SHIBATAFENDERTEAM

on the safe side

SHIBATAFENDERTEAM GROUP

GERMANY | FRANCE | AMERICAS | ASIA

Technical Presentation - 14th ASEAN Ports&Shipping 2016

Presented by: Y. Agari

CONTENT

SHIBATAFENDERTEAM

on the safe side

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

SHIBATAFENDERTEAM

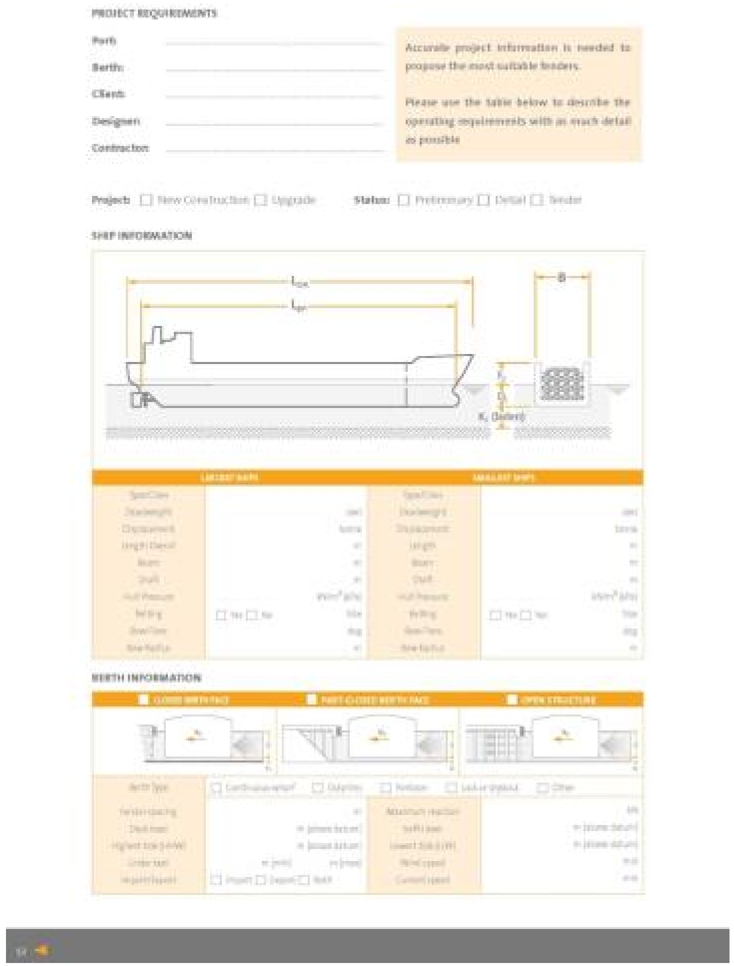
on the safe side

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

SHIBATAFENDERTEAM

on the safe side

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:

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

BERTH INFORMATION

CLOSED BERTH FACE | PART-CLOSED BERTH FACE | OPEN STRUCTURE

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

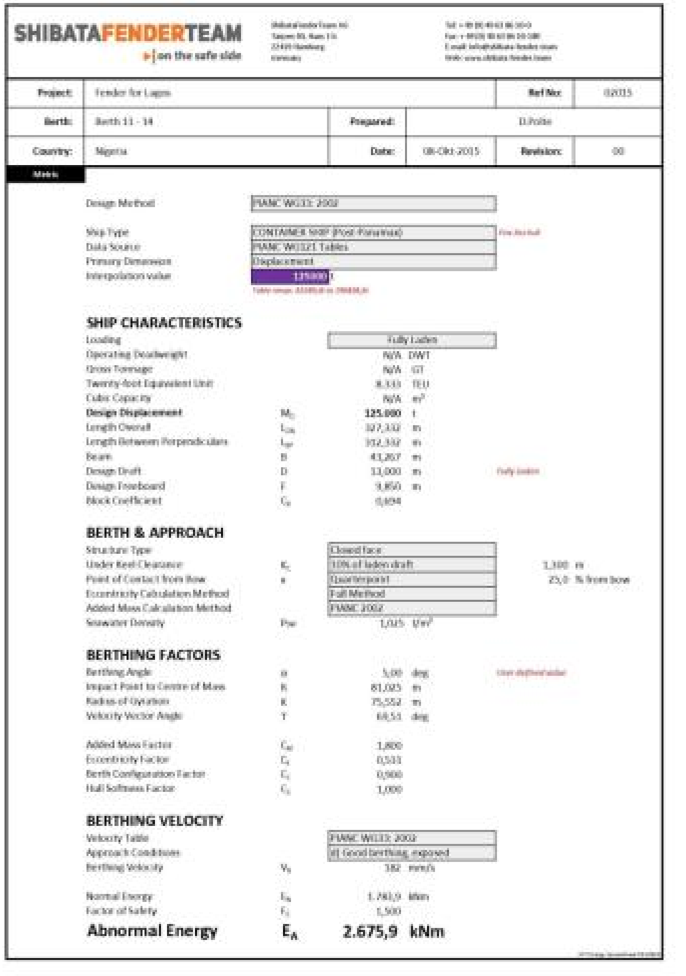
SECOND STEP – DESIGN

➢ PREPARE ENERGY CALCULATIONS

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

➡ **Berthing velocity**

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



SHIBATAFENDERTEAM ▶| on the safe side

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	m^3
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/m^3

BERTHING FACTORS

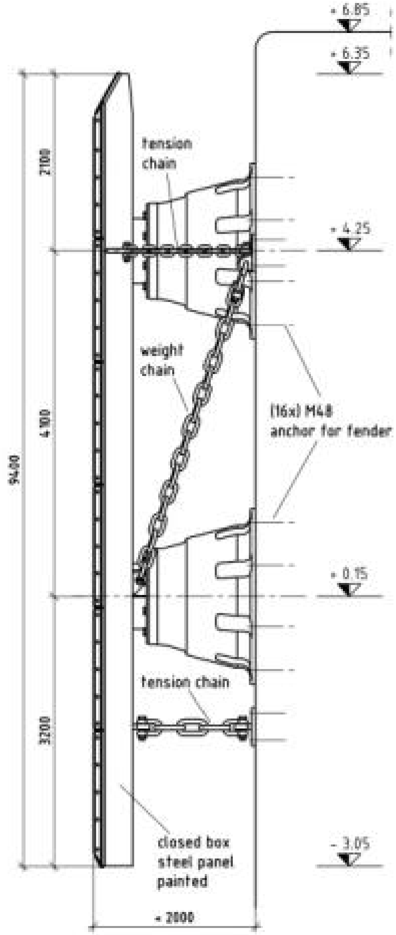
Berthing Angle	α	5,00	deg
Impact Point to Centre of Mass	R	81,025	m
Radius of Gyration	K	75,552	m
Velocity Vector Angle	γ	68,51	deg
Added Mass Factor	C_M	1,800	
Eccentricity Factor	C_E	0,533	
Berth Configuration Factor	C_C	0,900	
Hull Softness Factor	C_S	1,000	

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**

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








SHIBATAFENDERTEAM
on the safe side

SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT

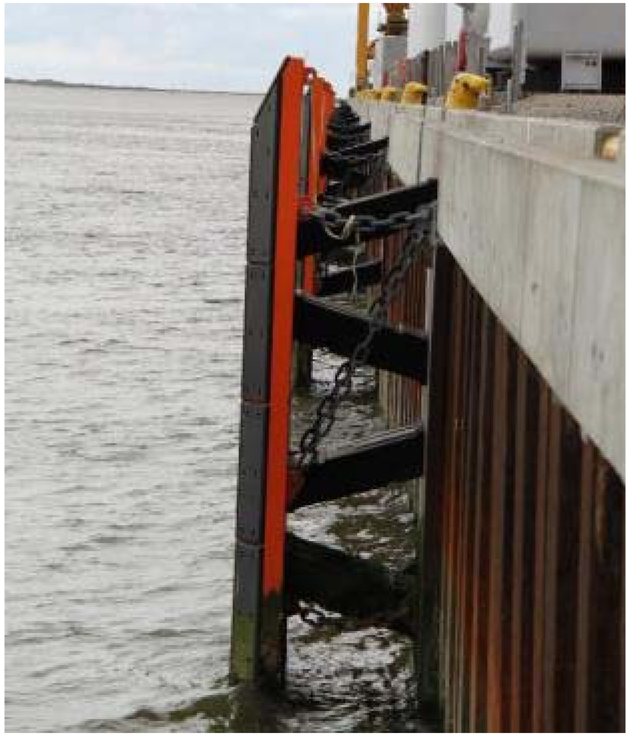
SPC Cone Fender

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

SHIBATAFENDERTEAM
on the safe side

SECOND STEP – DESIGN

➢ SELECTION OF THE FENDER UNIT

Ocean Guard

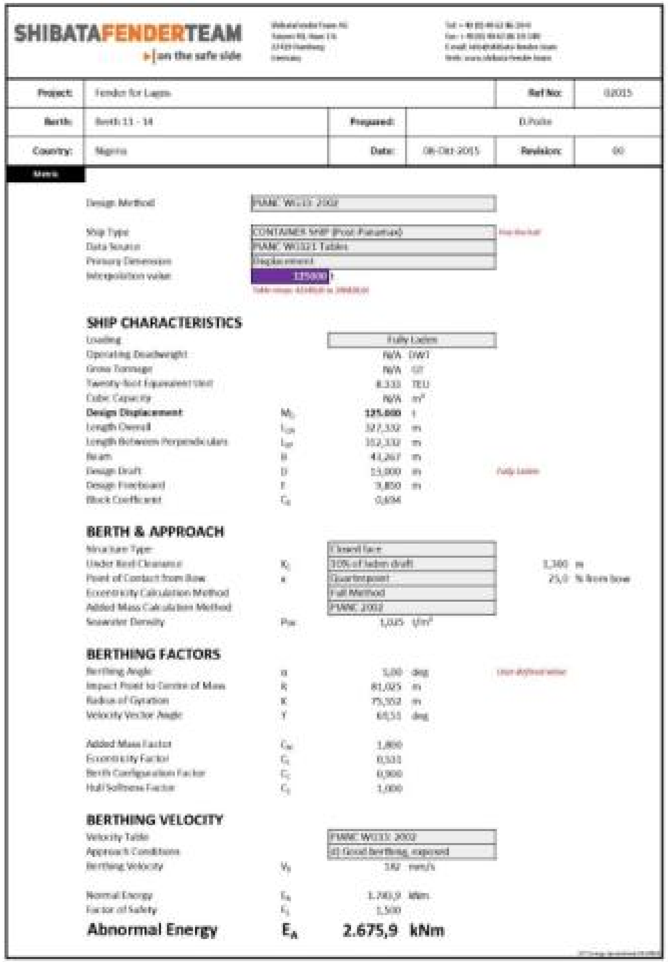
Ocean Cushion

SHIBATAFENDERTEAM

on the safe side

SECOND STEP – DESIGN

- SELECTION OF THE RUBBER FENDER UNIT



SHIBATAFENDERTEAM

on the safe side

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
Design Freeboard	F	3,850	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	60,51	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**

Design Criteria

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

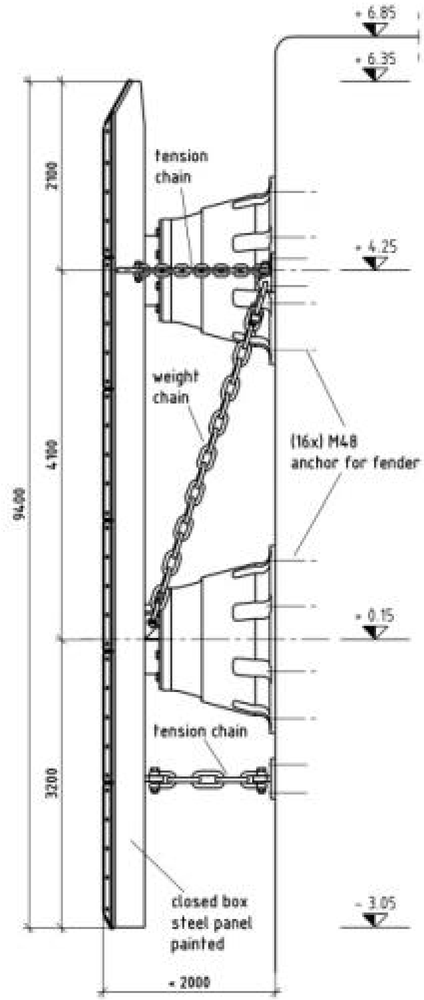
=> Tolerance and correction factor to be discussed

SHIBATAFENDERTEAM

on the safe side

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>

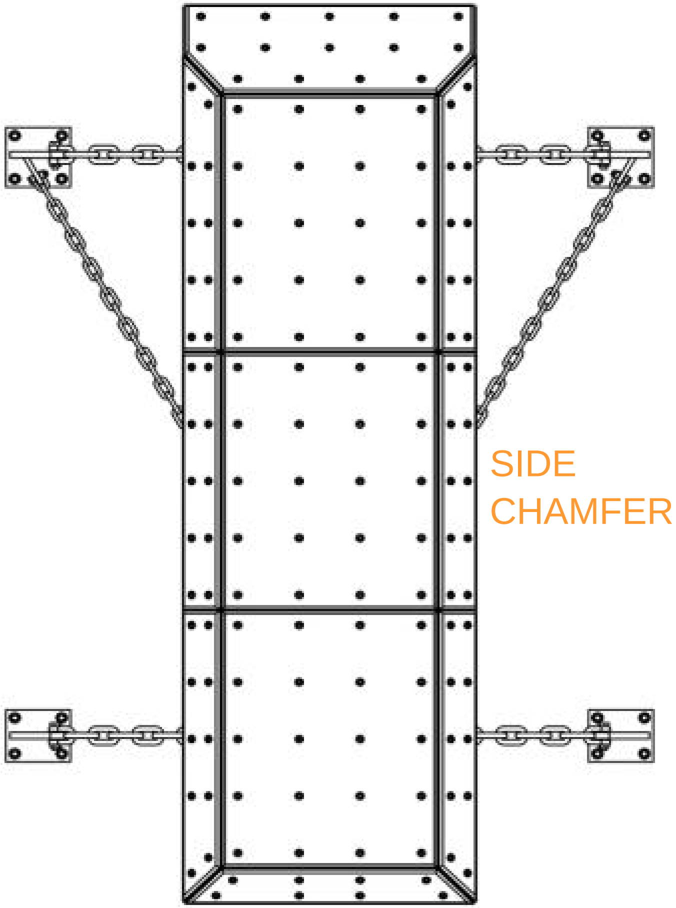
R = 1705 kN * 2 = <u>3410 kN (< 3500)</u>

SHIBATAFENDERTEAM
on the safe side

SECOND STEP – DESIGN

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

Why chamfers?



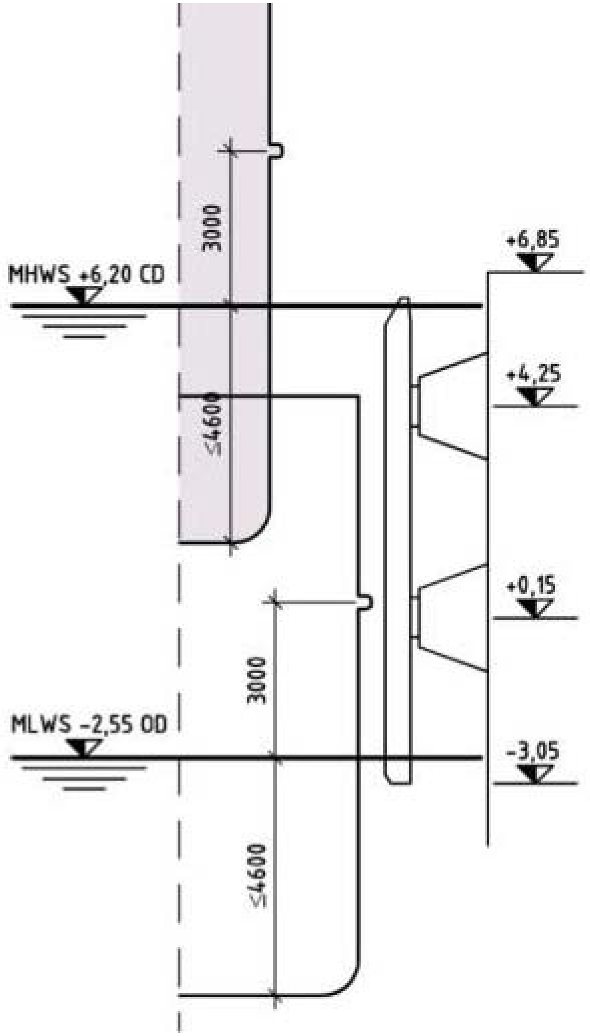
SHIBATAFENDERTEAM

on the safe side

SECOND STEP – DESIGN

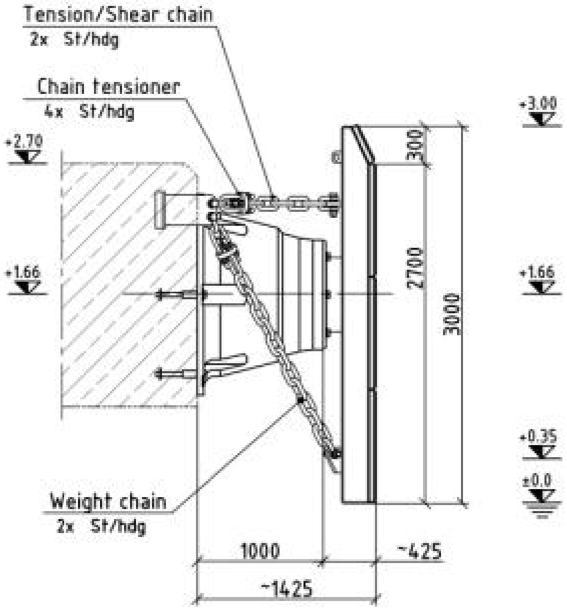
- **PRELIMINARY DESIGN OF THE STEEL FENDER PANEL**

Why chamfers?



SECOND STEP – DESIGN

➢ SELECTION OF ACCESSORIES



<u>Chain and shackle assembly</u>

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

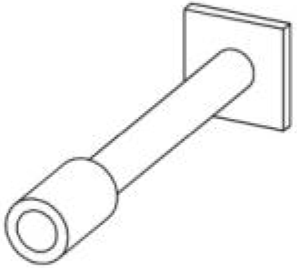
=> Make sure you consider angles

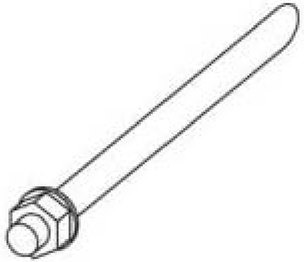
SECOND STEP – DESIGN

➢ SELECTION OF ACCESSORIES

Anchors

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





Chain fixation

- U-anchors
- Brackets

SHIBATAFENDERTEAM

on the safe side

SECOND STEP – DESIGN

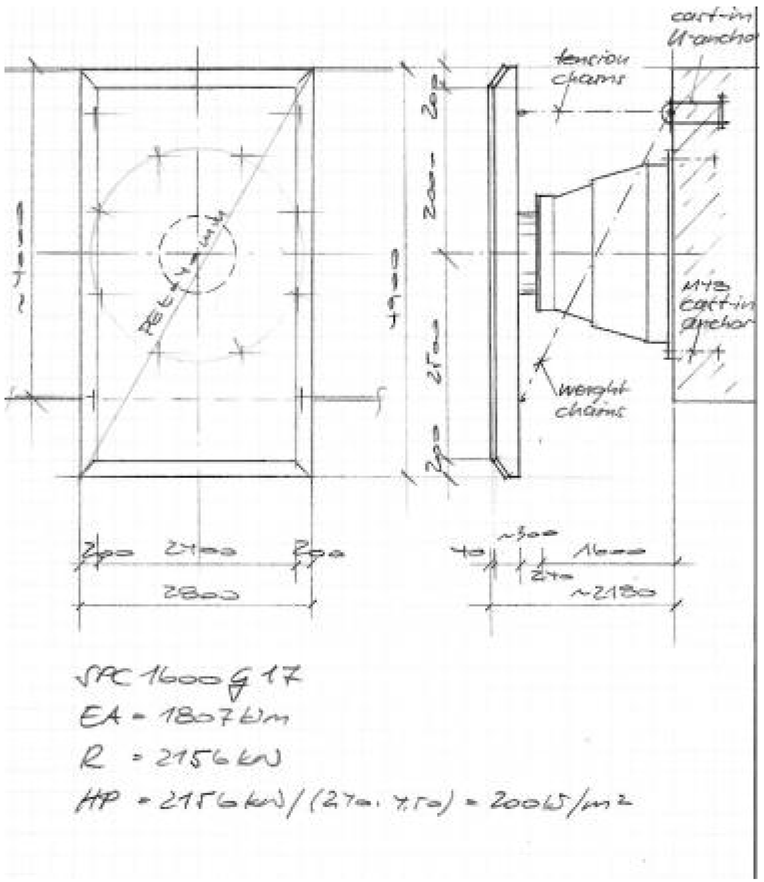
➢ SELECTION OF ACCESSORIES

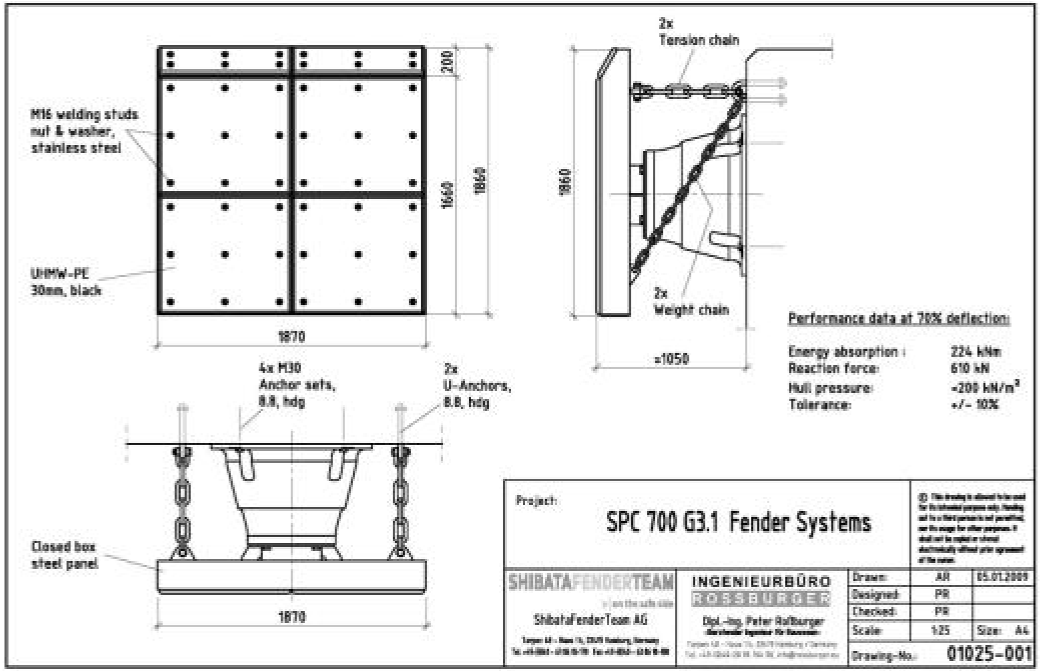
<u>UHMW-PE Low Friction Plates</u>

- Reclaimed (FQ Material, multicolour)
- Virgin material

SECOND STEP – DESIGN

➢ PREPARATION AND SUBMISSION OF SKETCHES/ DRAWINGS



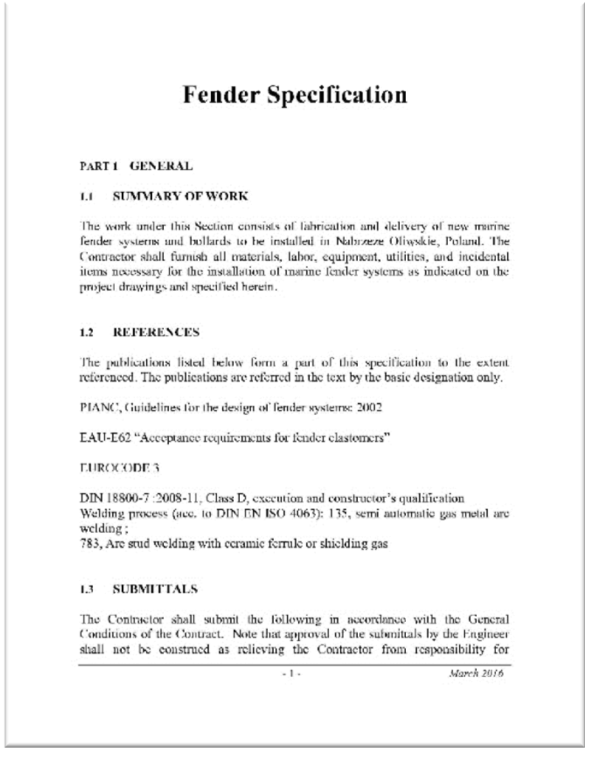


SHIBATAFENDERTEAM
on the safe side

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"

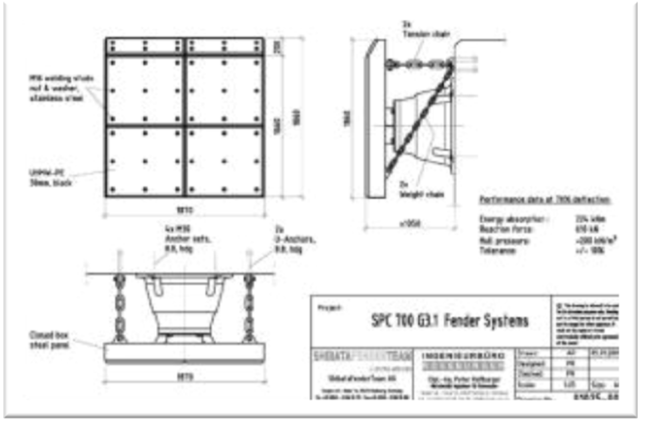
EUROCODE 3

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:

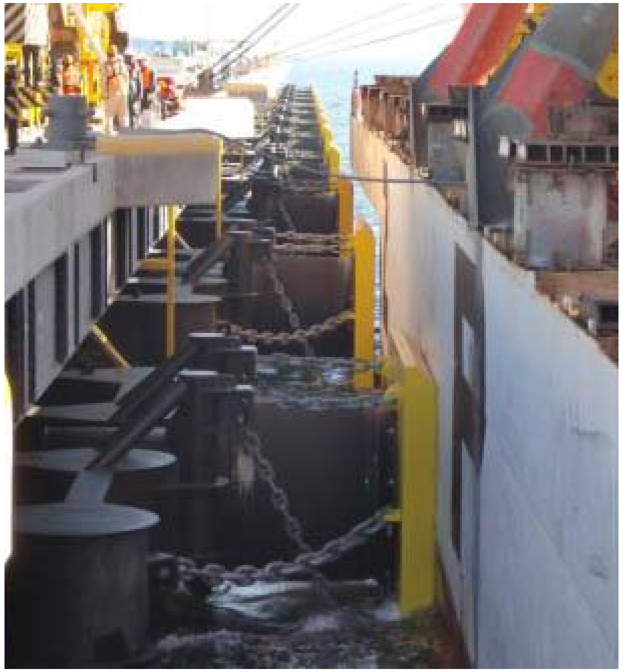
Additional requirements to allow only highly qualified bidders to participate

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

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

SHIBATAFENDERTEAM

on the safe side

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

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

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

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

SHIBATAFENDERTEAM

on the safe side

➢ PM Fender systems for Oil Terminal - Labuan, Malaysia

SHIBATAFENDERTEAM
on the safe side

➢ PM Fender systems for Ferry Terminal – Hirtshals, Denmark

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

SHIBATAFENDERTEAM

on the safe side

- **Cylindrical Fenders for Burchardkai LP2 – Hamburg, Germany**

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

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

SHIBATAFENDERTEAM
on the safe side

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

SHIBATAFENDERTEAM

on the safe side

Thank you for your attention!

For more information visit us at

www.shibata-fender.team