Use of GFRP Grid for Innovative Concrete Sandwich Panels

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Abstract
Glass fiber reinforced polymer (GFRP) materials are typically used now as an effective material for strengthening and repair of concrete structures and bridges. Recently, GFRP has been introduced as a new alternative reinforcement for cast in place and precast concrete elements, such as double tee beams. This paper proposed the use of GFRP grid as a shear transfer mechanism for concrete sandwich wall panels typically used for a building envelope. These wall panels are typically prestressed and can be used in structural or architectural applications, providing high structural resistive capacity and a high R-value. An experimental program was conducted at the North Carolina State University focused on the behavior of insulated concrete sandwich wall panels with a GFRP grid shear transfer mechanism produced in Korea. The program examined various parameters believed to affect the shear transfer, such as the type of rigid foam insulation, insulation thickness, and the spacing between the rows of GFRP grid. A typical specimen used to determine the shear resistance of the grid/foam is shown in Figure 1. The program was designed to determine the characteristics of the shear transfer mechanism of the grid/insulation as affected by these parameters. This paper describes the experimental program, presents test results, and provides guidelines for the design of these structurally and thermally efficient concrete sandwich panels.

Figure 1: Typical Specimen used to evaluate the Grid/Foam Shear Resistant of Concrete Sandwich Panels