

BEHAVIOR OF INSULATED PRESTRESSED CONCRETE SANDWICH PANELS REINFORCED WITH FRP GRID

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This paper presents an experimental program conducted at North Carolina State University in collaboration with Washington University to investigate the behavior of Concrete Sandwich Wall Panels reinforced with carbon-fiber shear connection grid (C-Grid). The study included testing of full size sandwich panels constructed with expanded polystyrene foam (EPS foam) and extruded polystyrene foam (XPS foam). The panels consist of two wythes of prestressed concrete and an inner layer of foam. Carbon fiber reinforced polymer (FRP) grid, commercially known as C-GRID, was used at selected locations to achieve the composite action of the two concrete wythes. Panels were tested vertically in a frame that allowed simultaneous application of gravity and lateral loads. Reverse cyclical lateral loads were applied to simulate the effects of wind pressure. Both panels were subjected to nearly 4000 cycles of reverse fatigue loading with the presence of the factored axial load. Following the fatigue regime, the lateral loads were increased until failure. Test results were used to calibrate an analytical model which is used to study the effect of various parameters. Strain measurements across the thickness of the panels were used to evaluate the level of composite action using the two types of foam. The research included testing small scale panels specifically designed to determine the shear resistance of the FRP C-GRID. Use of C-GRID produced highly thermal efficient panels and eliminated the cold spots normally observed by using steel shear connectors.

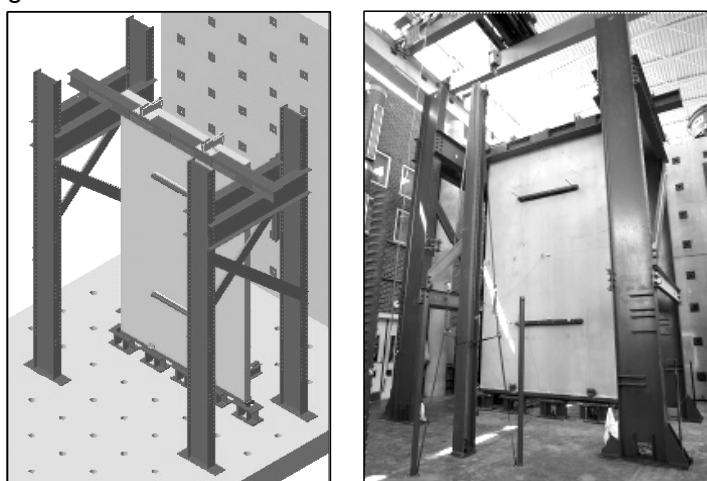


Figure 1: Twenty Foot Wall Panel Test Setup

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