



Experimental and Analytical Study of the Sandwich Beam under Flexural Behavior

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Abstract

Steel-Concrete-Steel beam or as known in other engineering phrases (Sandwich Beam) is part of the modern structural frames which assist the interactions between concrete and steel, knowing that this parts of structure looks similar to the sandwich slab.

The sandwich beam can be created by replacing the main longitudinal Steel bars for the tension and compression with an equivalent one of steel plates and binding both the top and bottom plates using stud connectors that replace strips on the standard reinforced concrete beam and filling all the spaces between the two plates with concrete.

Also all of the practical results were compared to the numerical results using Finite Element Methods Techniques by software computer engineering program (ANSYS VER.11) and it has been noticed that all of the practical results are close together with the numerical ones; also it has been noticed that the bearing force of the Sandwich Beam is more powerful, durable and reliable from the standard reinforced concrete beam and that's mainly because of the full and strong correlation between the beam components.

Keywords: steel; flexural behavior, stud connectors, sandwich beam, concrete, composite.

1. INTRODUCTION

The need for large structures with higher specific strength and stiffness is increasing. This is especially true of recent engineering structures where there is an interest in increasing payload to structure weight ratios. To deliver such structures, engineers can either find a new structural material or produce a new structural topology. The former method is however quite difficult to complete because qualification of new materials is expensive and time consuming. The latter method is more realistically possible because engineers can select any combination of existing materials and arrange them into a desired structural topology such as a sandwich structure.

A steel-concrete-steel (SCS) sandwich beam represents a special form of sandwich structure .It consists of steel face plates and concrete core which are connected together by mean of a series of shear connectors. The state-of-the-art construction forms of SCS sandwich structures are (a) double-skin sandwich construction (DSC), (b) Bi-Steel sandwich construction (Bi-Steel), and (c) alternative SCS sandwich construction. They are different only due to the pattern of their shear connectors, as shown in Figure (1) follow.

