

**ANALYSIS OF HINGE CHANGES ON THE STRENGTH  
OF RAMP DOOR CONSTRUCTION  
CASE STUDY OF KMP. SWARNA PUTRI**

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**ABSTRACT**

*Ramp doors are one of the critical components of a Ro-Ro (Roll-on/Roll-off) vessel, serving as the main access point for cargo to be loaded onto the ship. Therefore, the integrity and performance of the ramp door must be carefully maintained. This is particularly relevant in the case of the ramp door on the vessel KMP. Swarna Putri, which frequently experiences damage to its hinge components. This study aims to analyze the structural strength of the ramp door by replacing the existing hinge type. The method used in this research is the Finite Element Method (FEM). The analysis results show that the maximum stress on the ramp door using a piano hinge at a  $+10^\circ$  angle is 182.87 MPa, at a  $0^\circ$  angle is 131.68 MPa, and at a  $-10^\circ$  angle is 129.34 MPa. Meanwhile, for the ramp door with a clevis hinge, the maximum stress at a  $+10^\circ$  angle is 178.01 MPa, at a  $0^\circ$  angle is 123.13 MPa, and at a  $-10^\circ$  angle is 172.22 MPa. Based on the safety factor analysis, both types of hinges meet the criteria set by the Biro Klasifikasi Indonesia (BKI). The safety factor for the ramp door with a piano hinge is 1.29 at  $+10^\circ$ , 1.80 at  $0^\circ$ , and 1.82 at  $-10^\circ$ . For the clevis hinge, the safety factors are 1.32 at  $+10^\circ$ , 1.91 at  $0^\circ$ , and 1.36 at  $-10^\circ$ . The analysis indicates that changing the hinge type can enhance the structural strength of the ramp door.*

**Keywords:** *Piano hinge, Clevis hinge, Finite Element Method (FEM), Ramp door, Safety factor and Stres*