

MEMO

Project: LONGYEARBYEN JETTY
UPGRADING FENDERS

Subject: **FENDER SPECIFICATIONS**

Date: 12.11.2012

To: Fender Contractors

From: OLH/RiK

Copy to: Kjetil Bråthen(Port Longyearbyen)

1. Introduction

These Specifications are for the upgrading of Bykaia in Longyearbyen, Svalbard; new fenders for the Bykaia.

The Company shall approve any deviation from the Specifications.

Where Standards, Codes, other Specifications etc. are referred to, the latest issue/revision shall be used. In case that any such documents referred to in this Specification has been replaced, the new documents shall be deemed to be valid for.

2. Scope

These Specifications cover the design, manufacturing, delivery and installation of special fenders ref drawing (711485-100) at the Bykaia for use by:

- Cruise ships with length up to 300m during summer season.
- Large variation of freighters, fishing boats, etc.

3. REFERENCES, CODES AND STANDARDS

The latest versions of the publications listed below are to be considered applicable to the Work:

- NS-EN 1990 Eurocode – Bases of structural design
- NS-EN 1991 Eurocode 1 – Action on structures
- NS-EN 1992 Eurocode 2 Concrete structures
- NS-EN 1993 Eurocode 3 Steel structures
- NS 3479 Design loads for structures (for loads not given in NS3491)
- BS 6349 Maritime structures – Part 1: Code of practice for general criteria
- BS 6349 Maritime structures – Part 4: Code of practice for design of fendering and mooring systems
- PIANC Guidelines for the Design of Fenders Systems: 2002, including Appendices

4. DESIGN BASIS

Table A: Definition of tidal references and jetty elevations according to "Tidevannstabeller 2012" for Longyearbyen, (Norges Kartverk).

	Relative to "Sea map"- zero (Chart Datum ref.) (m)
Elevation of the main front of the Product Jetty	Approx.4.05
Highest astronomical tide (HAT)	2.12
Mean high water (MHW)	1.57
Mean sea level (MSL)	1.05
Mean low water (MLW)	0.53
Lowest astronomical tide (LAT)	0
Minimum water depth at the jetty	9

The Jetty is built of sheet pile cells, with a concrete capping beam on top. The main front of the Jetty is 84,4m long, and has 2 secondary fronts that each is 16m. Reference is made to the as-built drawings:

- 4254-310 Cellespункkai-Oversiktstegning
- 4254-315 Cellespункkai-Plan og Oppriss
- 4254-316 Cellespункkai-Detaljer
- 4254-316 Cellespункkai-Detaljer 2
- 4254-321 Fendring for småbåter-Plan, Snitt og Oppriss

The design vessels for the Jetty are:

Table B. Design vessel for the main front

	Maximum / Minimum sizes		
	LOA(m)	Front	Design criteria
Cruise ship (max)	300	Main Front	Only in summer season
General cargo ships	50-130	Main Front	all-year-round
Fishing boat (min)	40	Main Front	all-year-round

The season for cruise ships is the months June to August. The cruise ships will use the jetty when the weather condition is suitable. A period in the winter, the Adventfjord maybe is frozen with ice with thickness up to 1.5m. Biggest ships outside summer season are freighter and fishing boats. These ships visit the Jetty all-year-round in all weather, when Adventfjorden is not frozen. Fenders must be suitable for the local climate and environments forces that occur at the jetty.

Special fenders must be compatible with the remaining fenders on the jetty. Concrete edges on the jetty must be protected, ref drawing 711485-100. Special fenders must together with the other fenders establish a fender system that is suitable for all calling ships.

The fender environmental design temperature is between -45° to +20°C.

The design life for all jetty equipment shall be 25 years.

The light UV-index at Spitsbergen must be taken into consideration at design of fenders.

5. FENDER PERFORMANCE

5.1 General

The fender systems shall be supplied by a reputable manufacturer able to demonstrate a satisfactory supply record over a number of years for the type of fender being offered, to have experience with fenders placed at similar environmental conditions, and have a record of successful applications. Both fenders shall have the same size and capacities for deflections, energy absorptions and impact forces. The fender system shall include the following main items and design principle:

- Energy absorbing rubber elements to be fitted to the existing concrete front beams at the jetty.
- The fenders shall have a rigid structural steel frame to evenly distribute forces between the rubber elements and the ships' hull.
- The fenders shall be equipped with replaceable low-friction panels facing the vessels' hulls.
- Other structural elements to secure the performance of the fenders in the described environmental conditions and to transfer longitudinal and vertical forces on the fender panels to the jettyhead. Special designed steel items for fixing the fenders to the jetty shall be included.

The front panels shall have an inclined upper and lower end. All low-frictions panels shall be bolted to the steel frame, and the edge panels shall be chamfered. The overall design of the fenders shall include service life assessment and ensure easy maintenance and replacement of the single elements. Furthermore, the fender structures and chains shall be designed in such a way that mooring lines will not be hooked up on obstacles during the departure/emergency departure of any ships.

The fender system shall be designed and manufactured to have the specified capacities at the design temperatures and the fenders shall perform within the specified temperature range and weather conditions that will occur at the jetty. The fender specifications shall include performance curves for the maximum, minimum and design temperatures.

The fender system (rubber fender units, steel front panel/frames with replaceable fender panels and chains) shall be designed and manufactured to withstand regular use of steam for ice clearing during winter.

The fender structures and chains shall be designed to withstand all forces including friction forces that may occur while vessels are moving in contact with the fender front.

5.2 Materials

5.2.1 Rubber Fender Units

Rubber fender units shall be compression moulded from natural and/or synthetic rubber compounds in compliance with PIANC: "Guidelines for the Design of Fenders Systems: 2002", Appendix A "Procedure to Determine and Report the Performance of Marine Fenders, Section 7.3."

The rubber shall be fully vulcanized and homogeneous with no foreign particles, and free from voids, cracks and cuts. Steel plates shall be hot dip galvanized and shall be fully embedded and fully adhered to the rubber during the vulcanization process to avoid separation between the rubber and steel.

Each rubber fender unit shall be full-size tested in accordance with PIANC: “Guidelines for the Design of Fenders Systems: 2002”, Appendix A “Procedure to Determine and Report the Performance of Marine Fenders”.

5.2.2 Steel Materials

The steel panels shall be structured with suitable stiffening members. It shall be appropriately designed to resist the reaction forces imposed by fender and its supporting chains, and keep in equilibrium with the vessel berthing force. Steel panels shall be fabricated structural mild steel conforming to the latest Eurocode, ASTM and JIS.

Steel for embedding into the concrete structure shall be stainless AISI 316L or equivalent. All other steel materials, except the fender frame, shall be hot dip galvanized.

Chains shall be designed with the shackles as weak links. Chain materials shall be in accordance with Eurocode, ASTM and JIS. The chains shall be furnished with durable low-friction sleeves to avoid hook-up and wear on mooring lines.

Protective treatment of the steel panel shall be coal tar epoxy.

5.2.3 Low Friction Plastic panels

Ultra High Molecular Weight Polyethylene (UHMW-PE) plastic panels shall be fitted on all the seaward sides of the steel fender frame.

The friction coefficient between steel and UHMW-PE shall be less than 0.2 throughout the service life of the fenders. The design shall include documentation on the service life friction coefficient of the fenders.

The UHMW-PE panels shall be black in colour.

6. QUALITY CONTROL/DELIVERY OF DOCUMENTATION

At the time of bidding Contractor shall supply the following information from the fender manufacturer:

- Drawings of the proposed fender system
- Documentation of compliance with this design specifications, and document the fender deflection, fender characteristics (both for compression and decompression), energy absorption, impact loads and shear loads.
- Quality certificate of ISO 9002 or equivalent.
- Supply history of the offered fenders with references.
- Product literature

Maximum three weeks after the manufacturer is chosen Contractor shall supply:

- Drawings of the chosen fender solution in digital format (CAD)

At the time of fender delivery Contractor shall supply:

- Testing reports with fender performance curves for deflection, fender characteristics (both for compression and decompression), energy absorption and impact loads for all fenders.
- Certificate of physical properties of rubber for all fenders, all in accordance with PIANC: "Guidelines for the Design of Fenders Systems: 2002", Appendix A "Procedure to Determine and Report the Performance of Marine Fenders".
- Mill certificates for steel panels, chains, bolts, shackles and cast-in parts in accordance with applied standards

At any time during manufacture and testing of the fenders Company shall be granted access to fender producer's premises for the purpose of inspecting production and/or testing.

Tromsø, 12.11.2012
MULTICONSULT AS

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