HYDRO-PNEUMATIC SUBMARINE FENDER SPECIFICATION

Scope: The Hydro-Pneumatic Submarine Fender to be furnished will be used for the protection of vessels and piers from damage when vessels are moored either ship-by-side or against piers and wharves and shall comply with the following requirements.

ITEMS 0001, 0002 & 0003:

The Hydro-Pneumatic Submarine Fenders shall be in accordance with International Organization for Standardization (ISO) Standard Number ISO 17357, 2002(E). Ordering Information in accordance with Clause 5 of ISO Standard 17357, 2002(E) is as follows:

Items 0001, 0002 & 0003:

- Diameter 3.3 meters x Length 10.6 meters
- Fender Type is not applicable
- Initial Internal Pressure is 0.5 Kgf/cm2
- Color is Black
- Safety Valve required
- Identification System is required
- Inspection/Evaluation by a major classification society is not required.

The Fender shall be deployed vertically. To maintain their position, the Fenders is water ballasted and also have a counter-weight attached to the bottom of the fender. The weight, shape and method of deployment of the counter-weight can be adjusted to suit individual situations. The Hydro-Pneumatic Submarine Rubber Fenders to be furnished under Items 0001, 0002 and 0003 shall be furnished with a Guy Chain, Hanging Chain, Upper & Lower End Fittings, Counterweights and in accordance with the requirements of ISO 17357, 2002 except as follows:

The Hydro-Pneumatic submarine fender body is to be constructed with an outer rubber layer, reinforcing cord layers and an inner rubber layer. All three layers are bonded together by a combination of heat and pressure over a period of time in a vulcanizing oven. Once completed, the fenders are to be pressure tested before release.

The outer rubber shall protect the cord layers and inner rubber from abrasion and other external forces. This rubber compound shall have sufficient tensile and tear resistance strength to withstand anticipated weather conditions and severe usage. This rubber shall satisfy the values specified in Table 3 of ISO 17357, 2002(E).

The inner rubber layer shall seal the air inside. This rubber shall satisfy the values specified in Table 3 of ISO 17357, 2002(E).

To provide maximum strength and safety, the outer skin of a submarine fender must be thicker than the normal surface fender. The outer rubber compound should be designed and manufactured to withstand both strenuous use and adverse weather Conditions whilst protecting the cord layers and inner rubber. The cord layers are to be arranged at optimum angles, designed to distribute load and stress evenly and the inner rubber compound should be designed to be completely airtight.

The Hydro-pneumatic Submarine Rubber Fender shall be designed to offer a minimum burst pressure of 5.7 kgf/cm^2

To facilitate water charge and discharge, flange openings are sited at the top end of each fender, in

addition to which, the Hydro-Pneumatic Submarine Fender is to be fitted with a safety valve to enable excess pressure to be released, should over compression occur.

The reinforcement synthetic cord layers shall be strong enough to hold the internal pressure. In both compressed and non-compressed situations, the fender's endurable pressure (i.e., the inner pressure when the fender bursts) shall be designed to maintain the pressure specified on Table 4 or 5 of ISO 17357, 2002(E).

NOTE: Reinforcement synthetic fabric layers may be used as replacement for the reinforcement synthetic cord layers if their fatigue resistance performance is proven to be equal to or superior than the reinforcement synthetic cord layers.

The Fender shall be equipped with an air valve for inflation, air pressure check and air-charge.

The contractor shall perform all the inspection and test requirements specified in Clauses 8 and 9 of ISO 17357.

ITEMS 0001, 0002 & 0003 HARDWARE:

The following shall be furnished with each Submarine Fender delivered under Items 0001, 0002 and 0003:

- Guy Chain: Galvanized guy chains shall be provided for attachment of the upper fender end filling assembly to the pier, wharf or tie-off location. That portion of the chain extending from the fender itself shall be covered with protective rubber sleeves to a point beyond which the fender will be contacted for fender body protection. The length of the Guy Chain should be 44mm long

- Hanging Chain: A galvanized hanging chain may be provided for attachment between the counterweight and the pier, wharf, or tie-off location. It should be strong enough to support the entire weight of the counterweight. The length of the hanging Chain should be 22mm long.

- Lower End Fitting Assembly: The lower end fitting assembly shall be fabricated of steel and shall provide connecting points for the connecting chain (30mm long) and auxiliary handling connections.

- Upper End Filling Assembly: The upper end fitting assembly shall be fabricated of steel and shall be designed to house all necessary valves and fittings to charge and discharge the fender body with air and water. This shall include the air charging assembly, the water charging assembly, the pressure safety relief valve assembly and lifting eyes adequately sized for guy chain attachment. All valves and related hardware shall be attached to the inner assembly plate. An outer assembly blind flange plate shall be included to provide protection during handling and operations. The pressure relief valve shall be manufactured from stainless steel, shall be set to relieve pressure at 177 kPa 42 psi—shall be adjustable to ensure maintenance of the proper setting, shall be capable of adequate flow rates (volume of air released per second) to maintain a safe internal pressure.

- Counterweight: A steel or cast iron counterweight shall be provided for attachment to the fender's lower flange assembly by the connecting chain (30mm long). It shall include an upper eye for shackle attachment of the hanging chain, eyes for attaching a hanging chain, and shall be coated with a marine epoxy coating system. The counter weight (in water) should we 5510kg.

PRESERVATION, PACKAGING, PACKING & MARKING REQUIREMENTS

The Fenders to be furnished shall be preserved, packaged and packed in accordance with the contractor's standard practice in a manner to prevent corrosion, deterioration, and damage and to insure arrival at destination in a satisfactory condition. All Fenders shall be marked in accordance with Clause 10 of ISO 17357.

ITEM 0004 (TECHNICAL DATA)

The Technical Data to be furnished under Item 0004 shall consist of the following and shall be provided with each Submarine Fender to be delivered:

The contractor shall provide a Maintenance Manual with each Submarine Fender to be furnished. The Maintenance Manual shall be in the format of a logbook, where details can be recorded of all maintenance and repairs carried out on the fender, including safety valves, from new to date. The contractor shall also supply handling, storage and packing recommendations for the Fender together with the Maintenance Manual. Refer to Sequence Number A001 of the DD Form 1423, Contract Data Requirements List.

The contractor shall submit a Certification as required by Clause 11 of ISO 17357 that the Fender delivered has been inspected and tested in accordance with ISO 17357 and provide an Inspection and Test Report detailing the results of all tests and inspections required by Clauses 8 and 9 of ISO 17357. Refer to Sequence Number A002 of the DD Form 1423, Contract Data Requirements List.

DELIVERY SCHEDULE

Item 0001 shall be delivered within 30 days after the date of award.

Item 0002 shall be delivered within 60 days after the date of award.

Delivery of the option quantities covered under Item 0003 shall be one each 30 days after exercise of the option and two each every thirty days thereafter until completion.

The Technical Data covered by Item 0004 shall be delivered concurrent with the deliveries of Items 0001, 0002 and 0003.

CONTRACT DATA REQUIREMENTS LIST

(2 Data Items)

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY
	A	TDP ____ TM ____ OTHER ____

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
HYDRO-PNEUMATIC SUBMARINE FENDER		

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A0001	CERTIFICATION & TEST REPORT	

17. PRICE GROUP

18. ESTIMATED TOTAL PRICE

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
ISO 17357, 2002(E)	ITEM 0004	NSWCCD-SSES Philadelphia

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10 FREQUENCY	12. DATE OF FIRST SUBMISSION
DD			With each Fender
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**

16. REMARKS

14. DISTRIBUTION

a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
15. TOTAL			

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A0001	MAINTENANCE MANUAL	

17. PRICE GROUP

18. ESTIMATED TOTAL PRICE

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING O FFICE
	ITEM 0004	NSWCCD-SSES Philadelphia

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10 FREQUENCY	12. DATE OF FIRST SUBMISSION
DD			With each Fender
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16. REMARKS

14. DISTRIBUTION

a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
15. TOTAL ^	0	1	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
Contract Manager **LOUIS J. DISTEFANO**	28 June 2004	Project Manager **LOUIS J. DISTEFANO**	28 June 2004

DD FORM 1423-2, AUG 96 (EG) PREVIOUS EDITION MAY BE USED

ATTACHMENT 2