ABSTRAK

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VERIFICATION TEST COMPLIANCE DALAM PENGUJIAN *RUBBER FENDER* UNTUK PELAKSANAAN KONSTRUKSI DERMAGA DI INDONESIA

(78 halaman ; 47 gambar ; 15 tabel ; 11 lampiran)

Fender merupakan hal yang sangat penting dan sangat diperlukan dalam desain dermaga. Saat kapal bertambat, kapal pertama kali harus menyentuh *fender*, bukan struktur dermaga. Mengingat badan kapal rata-rata terbuat dari baja sedangkan bangunan dermaga terbuat dari beton, maka jika kapal menyentuh dermaga akan mengakibatkan baik kapal maupun dermaga akan rusak. Bahkan meskipun kapal menumbuk *fender* namun menghasilkan *reaction force fender* yang melampaui desain gaya lateral dermaga, maka dermaga akan rusak serta berangsur-angsur runtuh. Untuk itulah diperlukan media di antara kapal dan dermaga sebagai pelindung. Seiring dengan perkembangan zaman, media yang bernama *fender* itu pun berkembang mulai dari bahan kayu menjadi beton, baja, dan sekarang terbuat dari karet (*rubber*). Namun tidak sembarang tipe karet dapat dijadikan sebagai *fender*, untuk itulah diperlukan adanya pengujian fisik terhadap *rubber* itu sendiri untuk membuktikan ketahanan karet dari efek waktu (pengusangan) dan lingkungan. Sebagaimana yang telah ditetapkan oleh organisasi internasional, setiap *fender* karet harus lulus pengujian beberapa parameter uji material dan tes *performance*. Dengan memiliki sertifikat T*ype Approval Test*, melalui *test* laboratorium yang diakui dan diakreditasi, maka katalog produk suatu perusahaan *fender* karet akan bisa diterbitkan secara resmi untuk publik. Besarnya energi yang dapat diserap oleh *fender* dan besarnya reaksi *fender* yang ditransfer ke struktur dermaga merupakan aspek penting sebagai dasar untuk pemilihan tipe *fender*. Namun jika hasil *Verification Test* yang dilakukan sebelum memasang *fender* di dermaga ternyata menunjukkan bahwa gaya reaksi lebih besar dari 110% dari nilai katalog dan penyerapan energi kurang dari 90% nilai katalog, maka *fender* karet tersebut dinyatakan gagal dan tidak dipasang di dermaga karena melebihi gaya lateral desain. Dalam analisis yang dilakukan terhadap 2 (dua) perusahaan *fender*, hasil *Verification Test fender* produksi Indonesia tidak sesuai dengan katalog, sedangkan *fender* produksi Jepang menunjukkan kesesuaian dengan katalog. Karena laboratorium, peralatan dan prosedur pengujian *fender* belum diatur di Indonesia maka Indonesia perlu menyusun peraturan yang mengatur standar, prosedur, peralatan dan penilaian untuk melaksanakan *Type Approval Test* dan *Verification Test* untuk menjamin kesesuaian, konsistensi penggunaan bahan dan konsistensi dari kinerja produk *fender* karet.

Kata Kunci : *fender, reaction force, energy absorption, performance curve*

ABSTRACT

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VERIFICATION TEST COMPLIANCE OF TESTING RUBBER FENDER FOR QUAY'S CONSTRUCTION IN INDONESIA

(78 pages ; 47 figures ; 15 tables ; 11 attachments)

Fender is an essential and indispensable part in designing quays of a port. As a vessel berths, it is compulsory that it first touches the fender instead of directly hitting the quay structure. Since the hull of a vessel is mostly made of steel whereas the quay superstructure is usually made of concrete, both vessel and quay will get damaged shall the vessel come to direct impact with the 'unfended' quay. Even if the fenders are in place but yet the fender's reaction force surpasses the lateral force to which the quay structure is designed to uphold, the quay may still subject to damages and over time it will collapse. This is why the interface between a vessel and the berth facility is required as a protection. As time goes by, that medium – which is commonly called fender – evolves from woodpile, concrete, steel, to the present time where it is made of rubber. However, not all of types of rubber can be produced as a fender; certain properties of rubber are subject to physical testing in order to prove their resistance against aging and other environmental effect. As specified by international professional organization on port and navigation, any type of rubber fender should pass certain properties and performance tests. By having a certificate of Type Approval Test by a recognized and accredited testing laboratory, a catalogue of rubber fender products from a manufacturer could then be officially published to the public through a catalogue. The amount of energy that could be absorbed by fender and the amount or rate of reaction force of a fender, which is transferred to the quay structure, is an important aspect on which fender selection is based. However, if the result of the verification test conducted before installing the fender on the quay shows that the reaction force is bigger than 110% of the catalogue's value and the energy absorption is less than 90% of catalogue's value then the rubber fender is failed, cannot and should not be installed on the quay since the quay will experience a force greater than the designed lateral force resistance. As the results of analysis on 2 (two) fender's manufacturers, there is inappropriate and inconsistent performance between catalogue and Verification Test for Indonesia's fender. In contrast, Japanese product shows a good quality of their fender which has an appropriate and consistent result between catalogue and Verification Test. Since the laboratory, equipment and procedures for fender test are not regulated therefore Indonesia has to develop standard and regulation which stipulate the standard, procedure of fender Type Approval Test and fender Verification Test in order to guarantee a consistent material being used and consistent fender performance.

Key Words : *fender, reaction force, energy absorption, performance curve*