

Bencros testing protocol for high performance solid rubber dock fenders¹ is adopted from PIANC².

The test press is equipped with load and deflection transponders which are calibrated annually.

Fenders are pre-conditioned and thermally stabilised before 10% of fenders are performance tested. Additionally, all fenders with a nominal rated reaction of 1000kN are pre-conditioned before shipment.

Please ask Bencros for further details.

Each fender is given a unique serial number, traceable to manufacturing and material records.

Fenders are tested under coaxial (vertical) compression.

Pre-conditioning involves at least three initial compression cycles³ followed by a recover period of at least one hour before measured testing.

Compression speed is 2–8 cm/min (nominally 1mm/s for ‘constant velocity’ CV-method tests).

Test temperature is 23°C ±5°C.⁴

Deflection is expressed in metres (m) and is measured at increments of 0.01H to 0.05H (where H is the uncompressed height of the fender).

Reaction force is expressed in kilonewtons (kN) and is recorded to at least a deflection at which the permitted minimum energy absorption is achieved.⁵

Energy absorption is expressed in kilonewton-metres (kNm) and is calculated as the integral of reaction and deflection, calculated using Simpson’s Rule.

The maximum or high-end reaction force should not be more than the fender’s mean rated reaction plus tolerance. The minimum or low-end energy absorption should not be less than the fender’s mean rated energy minus tolerance. Deflection is not a pass/fail requirement.^{6,7}

10% of the ordered fenders (rounded up to a whole unit) are verification tested.

If any sample does not meet the specifications, sampling is increased to 20% of fenders (rounded up to a unit). Non-conforming fenders are rejected and segregated.

If further samples do not meet the specifications, all remaining fenders will be tested. Only fenders verified as meeting the performance will be delivered.

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1. Moulded fenders include BME Elements, BAS and BAP Arch Fenders,. BME Elements are tested in pairs.
 2. PIANC refers to the Permanent International Association of Navigation Congresses, Report of Working Group 33 (Guidelines for the design of Fender systems: 2002, Appendix A).
 3. Reaction force is not recorded for pre-compression testing.
 4. Where ambient temperature is outside of this range, fenders will be normalised to this temperature range in a conditioning room for an appropriate period (dependent upon fender size and as defined by PIANC). Alternatively the performance values will be corrected according to Bencros published temperature correction factors.
 5. 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.
 6. Permitted values for reaction and energy are catalogue values and applicable manufacturing tolerances.
 7. The deflection at which minimum energy permitted energy absorption is achieved may differ from the nominal “rated” deflection indicated in the catalogue for the relevant fender type.
 8. Standard PIANC testing is charged in addition to the fender price. Additional testing frequency, third party witnessing and temperature conditioning costs are also charged for.



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