

Pull-Out Capacity of GFRP Connectors in the Edge Area of Precast Concrete Sandwich Walls

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Abstract

Precast concrete sandwich panels are used to fulfil the rising thermal requirements. The sandwich walls consist of three layers, a facing, a thermal insulation layer and a load-bearing layer. The two outer layers are coupled by connectors made of glass-fibre reinforced polymer. The connectors are loaded primarily in tension. Their failure mode under short-term tensile load is a combination of a concrete breakout and bond failure modes. In the edge area, the concrete breakout can not be fully developed, resulting in a reduction of the ultimate load. Conservative approach for this reduction adopted in the codes limits application of GFRP connectors. Tests were carried out in the edge area to compare the ultimate load with predictions of the CC method from the field of fastening technology. The comparison shows good compliance and allows an investigation of the tensile load capacity in the edge area and so a more efficient design with reduced edge distances is possible.

Keywords: GFRP connector; sandwich wall; pull-out strength; CC-method; edge distance.

1. Introduction

Precast concrete sandwich panels with outer layers out of normal concrete have been used as exterior wall systems for many years and have been proven themselves in practice (Fig. 1) [1-3]. The

prefabricated wall elements have a three-layer structure consisting of a facing layer, a thermal insulation layer and a load-bearing layer (Fig. 2). Metallic connectors such as composite needles and lattice girders are used usually to couple the two outer concrete layers [4].

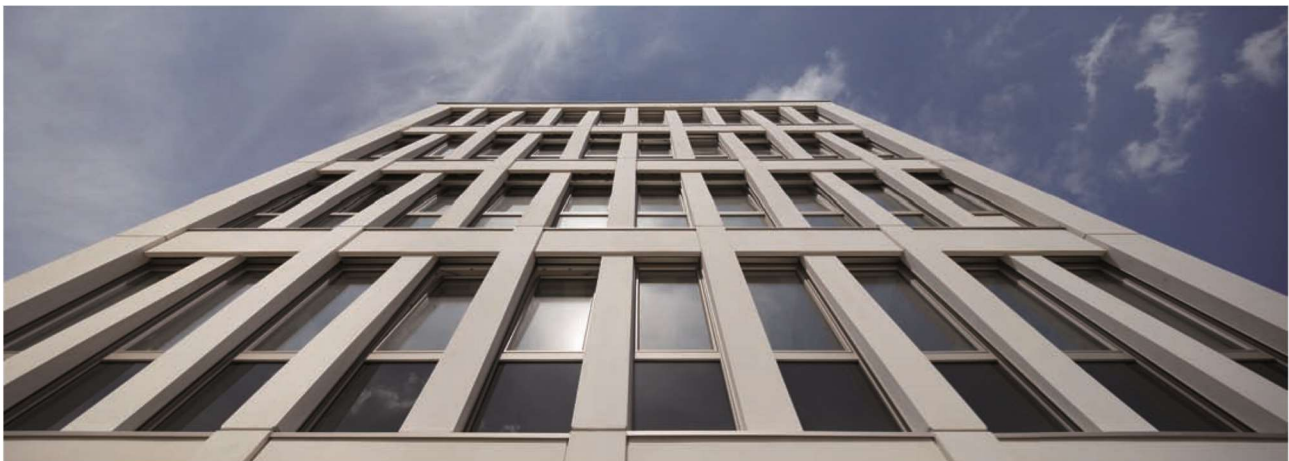


Figure 1. Precast concrete sandwich panels for use as a façade [5]