



Creativity in the New Stone Age Part 2 - Structural Stone in Staircases

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Abstract

Stone has been used as a structural material for thousands of years and yet its use has declined in recent times.. This paper uses a series of stone stairs, including the award-winning Formby Stair designed by Webb Yates Engineers, as case studies to discuss the creative use of stone. It details the design, testing and realisation of contemporary stone structures.

Keywords: Stone, Post-tensioned, Reinforced, Statistics, Analysis, FE Modelling, Prototype, Testing

1 Introduction

The structural principles of traditional stone 'cantilever' staircases are now widely understood, but by adopting a creative approach to structural analysis, design, and detailing, they can be combined and extrapolated to design and construct more refined structures in myriad applications. Clients, Architects, and Stonemasons are increasingly requesting longer spans, thinner sections and 'unsupported' half/quarter landings. Combining the compressive strength of stone with the tensile strength and ductility of steel allows these requests to be realised.

2 The design process

At Webb Yates Engineers our approach is to combine analogue hand calculations and sketches with digital modelling and analysis. We often ask difficult questions of ourselves and others to explore the limits of the project from a programme, budget, and risk perspective. Only once these boundaries are understood can the designs be pushed to their limit.

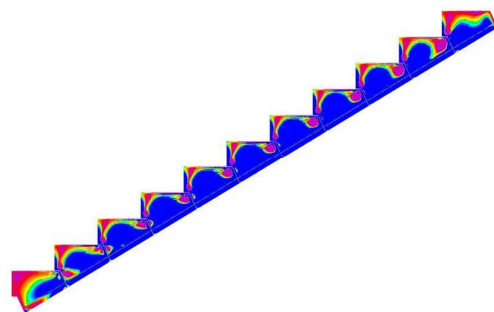


Figure 1. FE model principal stress plot of a reinforced flight

When designing with stone, we use physical material and prototype tests to calibrate and verify theoretical models, improving our understanding.



Figure 2. Physical testing of 1:1 prototype