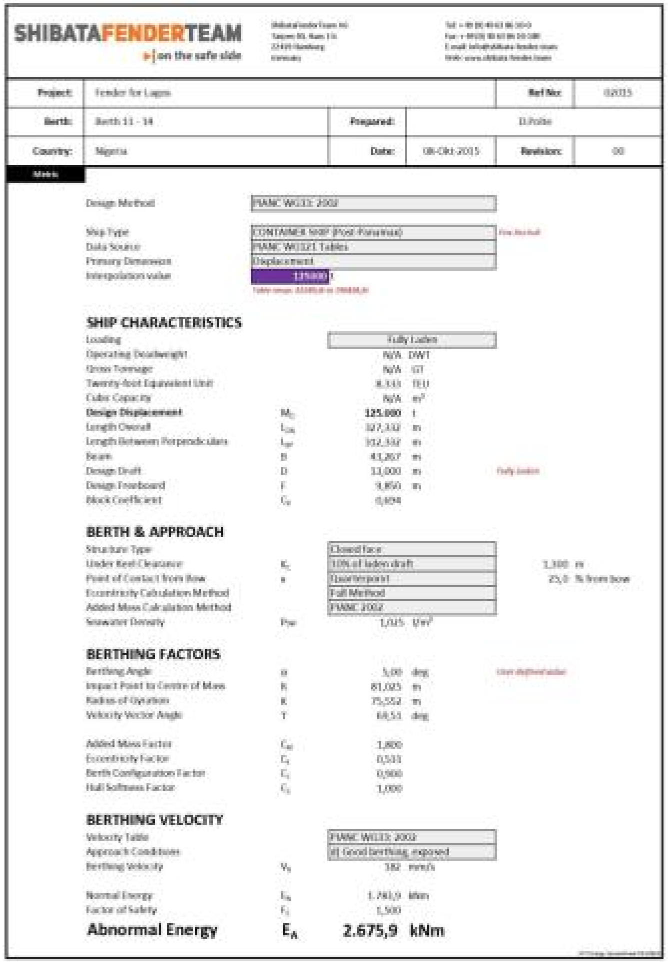
SECOND STEP – DESIGN

➢ PREPARE ENERGY CALCULATIONS

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

→ **Berthing velocity**

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



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	43,207	m
Design Draft	D	13,000	m
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
Impact Point to Centre of Mass	R	81,025	m
Radius of Gyration	K	75,552	m
Velocity Vector Angle	γ	68,51	deg
Added Mass Factor	C_M	1,800	
Eccentricity Factor	C_E	0,533	
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**

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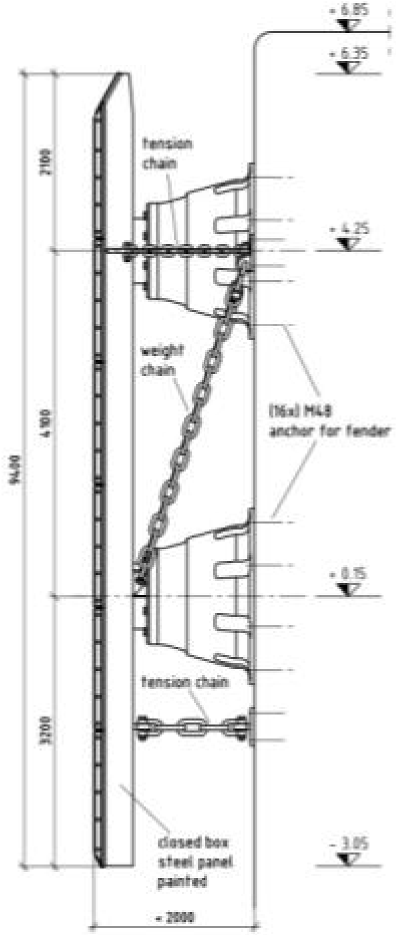
SECOND STEP – DESIGN

➢ 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

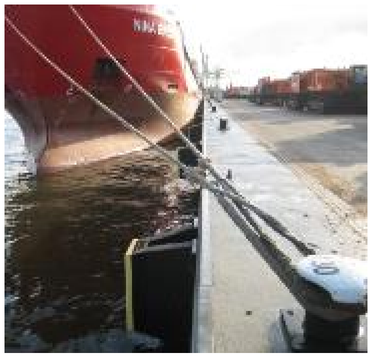
SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT

Standard types of fender units





SECOND STEP – DESIGN

- **SELECTION OF THE FENDER UNIT**

SPC Fender

CSS Fender

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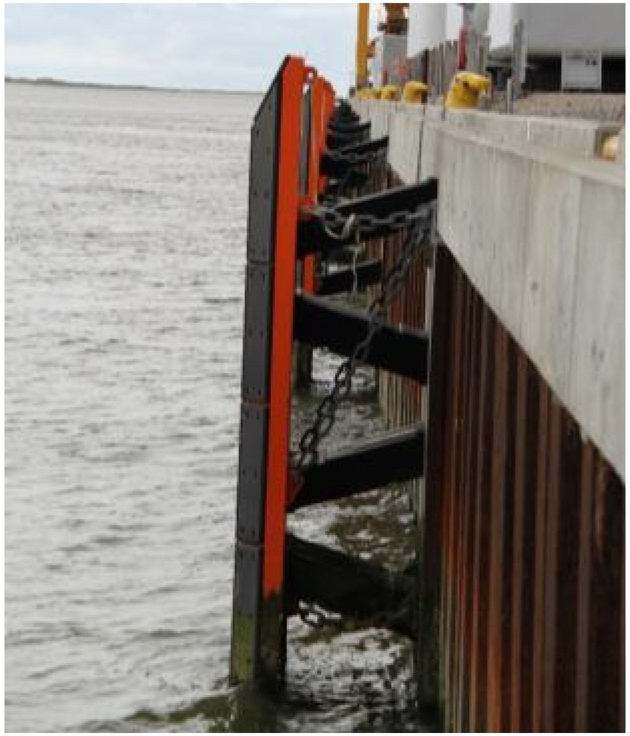
SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT

FE Element Fender



SX Fender / SX-P Fender

SECOND STEP – DESIGN

➢ **SELECTION OF THE FENDER UNIT**

Cylindrical Fender

Pneumatic Fender

SECOND STEP – DESIGN

➢ **SELECTION OF THE FENDER UNIT**

Ocean Guard

Ocean Cushion

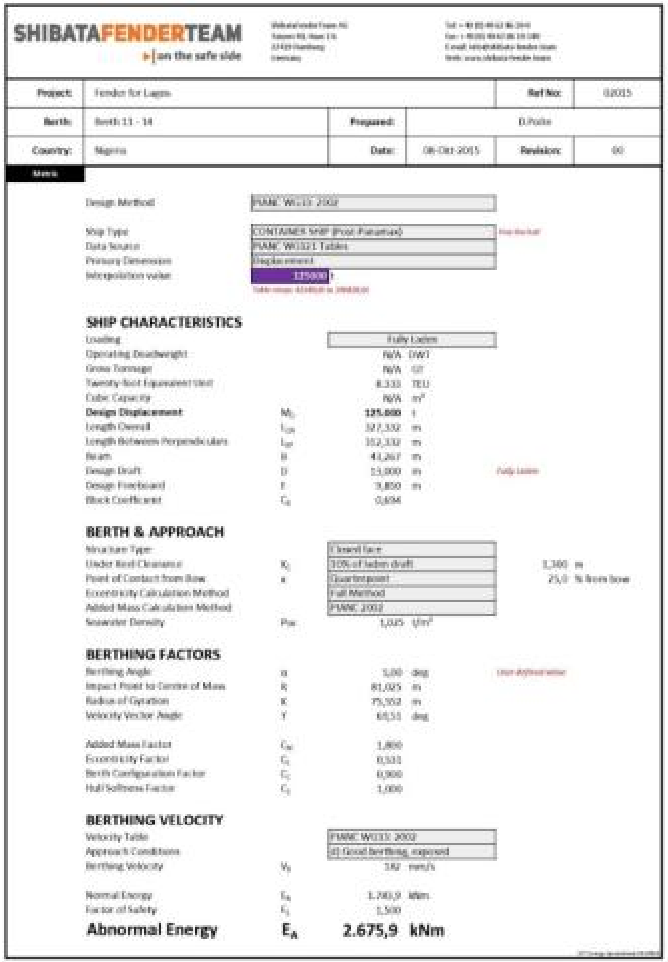
SECOND STEP – DESIGN

- **SELECTION OF THE RUBBER FENDER UNIT**

Design Criteria

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

=> Tolerance and correction factor to be discussed



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Project:	Fender for Lagos	Ref No:	02015
Berth:	Berth 11 - 14	Prepared:	D.Polte
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Beam	B	41,267	m
Design Draft	D	13,000	m
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Block Coefficient	C_B	0,694	

BERTH & APPROACH

BERTHING FACTORS

Berthing Angle	α	5,00	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

Normal Energy	E_N	1.783,9	kNm
Factor of Safety	F_S	1,500	
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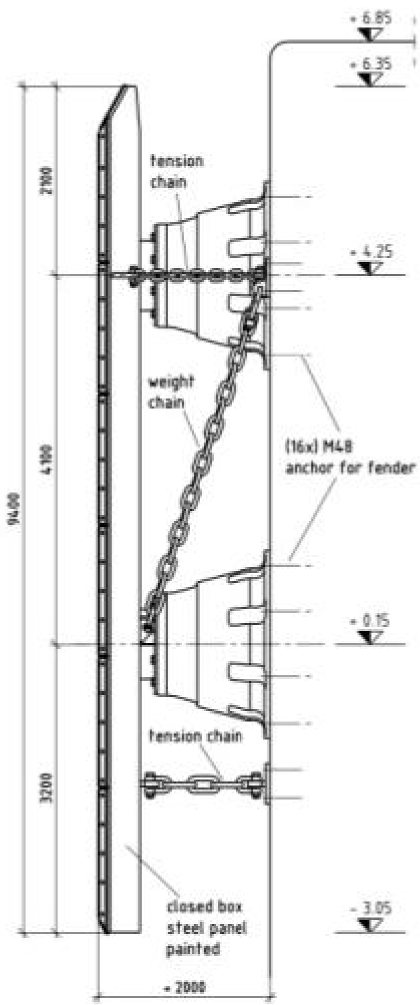
SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT



<u>Selected Fender</u>

2 nos. SPC-1300H G2.3

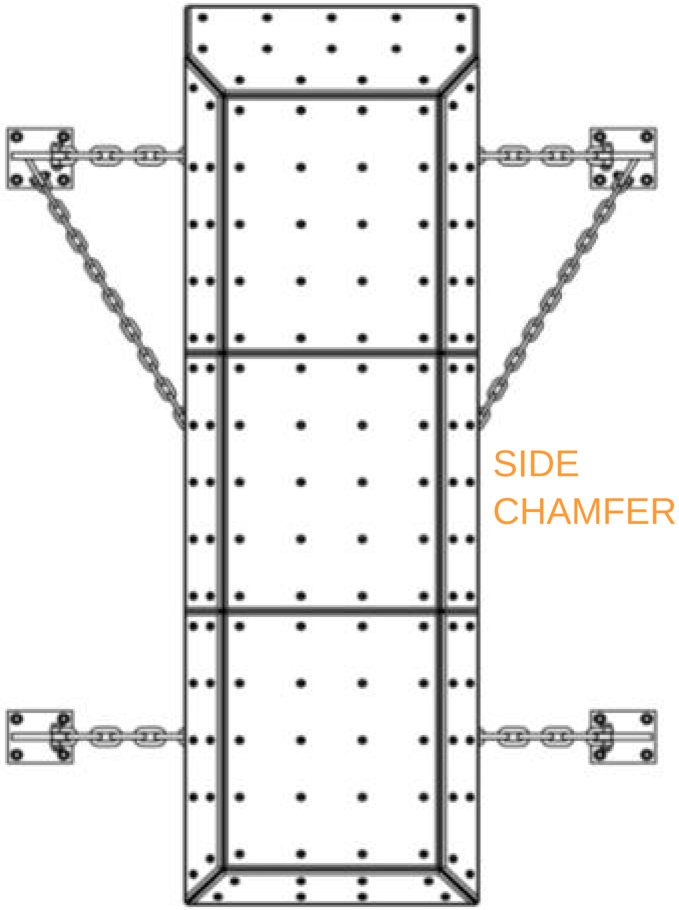
E = 1168 kNm * 2 = <u>2336 kNm (> 2281)</u>

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

SECOND STEP – DESIGN

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

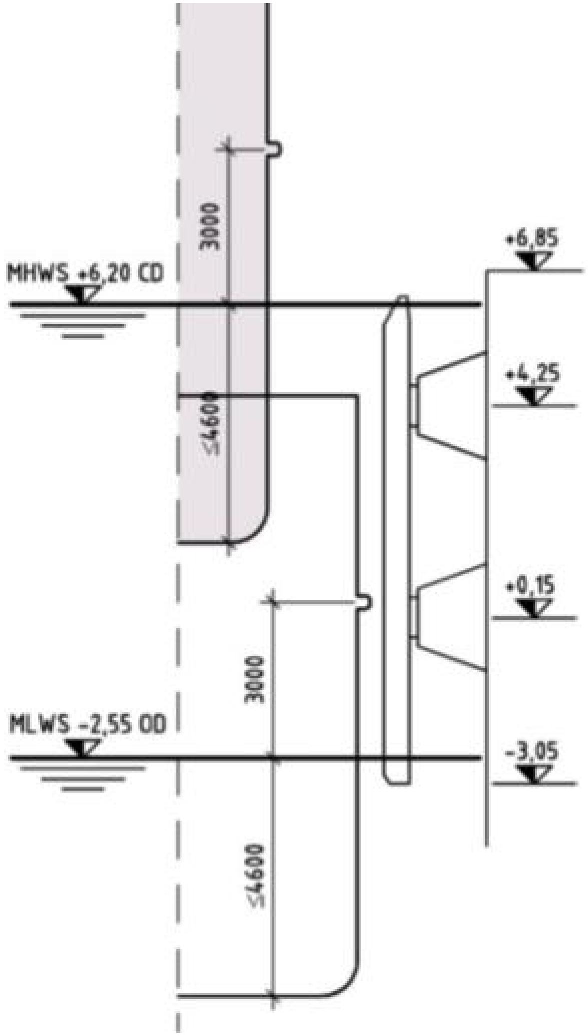
Why chamfers?



SECOND STEP – DESIGN

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

Why chamfers?



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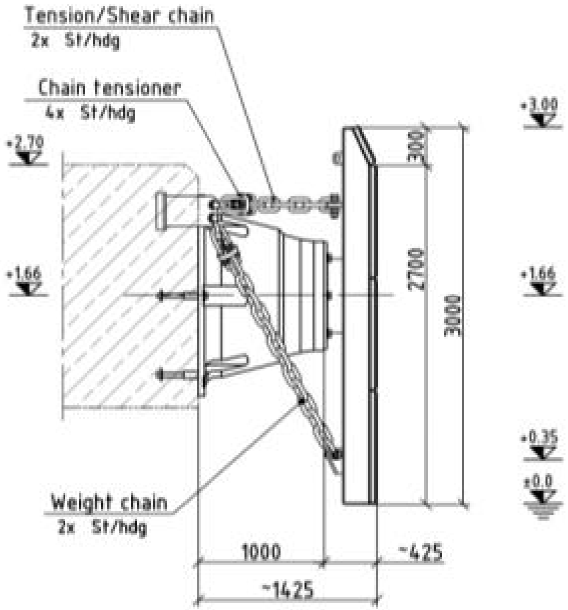
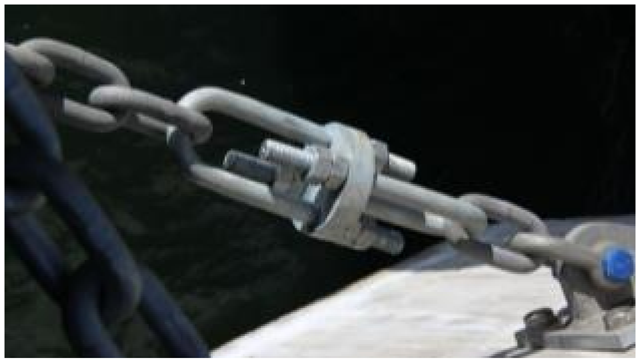
SECOND STEP – DESIGN
➢ SELECTION OF ACCESSORIES



Chain and shackle assembly

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

=> Make sure you consider angles



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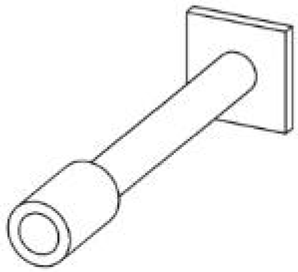
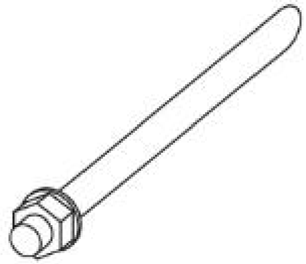
SECOND STEP – DESIGN

➢ SELECTION OF ACCESSORIES

Anchors





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

Chain fixation

- U-anchors
- Brackets

SECOND STEP – DESIGN

➢ SELECTION OF ACCESSORIES

<u>UHMW-PE Low Friction Plates</u>

- Reclaimed (FQ Material, multicolour)
- Virgin material

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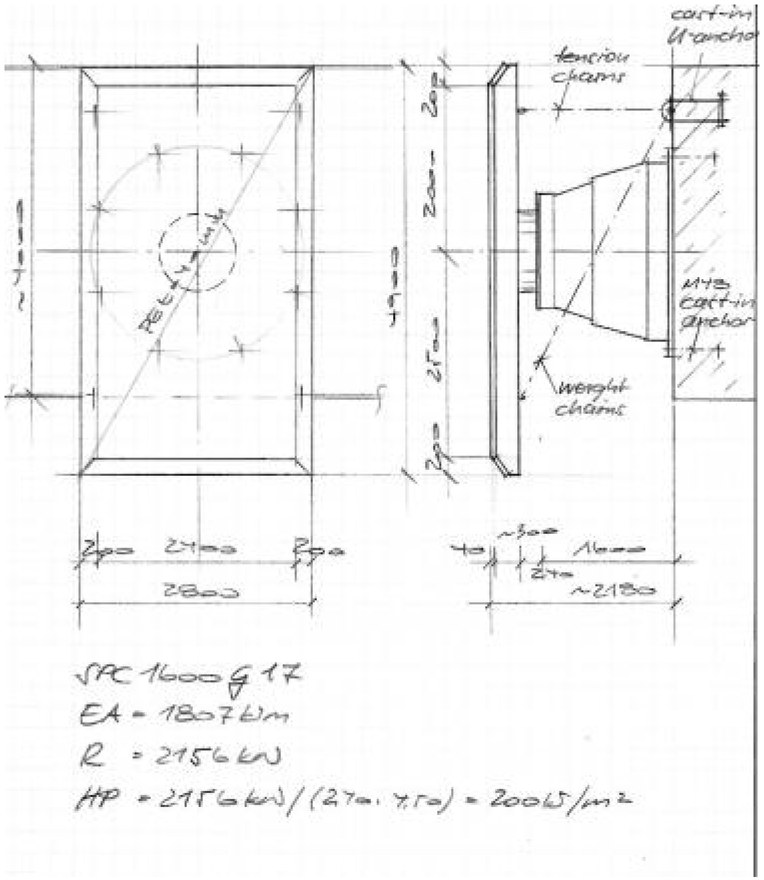
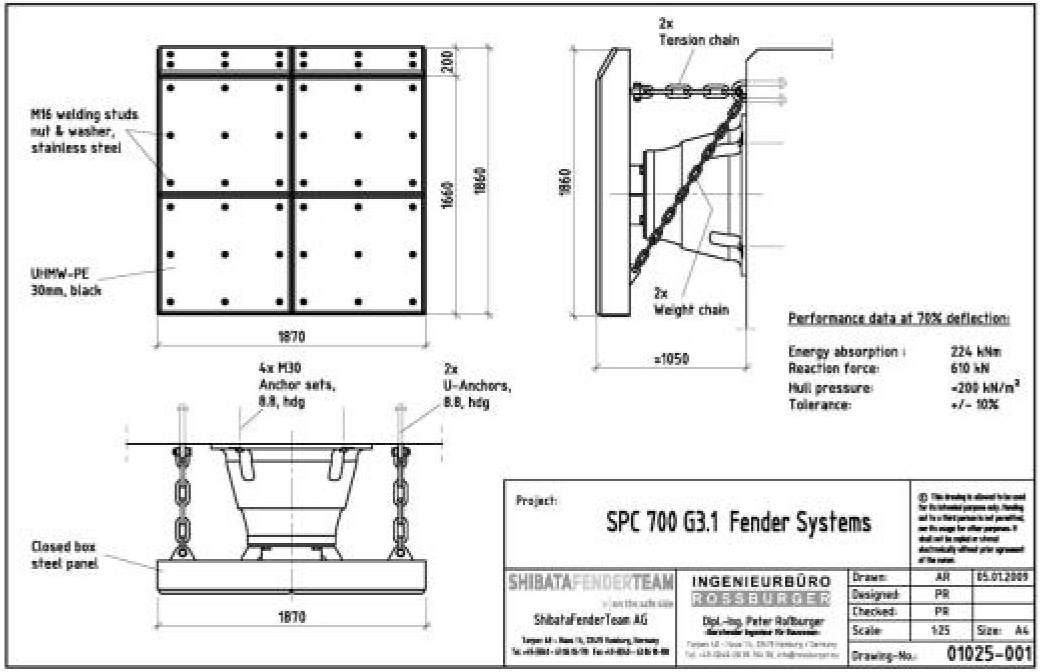
SECOND STEP – DESIGN

➢ PREPARATION AND SUBMISSION OF SKETCHES/ DRAWINGS





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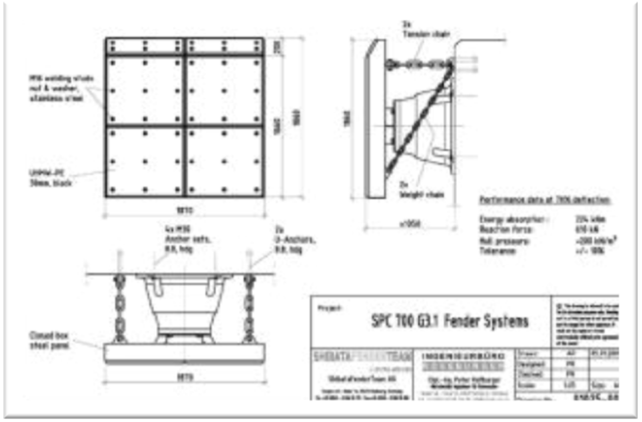
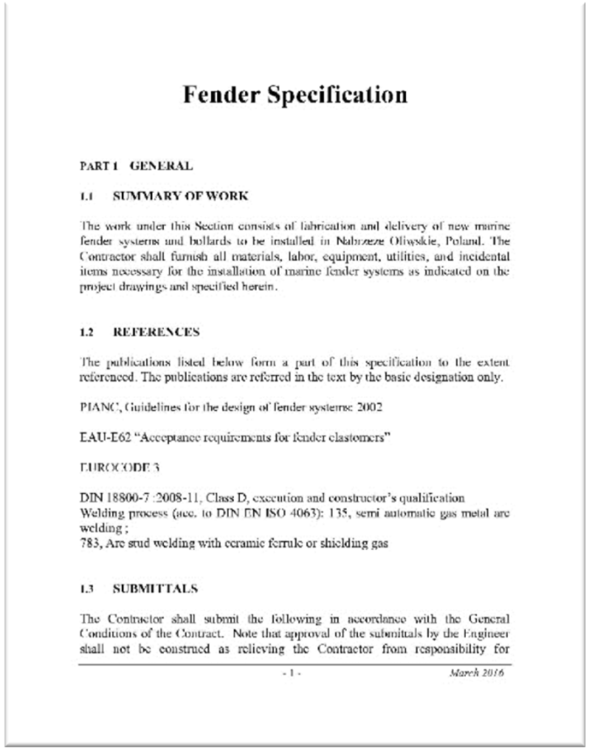
THIRD STEP – FINALISATION

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





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*

THIRD STEP – FINALISATION

The final steps in preparing a high performance fender design:

<u>Additional requirements to allow only highly qualified bidders to participate</u>

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

REFERENCE PROJECTS

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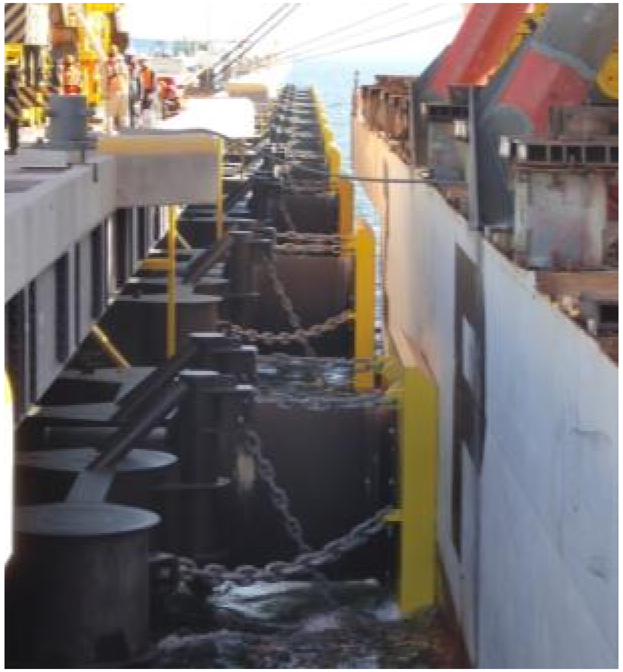
SPC/CSS-Fender System for Bulk Jetty - Sohar, Oman



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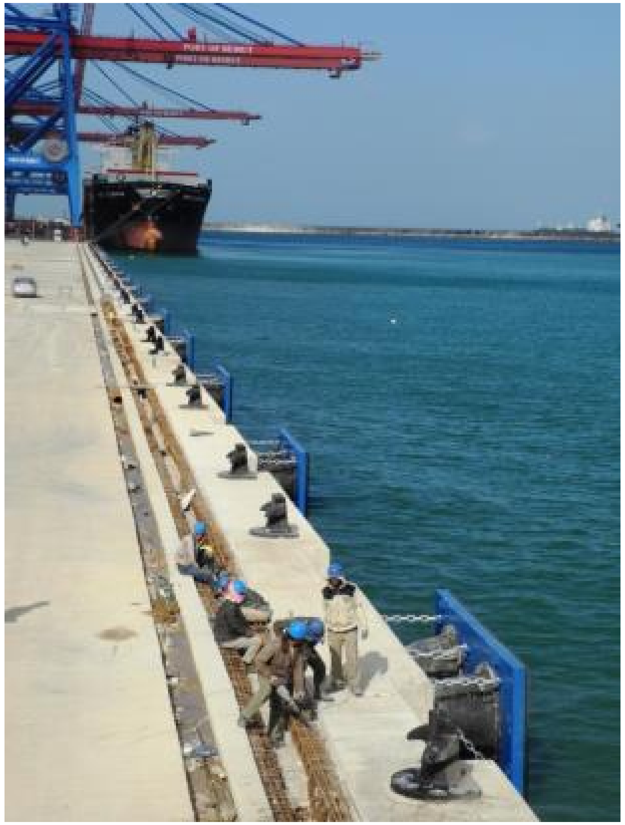
Double SPC System for Container Terminal – Port of Beirut, Lebanon



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

- **FE-Element Fender System with Belt Deflectors – Port of Sochi, Russia**

Parallel Motion Fender System for Oil Terminal - Labuan, Malaysia

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➢ Parallel Motion Fender System for Ferry Terminal – Hirtshals, Denmark

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

- **Cylindrical Fender System for Burchardkai LP2 – Hamburg, Germany**

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

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Thank you for your attention!

For more information visit us on

www.shibata-fender.team