

# ULTIMATE STRENGTH ANALYSIS OF SHIPS PLATE DUE TO CORROSION

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To my beloved mother, *Kamariah* and father, *Lazim*, my sisters, *Nuha*, and *Madihah* who are never fail to give me a full of supports in the journey of my study.

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## ABSTRACT

Today in maritime industry, it is a mandatory task to compute the ultimate strength of structural components and their system for structural design and strength assessment based on ultimate limit states. Increasing the number of ship failure because of structural incapable to support the load have gain the motivation and interest to study the ultimate strength of the ship's structure. One of the reason of ship structural failure mainly because of ship's plate corrosion. Through this thesis, the study have found out that decreasing thickness of the plate due to ship's plate corrosion will decrease the critical load of the ship's plate itself. The study concern about compressive uni-axial loading on the ship's plate which resulting linear and nonlinear buckling effect. The critical load of the ship's plate structure is study using method eigenvalue linear buckling analysis by ABAQUS Finite Element Software packaged. The result show that more lower the critical load by the structure, more tendency the structure will fail and reach the un-stability mode of deflection. The ultimate compressive strength on the other hand showing the strength of the ship plate under condition of nonlinear buckling analysis. The condition which ship plate located at the bottom and middle section of bulkhead experienced more compressive stress compare to other part in ship. This is according to maximum moment according to shear force-moment diagram of any ship that gives the maximum moment stress at the middle of the ship. Finding ultimate strength of the ship's plate gives the understanding about the concept of allowable limit load the ship structure can withstand under ship service loading. The parameter of plate slenderness ratio is important for linear and nonlinear ship's plate buckling analysis and the ultimate strength is calculated based on formula by Faulkner.

## ABSTRAK

Hari ini dalam industri maritim, ia merupakan satu tugas yang wajib untuk mengira kekuatan muktamad komponen struktur dan sistem mereka untuk reka bentuk struktur dan penilaian kekuatan berdasarkan keadaan had muktamad. Meningkatnya bilangan kegagalan kapal kerana tidak mampu untuk menyokong beban struktur telah membawa motivasi dan minat untuk mengkaji kekuatan muktamad struktur kapal. Salah satu sebab kegagalan struktur kapal terutamanya kerana pengaratan pada plat kapal. Melalui tesis ini, kajian telah dipelajari bahawa pengurangan ketebalan plat kerana pengaratan pada plat kapal akan mengurangkan beban kritikal plat kapal sendiri. Kajian mengambilkira tentang mampatan beban uni-paksi pada plat kapal yang menyebabkan kesan lengkok linear dan tak linear. Beban kritikal struktur plat kapal adalah kajian menggunakan kaedah lengkok linear '*eigenvalue*' analisis menggunakan '*ABAQUS Finite Element Software packaged*'. Keputusan kajian menunjukkan hasil yang lebih rendah beban kritikal pada struktur, lebih kecenderungan struktur akan gagal dan mencapai mod ketidakstabilan pesongan. Kekuatan mampatan muktamad sebaliknya menunjukkan kekuatan plat kapal dalam keadaan analisis lengkokan tak linear. Keadaan plat kapal yang terletak di bahagian bawah dan bahagian tengah '*bulkhead*' kapal mengalami lebih mampatan berbanding dengan bahagian lain dalam kapal. Ini adalah berpandukan momen maksimum mengikut gambarajah ricih-momen mana-mana kapal yang memberikan tekanan momen maksimum di tengah-tengah kapal. Mencari kekuatan muktamad plat kapal memberikan pemahaman tentang konsep beban had yang dibenarkan struktur kapal yang boleh ditahan dalam beban semasa penggunaan kapal. Parameter '*plate slenderness ratio*' adalah penting bagi analisis plat kapal lengkokan linear dan tak linear dan kekuatan muktamad dikira berdasarkan formula oleh Faulkner.