

## PERFORMANCE TESTING

Testing moulded<sup>1</sup> and wrapped cylindrical<sup>2</sup> fenders is carried in-house, with the option of third party witnessing, using full size fenders in accordance with the PIANC<sup>3</sup> guidelines below.

- ▶ All fender units do have a unique serial number which can be traced back to manufacturing and testing records.
- ▶ Fenders are tested under direct (vertical) compression.
- ▶ Compression speed is 2 ~ 8 cm/min.
- ▶ Test temperature is 23° C ± 5° C<sup>4</sup>.
- ▶ Reaction force<sup>5</sup> is recorded at intervals to at least a deflection at which the permitted<sup>6</sup> minimum energy absorption is achieved.
- ▶ Energy absorption<sup>5</sup> is determined as the integral of reaction and deflection, calculated using Simpson's Rule.
- ▶ The fender shall be compressed 3 times up to rated deflection following a recovery period of at least one hour.
- ▶ Actual performance values are recorded from 4th compression.
- ▶ Compression shall be stopped once either rated deflection and/or 110% of rated reaction has been reached, whatever comes first.
- ▶ Sampling is 10 % of fenders (rounded up to a unit).<sup>6</sup>
- ▶ If any sample does not satisfy the specifications, sampling of the remainder is increased to 20 % of fenders (rounded up to a unit), excluding non-compliant units.
- ▶ If any further sample does not satisfy the specifications, 100 % of remaining samples will be tested. Only units which satisfy the specifications shall be passed for shipment. The non-compliant fenders will be rejected.

<sup>1</sup> Moulded Fenders include SPC, CSS, FE, SX, SX-P and SH Fenders. SPC, CSS, SX, SX-P and SH Fenders are tested singly, FE Fenders are tested in pairs.

<sup>2</sup> Excluding Tug Cylindrical Fenders.

<sup>3</sup> PIANC – Permanent International Association of Navigation Congress Report for the International Commission for Improving the Design of Fender Systems (Guidelines for the design of Fender systems: 2002, Appendix A).

<sup>4</sup> Where ambient temperature is outside of this range, fenders shall be normalised to this temperature range in a conditioning room for an appropriate period (dependent upon fender size) or performance values may be corrected according to temperature correction factor tables.

<sup>5</sup> Reaction force (and corresponding calculated energy absorption) shall be the exact recorded value and not corrected or otherwise adjusted for speed correction unless required by the project specifications.

<sup>6</sup> Standard PIANC testing is included within the fender price. Additional testing frequency, third party witnessing and temperature conditioning costs are borne by the purchaser.

<sup>7</sup> Pre-compression testing involves a single "run in" cycle up to catalogue rated deflection. Reaction force is not recorded for pre-compression testing.

## IN-HOUSE PERFORMANCE TEST STANDARD



Fender Height	Pre-Compression <sup>7</sup>	PIANC Testing
Buckling Fender	as per PIANC	min. 10 % of units

QUALITY CERTIFICATES



- ▶ ISO 9001:2008 certified supply chain
- ▶ ISO 14001:2004 certified production facility



Type approval certificates according to PIANC 2002 for:

- ▶ SPC Fender
- ▶ CSS Fender
- ▶ FE Fender
- ▶ Cylindrical Fender
- ▶ V Fender
- ▶ Ocean Guard