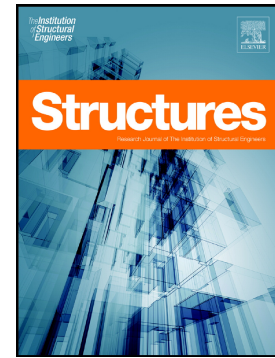


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Headed Bar Connections between Precast Concrete Elements: Design Recommendations and Practical Applications

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Abstract

The paper provides an overview of research into the design and behaviour of joints between precast concrete elements in which continuity of reinforcement is achieved through overlapping headed bars, allowing very short lap lengths. A series of tensile and flexural tests were carried out on joints with lapped headed bars of 25 mm diameter with 70 mm square heads and measured yield strength of 530 MPa. The tests studied the influence on joint behaviour of joint concrete strength, transverse reinforcement, geometry, and out-of-plane tolerances. Observations from tests and numerical analysis were used to develop design procedures for headed bar joints based on strut-and-tie modelling and the upper bound theorem of plasticity respectively. A recently completed project using headed bar joints demonstrates the benefits of using this system in precast concrete construction. The potential for further savings in costs and labour when adopting design recommendations stemming from this research is also discussed.

Keywords: Precast concrete, Headed reinforcement, Lap length, Strut-and-tie, Nonlinear finite element analysis.

1. Introduction

The paper presents design recommendations for narrow cast in-situ joints between precast concrete slabs in which continuity of reinforcement is achieved through overlapping headed bars, similar to those used by Laing O'Rourke (LOR) in their patented e6 floor system and shown in Figure 1. The use of headed bars allows very short lap lengths to be used in comparison with straight bar splices which facilitates highly efficient construction systems. The design recommendations are based on a research project

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