sea transportation is absolutely needed. Starting from the need to transport logistics and to transport natural resources. One type of marine transportation which is currently highly needed is a CPO Barge. But now to minimize the occurrence of accidents resulting in oil spills from ships, the requirements for the type of liquid cargo barge is to use a double hull. This requirement standard by the Oil Pollution Act of 1990 (OPA'90), the International Maritime Organization (IMO), MARPOL (13 F & G). This determination is a requirement in designing the ship. On the barge has a critical region of the longitudinal strength (longitudinal force) due to the influence of waves. In general calculation safe dimension of each strength member on the ship can be determined by the ship designer, the burden is on the vessel or internal factors, and stresses and deflection due to external factors. Also is the value of minimum yield strength for the stresses and deflection on the external load, the load at the extreme wave load analysis is the result Hogg ing and shagging, besides that the heaving pitching couple encounter towards 0 deg. and 180 deg., as well as loading a specific load of ballast during loading and unloading. With the condition of 3rd sea state variations waves of 0.5 m to 2.5 m. Numerical analysis using finite element method, obtained 3 critical conditions at full load at 0 deg. and 180 deg. at 38 station. And the direction 0 deg. at empty load at station 4 and direction 180 deg. at station 30. At station 4 on the analysis obtained max stress $\sigma_{\text{max}} = 46.4 \text{ MPa}$. At the direction of 180 $^\circ$ at station 30 obtained maximum stress $\sigma_{\text{max}} = 226 \text{ MPa}$, the direction of 0 $^\circ$ at the station 38 obtained maximum stress $\sigma_{\text{max}} = 220 \text{ MPa}$. At the direction of 180 $^\circ$ at station 38 obtained maximum stress $\sigma_{\text{max}} = 157 \text{ MPa}$. The allowable stress on this research refer BKI standard, that gives allowable stress $\sigma_{ijin} = 253 \text{ MPa}$. It is proved that stresses at station 38, station 4 and station 30 have value less than the allowable stress standard of the BKI. It is recommended to do further analysis by laboratory model in the Towing tank, to get a more perspective and confident of the actual conditions.

Key words: longitudinal strength, wave loads, double hull, Heaving-pitching couple