

A Review Paper on Flexible Formwork

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Abstract: Concrete, our most widely used construction material, is a fluid that offers the opportunity to economically create structures of almost any geometry. Yet this unique fluidity is seldom capitalised on, with concrete instead being cast into rigid prismatic moulds to create high material use structures with large carbon footprints. Our rate of concrete consumption means that cement manufacture alone is estimated to account for some 5% of global Carbon Dioxide emissions. This dissertation shows that by replacing conventional orthogonal moulds with a flexible system comprised primarily of high strength, low cost fabric sheets, the fluidity of concrete can be utilised to create structurally optimised concrete structures. Flexible formwork therefore has the potential to facilitate the change in design and construction philosophy that will be required for a move towards a less material intensive, more sustainable, construction industry. Optimisation and design processes developed in this thesis show that material savings of up to 40% are possible in flexibly formed concrete beams. Full scale structural testing of these processes is undertaken to verify the flexural and shear behaviours of non-prismatic elements. This is supported by further experimental and theoretical investigations into the durability of concrete cast in a permeable, flexible mould. Detailed analysis is provided alongside practical guidance for designers. Coupled with innovation in design and analysis techniques, flexible formwork is shown to provide a globally accessible method for the construction of low carbon, materially efficient and architecturally interesting concrete structures. Recognising the impact construction has on the environment, design philosophies centred around the need to put material where it is required are becoming increasingly desirable. This can now be achieved by replacing rigid formworks with systems comprised of flexible sheets of fabric. This is a step change in the way we think about our new concrete structures.

Keywords: Fabric formwork, Flexible formwork, Disruptive Innovation

I. INTRODUCTION

Concrete has been cast in rigid moulds since its invention in antiquity. The traditional use of rigid, flat formwork panels has thoroughly embedded uniform cross-section. Concrete is the main building material in the construction industry. It is widely used in residential and commercial buildings and infrastructure due to its superior design properties such as structural properties, reliability, economy and low cost, as well flexibility to achieve any shape regardless of geometry and complexity. Formwork is very important in the construction of concrete structures. On the one hand, concrete can be given any shape. On the other hand, fresh concrete may gradually gain strength. The use of formwork dates back to the Roman Empire [1]. At that time, wooden formwork was used by Roman engineers as formwork for the construction of reinforced concrete vaults and arches [2]. During the Renaissance, formwork was increasingly used in the construction of concrete structures. Compared to masonry buildings, concrete buildings require significantly less construction work, and the use of formwork is advantageous in the construction of conventional concrete structures. In the 20th century, various types of formwork were developed, which became an integral part of the construction of reinforced concrete structures. According to material hardness, recyclability and production process, formwork systems can be divided into traditional formwork systems, flexible formwork systems and recyclable formwork systems, as shown in the figure. 1 Traditional formwork, made of hard materials and commonly used for regular geometry structures, has been used in concrete construction since ancient times. Wooden formwork and metal form are the two most commonly used forms of traditional formwork [3]. Due to the growing demand for static efficiency and aesthetics, in recent decades, flexible formwork systems have been developed that used in the construction of geometrically

complex concrete elements and structures. Fabric formwork systems and digitally manufactured formwork systems are the two main forms of flexible formwork systems [4]. A major contributor to greenhouse gas emissions and climate. As the construction industry has attracted worldwide attention in recent years, the use of recyclable and environmentally friendly materials such as sand and ice as formwork has gained acceptance in recent years. It has brought in, year by year. It has proven itself in the production of individual concrete components. Formwork is a temporary support for the construction of concrete structures and is primarily used to form and support fresh concrete until it reaches the required strength. The final shape and surface quality of a finished concrete structure is highly dependent on the formwork system used in the structure. Therefore, the selection criteria and the basic requirements for the formwork system should be carefully studied before starting construction [10, 11]. First of all, the formwork system must have excellent quality in terms of strength, durability and rigidity and ensure the safety of the construction process. This requires a careful analysis of possible loads, especially lateral stresses in the formwork. You then need to select the appropriate formwork material and scaffolding system that is strong enough to withstand the load.

Traditional formwork system saving method

At the same time, the flexibility of Traditional formworks are usually fabricated with rigid materials such as wood and metal for the construction of concrete structures with regular geometries. These formworks are usually constructed manually by skilled craftsmen. As the application of traditional formworks has a long history, the techniques involved in fabrication such as cutting, assembling and erecting of formwork members have been well established. In this section, a detailed review of the characteristics and applications of wooden formwork, steel formwork and aluminium formwork will be presented. Plastic formwork.

Aluminum inaccessible to cranes and machinery.

Formwork System A relatively new technology in India, aluminum formwork systems save time and money and improve construction efficiency. Aluminum formwork systems are very economical for repetitive building projects. This is one technology that is considered very suitable for mass construction situations in India that require good quality and speed. This system builds faster than most other deployment methods. Workers use this method effectively to expedite construction while ensuring quality control and durability. All kinds of conditions or building elements such as large windows, stairs, balconies and other architectural elements can be made with aluminum formwork panels []. Stones are not needed. It provides a durable finish, requires no exterior or interior plaster, and results in cost savings.

Table Formwork System

Table top formwork, also known as flying formwork, is a large prefabricated formwork and is often a faulty assembly used to form entire sections of a suspended floor slab. In the new development, the machine needed enough space to move its mass around the perimeter of the building on a daily basis. End railings at the support points must withstand high loads. Its flexibility and ease of installation make it suitable for flat floors, beams and ceilings in building projects with conventional floor plans or low Residential and commercial buildings are two application examples. In addition to high quality surface treatment, fast assembly is ensured by the easy transport of assembled parts. It also has negligible waste compared to the traditional formwork method that have been used in the past.

II. CONCLUSION

Over the years, many have changed in the construction industry. Formwork is temporary or permanent mould is created which concrete is dispensed. There are different types of formwork available in India, and among the most common were traditional timber formwork, traditional formwork, aluminum depending on the purpose and budget for the project. Formwork is important for many reasons: formwork, tunnel formwork and table formwork. Each of these is used. In a nutshell, formwork is still important in this day and age as it makes construction quicker and cheaper. It also helps workers get the job done faster and better to achieve the best formwork quality. Moreover, formwork provides efficiency and lesser cost.

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