

SFRC JACKING PIPE DESIGN

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Abstract

This report outlines a numerical and experimental research on investigating the potential use of steel fibre reinforced concrete containing hooked end high strength steel fibres in precast jacking pipes.

The project investigated the extent to which fibre reinforcement could replace reinforcing bar in four sizes of jacking pipes through finite element modelling and experimental study. Mechanical properties of steel fibre reinforced concrete were experimentally determined and the results were input into finite element modelling software package DIANA in order to define the material and to model the behaviour of jacking pipes under crushing load. Full-scale jacking pipes including pipes with 450-1200 mm diameter and various reinforcement systems were tested in accordance to BS EN 1916. Full and partial replacement of bar reinforcement was considered as well as the potential to increase the level of cover of reinforcing bar in order to produce pipes meeting higher exposure classes.

Modelling showed that in smaller diameter pipes (DN450 and DN600), it was possible to completely replace rebar with steel fibres. For larger diameters (DN900 and DN1200), it was found that pipes with both lower amount of rebar and increased cover could be produced by using fibre reinforcement. This was also verified through factory testing. The designs obtained present the possibility of production of pipes meeting higher durability/service life requirements than is possible with the existing products. However, from the outcome of watertightness tests, it is suggested that modifications to the concrete mix proportions would need to be considered to avoid detrimental effects due to the effect of steel fibres on workability of the concrete.