



# GENERAL SPECIFICATIONS FOR LAMINATED RUBBER FENDERS

## 1.0 GENERAL

The laminated fender shall be made from recycled bus and/or truck tires. The rubber shall be free from any major imperfections that could be deemed to effect the overall fender performance.

The fender shall be of the (solid, SR3D-1 single loop SR3D-2 double loop, or SR3D-3 triple loop) construction.

## 2.0 PERFORMANCE

The proposed fender shall be capable of absorbing a minimum energy with a maximum reaction at the following design deflection:

### 2.1 Design Deflection ( ? %)

Minimum Energy Absorption = ? kips (?kNm)

Maximum Reaction = ? kips (?kN)

(Energy and Reaction values are based on ?)

## 3.0 MATERIALS

### 3.1 Rubber Properties

The resilient rubber material component of each fender shall be manufactured from recycled bus and truck tires (100% post-consumer waste) and cut to specific size and compressed onto steel supporting rods.

The performance of each fender shall comply with those physical properties noted and presented in the attached graphical tables.

The performance of the fender is expressed by the value of the energy absorbed during compression of the rubber test unit up to the designed deflection and the maximum value of the reaction load thus generated.

In the performance test of the fender, compression was applied toward the top face of the rubber test unit. The compression was repeated for three times up to the designed deflection. The average data obtained in the second and third tests reflect the performance values as shown.

All testing was conducted so as to comply with current PIANC requirements.

### 3.2 Steel Properties

All steel components of each fender shall comply with the requirements of ASTM A36.

### 3.3 Hardware

All steel components which constitute an integral part of each fender shall be (black, hot dip galvanized as per ASTM A153).

All hardware for mounting the fender (if required) to the concrete, steel, or wood fascia as per the attached fender system drawing shall be included. All mounting hardware (if required) shall be (black, hot dip galvanized as per ASTM A153).

Concrete embedments (if required) shall utilize 316 SS female couplings and an A307 galvanized hex head. Assuming 4000 psi concrete, the pull out strength shall be 1.25 times the yield strength of the male thread.

Bolts (if required) shall be A307 galvanized, nuts (if required) shall be A563, grade A heavy hex, galvanized. Washers (if required) shall be standard ANSI B18.22.1 carbon steel galvanized.

## 4.0 PERFORMANCE VERIFICATION

The performance of the fender is expressed by the value of the energy absorbed during compression of the fender up to the designed deflection and the maximum value of the reaction load thus generated.

In the performance test of the fender, compression shall be applied toward the top face of the fender. The compression is to be repeated for three times up to the designed deflection. The average data obtained in the second and third tests shall be the performance values. The average value shall be more than the designed performance value for the energy absorption and less than the designed performance value for the maximum reaction load. All testing shall comply with current PIANC requirements.

10% random sampling performance testing must be carried out and witnessed or conducted by a 3<sup>rd</sup> party inspection company prior to the delivery of the fenders. Vendor must include these costs within bid proposal.

## 5.0 PACKAGING

The rubber fenders shall be packaged in a manner that will prevent damage to the fenders.

## 6.0 SUBMITTALS (As required per project)

### 6.1 Bid

Items to be included with the bid proposal shall include at a minimum the following items:

1. Price for supply of required quantity of fender systems including all items required to complete and mount the system.
2. Catalog cut sheets and CAD sketches of proposed fenders.
3. Factory test reports conducted within the last 3 years that have 3<sup>rd</sup> party inspection certification. The testing procedures to generate the test reports shall comply with current PIANC requirements.

### 6.2 Award

Items to be provided upon award of the project shall include at a minimum the following items:

1. Final revisions of all drawings submitted for bid proposal.
2. Engineering calculations justifying the proposed design.
3. Detailed CAD construction/fabrication drawings.
4. A bill of materials drawing showing the general arrangement of the fender system and noting all included hardware with quantities.
5. A CAD drawing of the proposed fender.
6. Certificate of conformance for the following:
  - a. nuts, bolts, and embedments
  - b. galvanizing
  - c. steel components
  - d. rubber components
7. Factory test reports per item #3.

### 6.3 Delivery

Items to be provided upon delivery of the fender systems shall include at a minimum the following items:

1. Test certificates for the rubber material properties as required in section 3.0 of this specification.
2. Performance test certificates for fender performance as required in section 4.0 of this specification. 10% random sampling performance testing must be carried out and witnessed or conducted by 3<sup>rd</sup> party inspection company prior to delivery of fenders. Vendor must include these costs within bid proposal. The project engineer is to verify prior to acceptance of shipment.
3. Final set of all material certificates and as-built CAD drawings.

(SPECIFICATIONS AVAILABLE AS A WORD DOCUMENT)

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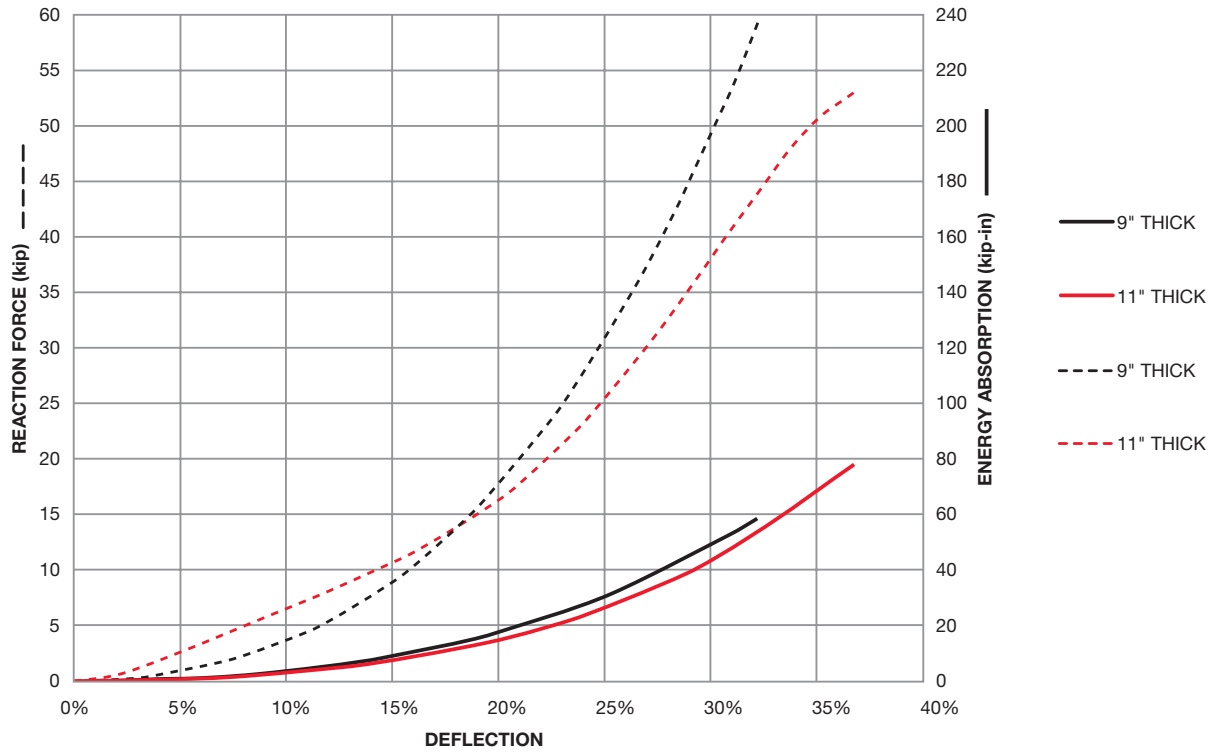
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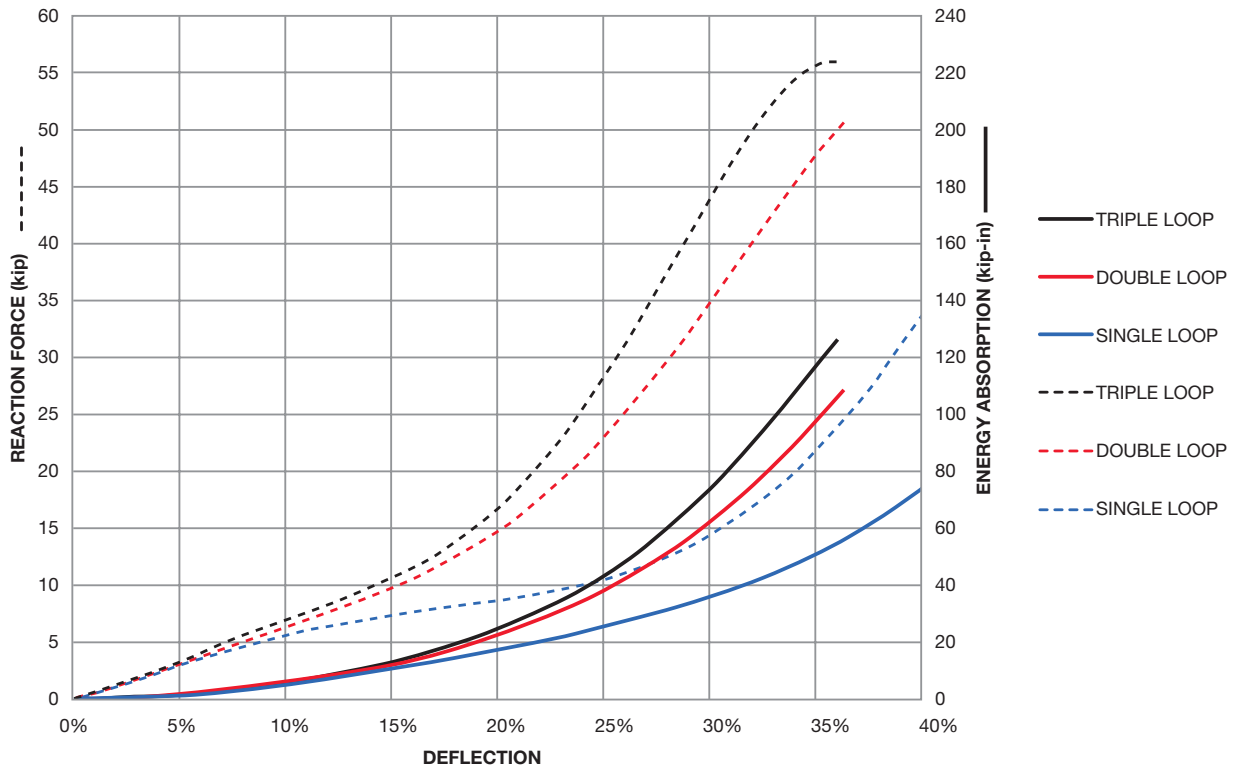


**SOLID FENDERS ( /ft<sup>2</sup> )**



**SR3D™ RADIAL FENDERS ( /ft<sup>2</sup> )**

6" Loop with 11" Solid Base



\* The SR3D™ design is patent protected (Patent Number: 5,957,073)

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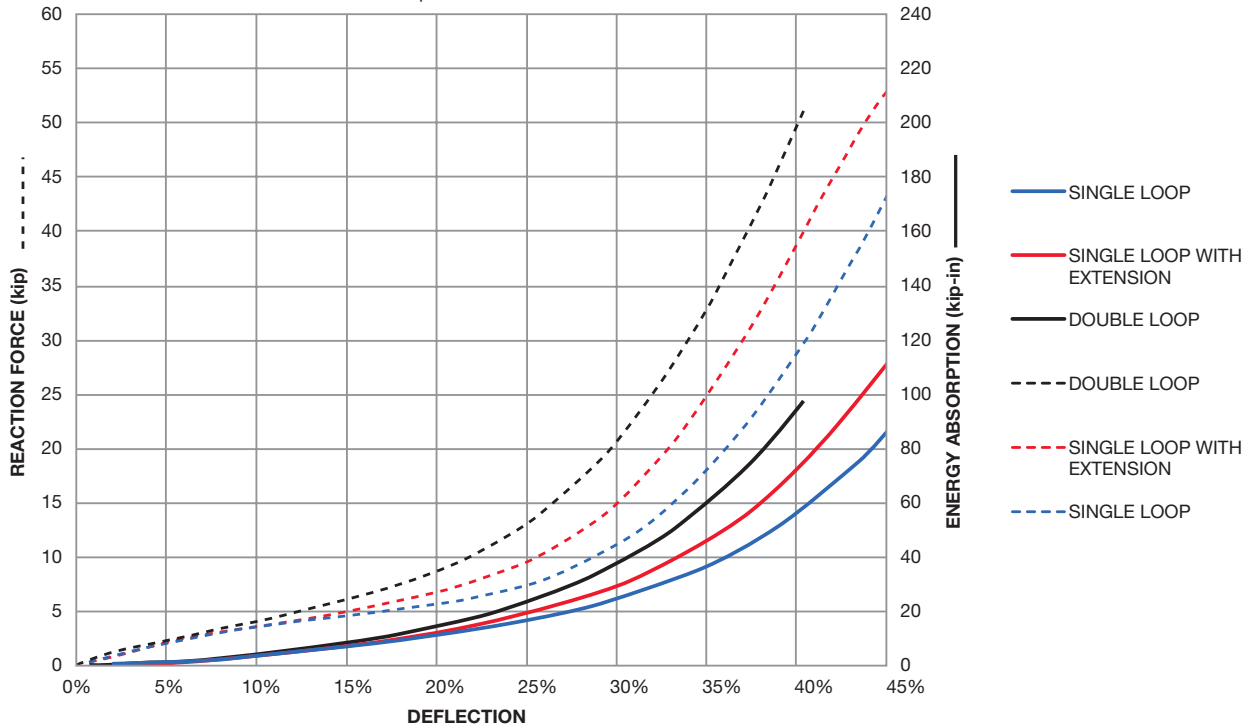
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### SR3D™ BIAS FENDERS (/ft<sup>2</sup>)

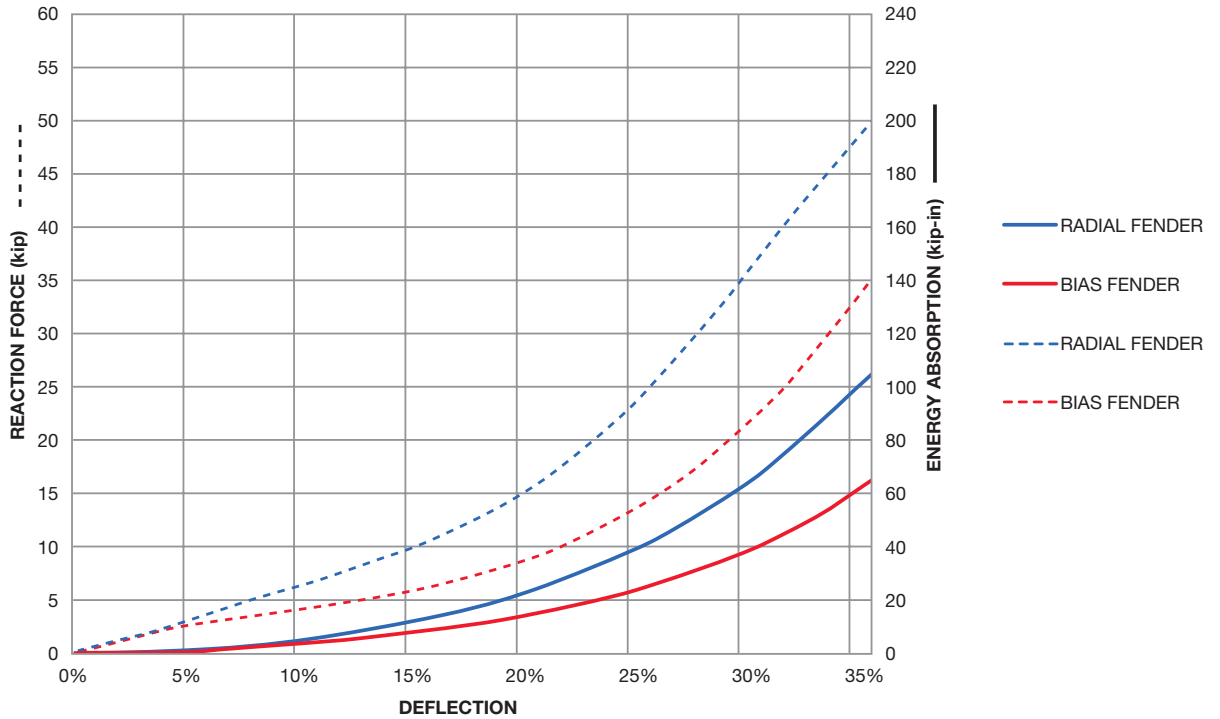
6" Loop with 11" Solid Base



\* The SR3D™ design is patent protected (Patent Number: 5,957,073)

### SR3D™ DOUBLE LOOP RADIAL VS BIAS COMPARISON (/ft<sup>2</sup>)

6" Loop with 11" Solid Base



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