Rubber Compound Specification

By far the most important factor affecting fender performance is rubber type and rubber compound composition. However, the behaviour of rubber under stress is unique, so it's essential that precisely the right formulation is specified and – critically, finds its way to the final product – to ensure a long and robust service life.

Three key factors – velocity factor, temperature factor and longevity are affected by rubber grade and compound formulation in marine fenders.

The properties of fenders vary dramatically depending on their composition, as such; rubber compound composition should be built into specifications in order to guarantee performance and lifecycle.

This model specification is intended to guide specifiers in ensuring the correct rubber compound composition.

Please copy and paste from this document when specifying rubber fenders to ensure your supplier can provide the compound composition and physical properties required to optimise performance and guarantee longevity.

Specification for chemical composition of moulded fenders

Test	Standard	Specification*
Density	ISO 2781	Max 1.20 g/cc
Polymer (rubber)	ASTM D6370	Min 45%
Carbon Black	ASTM D6370	Min 20%
Ash	ASTM D297	Max 5%
Rubber filler ratio		>1.2

* Does not apply to standard cylindrical and extruded fenders; however, can be supplied upon special request.

Testing your supplier's products

Before production:

The vendor is required to provide a tensile slab measuring 150mm L x 150 mm W x 2mm T.

[Insert name of specifier] will submit this sample for testing at an independent third party laboratory, to determine compound complies with specification.

Testing will include TGA and FTIR testing to ensure compliance with the above rubber compound composition specification.

After production:

The vendor will be required to submit two samples (approximately 50 grams each collected in the presence of the buyer or a third party appointed by the buyer) from the final product. The fender will be selected at random by [Insert name of specifier].

The sample does not necessarily have to be in one piece, it can be thin pieces sliced or scraped by a sharp knife, from the fender body without damaging the fender. If the fender sample collection is damaged, it should be repaired before the product is despatched.

[Insert name of specifier] will submit this sample to an independent third party for testing, to ensure that the final product adheres to the compound specification listed above.

Please note: if the samples tested do not satisfy the specification, the entire batch of fenders will be re-tested .

Please note: [Insert name of specifier] reserves the right to request a second sample to confirm results from the initial testing.

The vendor will only apply a test certificate to the final products once they have satisfied the criteria listed above.

Updating Quality Control practices

In the vast majority of cases, only physical properties are tested in marine fenders. This testing is conducted at the manufacturer's laboratory before or after production. Test certificates are produced based on these test results.

To guarantee physical property test results, it's essential that a chemical composition test takes place both before and after final production.

The table below details the physical property standards that must be met for the products to be considered of a high enough standard to meet fender performance and long life cycle.

Property	Testing standard	Condition	Requirement
Tensile Strength	DIN 53504; ASTM D 412 Die C; AS 1180.2; BS ISO 37; JIS K 6251	Original	16.0 Mpa (min)
		Aged for 96 hours at 70ºC	12.8 Mpa (min)
Elongation at Break	DIN 53504; ASTM D 412 Die C; AS 1180.2; BS ISO 37; JIS K 6251	Original	350% (min)
		Aged for 96 hours at 70ºC	280% (min)
Hardness	DIN 53505; ASTM D 2240; AS1683.15.2; JIS K 6253	Original	78º Shore A (max)
		Aged for 96 hours at 70ºC	Original +8º Shore A (max)
Compression Set	ASTM D 395 Method B; AS 1683.13 Method B; BS903 A6; ISO 815; JIS K 6262	22 hours at 70ºC	30% (max)
Tear Resistance	ASTM D 624 Die B; AS 1683.12; BS ISO 34-1; JIS K 6252	Original	70kN/m (min)
Ozone Resistance	DIN 53509; ASTM D 1149; AS 1683-24; BS ISO 1431-1; JIS K 6259	50pphm at 20% strain, 40ºC, 100 hours	No cracks
Seawater Resistance	BS ISO 1817; ASTM D 471	28 days at 95ºC	Hardness: ±10º Shore A (max) Volume: +10/-5% (max)
Abrasion	BS903 A9, Method B	3000 revolutions	1.5cc (max)
Bond Strength	ASTM D429, Method B; BS 903.A21 Section 21.1	Rubber to steel	7N/mm (min)
Dynamic Fatigue	ASTM D430-95, Method B	15,000 cycles	Grade 0-1 †

† Grade 0 = no cracks (pass).
Grade 1 = 10 or fewer pinpricks <0.5mm long (pass).
Grades 2-10 = increasing crack size (fail).