The hull is the most important structural part of any maritime vessel. It must be adequately designed to withstand the harsh sailing environmental conditions and associated forces. In the past, the basic material used to manufacture the ship hull was wood, where the hull was usually shaped as cylindrical wooden shanks. In the present, hull designs have developed to steel columns or stiffened panels that are made of different types of materials. Panels that are stiffened orthogonally in two or more directions and have nine independent material constants are defined as orthotropic panels, and they achieve high specific strength.

This thesis presents the effect of different patch orientations on the resulting strain and stress concentrations at the area of interaction between the panel and the patch. As it known, the behavior of stiffened plates is affected by several important parameters, e.g., length to width ratio of the panel, stiffener geometry and spacing, aspect ratio for plate between stiffeners, plate slenderness, residual stresses, initial distortions, boundary conditions, and type of loading. A finite element model of the ship hull has been developed and run on ABAQUS (commercially available finite element software). The stiffened panel and patch are modeled as equivalent orthotropic plates made of steel. The panel edges are considered to be simply supported, and uniaxial tension was applied to the equivalent stiffened panel, in addition to the lateral pressure (from water interaction). The model successfully predicted the optimal orientation of the panel for maximum stress concentration reduction. Moreover, in order to minimize the sever conditions caused by the mismatch that occurs if the material properties of the patch as well as the panel are the same during the patching process, it is necessary that the patch to be stiffed more than the stiffened panel. The developed model also suggested addition of an isotropic layer at the interaction to decrease the severity of arising stresses.

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The public is welcome to attend.