



Innovative structural forms of concrete structures using fabric formwork

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Abstract

Fabric formwork is a novel method for casting unconventional concrete forms in textile sheets. It offers extraordinary possibilities for combining structural efficiency and architectural expression in the design of concrete structures. This paper discusses opportunities, challenges and solutions for application of fabric-formed concrete in practice, in terms of design, buildability and potential advantages of using innovative Fibre-Reinforced Polymer (FRP) materials as reinforcement.

Keywords: concrete, fabric formwork, fibre-reinforced polymer reinforcement, structural forms

1 Introduction

Concrete as a material can be moulded in virtually any shape. However, this is rarely explored during conceptual design unless there is a necessity for reducing selfweight, such as in the case of large-span bridges. More often the opportunity for saving concrete material through optimisation of structural forms is likely to be precluded by the construction cost and waste associated with fabricating bespoke concrete moulds.

Fabric formwork offers a cost effective method for creating unconventional and unique structural elements by casting concrete in flexible fabric sheets. The hardened concrete shapes, formed under the hydrostatic pressure of wet concrete, can also be manipulated in various ways, including pinching of fabric, external attachments and void formers [1].

Further to the possibility to realise materially-efficient structures, fabric-formed concrete has attracted a significant interest among architects searching for freedom of form and creative designs. Numerous examples of successfully built fabric-formed concrete elements of different scale and complexity exist, including beams, columns, walls and shells [2]. The light weight of fabrics may also lead to considerable savings in transportation and construction costs. In addition, appropriately chosen porous fabrics can act as controlled permeability formwork, thereby, improving the durability characteristics of concrete [3].

2 Design and buildability

Despite the number of proven advantages, which provide a strong motivation for the profound use of fabric formwork, the practical applications of