

Geometrical parameters influence on the stiffness of steel sandwich plates with web-core

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Abstract. Laser welded sandwich plates with web-core have found their position in the marine and land vehicles. To implement such design accurately, knowledge about the influence of geometrical parameters on the stiffness is necessary. In this paper, the over-hanging three points bending tests were performed on the laser welded web-core steel sandwich plate under quasi-static conditions, together with the finite element (FE) simulations. The following parameters were analysed: the thickness of the face plate, the spacing of the two core plates and the height of the core plates. The agreement between experimental measurements and FE results was considered to be good. It is shown that changes of these parameters can contribute to increase or decrease of the stiffness of web-core sandwich plate, but the height of the core plate has no effect on the shear stiffness as the spacing of the two core plates is known. There are linear, exponential and polynomial fitted relationships between the geometrical and the stiffness of the web-core sandwich plates.

Keywords: Web-core sandwich plate; stiffness; geometrical parameters

1. Introduction

The demand for faster and lighter marine and land transports has increased the need for more efficient structures. All-metal sandwich plates offer an option that can fulfill these requirements. By using sandwich structures, it is possible to obtain high stiffness and strength to weight ratio, i.e., the sandwich structures were found to be 30-50% lighter than traditional stiffened plates in marine structures [1, 2]. Contemporary interest in steel sandwich plates has been awakened by the developments in laser welding technology which enables the efficient production of these plates. Elevated pre-fabrication accuracy of the components, high welding speed and the possibility to connect internal stiffeners with the face sheets from outside has led to a wide application of laser welding in the construction of steel sandwich plates [3, 4].

The web-core sandwich panel has perhaps the simplest core topology of all steel sandwich plates, as showed in Figure 1. The laser-welded web-core steel sandwich panel is a set of steel plates assembled by utilizing a state-welded T-joint. The joint connects a vertical core plate called the web plate to the horizontal face plates that are located far from the mid-plane of the cross-section of the panel. The so-called sandwich