Identification of relevant parameters for choosing an appropriate method of concrete construction

Philip Piek, Jan Wium

Stellenbosch University, South Africa

Contact: janw@sun.ac.za

Abstract

Project teams are required to make informed decisions during the conceptual phase of construction projects. For this reason designers need to be informed of the many factors and their contributions that play a role in determining the constructability and project outcome. This paper investigates the important time and cost factors to be considered during the design and construction phases of a project for an early decision between in-situ and hybrid concrete construction. The factors were identified through case studies of projects that had been constructed using hybrid concrete construction. The factors that influence the decision are difficult to quantify and the influence of each may differ from project to project. The proposed decision framework is therefore not based on mathematical outputs and decision making models, but consists of qualitative information that can assist project teams in their decision.

Keywords: Concrete, in-situ, hybrid concrete construction, time, cost, construction method.

1 INTRODUCTION

1.1 Background

Construction projects can benefit when design teams consider the method of construction and its challenges at an early stage. This is particularly of importance when the advantages of pre-fabrication are to be exploited, as a project needs to be designed for pre-fabrication right from the start.

To reap the most benefit from the construction method, designers also need to understand the parameters that play a role during the construction of a facility.

Hybrid Concrete Construction (HCC) is a combination of prefabricated concrete and cast in-situ concrete to obtain the optimum benefit of each approach [1]. This method of construction is ultimately used to achieve faster and occasionally, more cost effective project execution [2]. Hybrid concrete construction is widely used in the United Kingdom and other developed countries. However, its use is often limited in South Africa, and in-situ concrete construction remains the conventional method of construction. Some reasons for this could be the lack of experience on precast design and the shortage of sufficient precast information and guidelines [3], [4].

The decision between construction methods is influenced by many factors which can include project cost, time, socio-economic aspects (labour), client satisfaction (aesthetics), procurement method and contract form, safety, sustainability, quality, past experience and regulatory environment (refer to Figure 1). Ideally each of these aspects need to be quantified to enable project teams to decide on a construction method.

Whilst many studies have addressed these items, it remains valid that the local environment will dictate the contribution of each of these to the project outcome. Time and cost are often considered to be the most important of these factors [5], [6], [7], [8].

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