EVELOPING TRENDS IN FORMWORK - COST ANALYSIS AND EFFECTIVENESS OF ALUMINIUM FORMWORK OVER THE CONVENTIONAL FORMWORK

Shanker Prasad Mishra

Astt.Prof. Poornima College of Engineering

spmrgec@poornima.org

Abstract

Formwork systems are among the key elements deciding the accomplishment of a development venture as far as speed, quality, cost and security of works. These days, most tasks are required by the customer to finish in the briefest time conceivable as a way to limit costs. For tall structures, the best method to accelerate works is to accomplish a short floor cycle — to have the structure of a run of the mill floor finished in the most brief time.

Formwork, which holds and supports the wet concrete till such time it cures, is an extremely imperative component in solid development. This paper means to think about benefits and negative marks by utilizing an ordinary timber formwork framework and present day Aluminum formwork frameworks. The examinations incorporate costs, time, and nature of these frameworks. Aluminum Formwork system in development industry in created nations has enhanced the standard of the development business.

Key Words: Formwork systems, Aluminum Formwork, Development Industry

1. INTRODUCTION

Structures or forms are the containers in which concrete is set, with the goal that it will have desired shape or blueprint when solidified. When concrete builds up the satisfactory quality to help its own weight they can be taken out. Formwork is the term given to either impermanent or changeless molds into which concrete or comparable materials are poured.

There are many different types of formwork used in construction, usually differing according to what the building requirements and challenges are. Materials used for such moulds are wood, steel, aluminum or prefabricated forms.

Certain aluminum alloy, which are impervious to wet concrete and in addition to erosion, are utilized for making aluminum form moulds. These structures are fundamentally the same as steel formwork. Aluminum formwork is widely being used as a result of it being lightweight and corrosion resistance.

The Aluminum Formwork System was created by W. J. Malone, a Canadian Engineer in the late 1970s as a framework for building low– cost lodging unit in creating nations. The units were to be of thrown set up concrete, with stack bearing dividers utilizing a formwork of aluminum boards. To be raised by the hundreds, of a dreary plan, the framework guaranteed a quick and practical strategy for development.

2. ADVANTAGES OF ALUMINUM FORMWORK

- More seismic resistance
- Increased durability
- Higher carpet area
- Uniform quality of construction
- Negligible maintenance is required
- Faster completion of construction work
- Aluminium formwork doesn’t rust
- Higher scrap value
- Less debris generation
- Casting of walls and slab can be done simultaneously

3. LIMITATIONS OF ALUMINUM FORMWORK

- Because of small sizes of aluminum panels finishing lines are seen on concrete surfaces
- Modification are not possible as all members are casted in RCC
- Due to box type construction, shrinkage cracks are likely to appear
- Heat of hydration is high due to shear walls
- It requires uniform planning and elevations to be cost-effective

4. MATERIALS

a. CEMENT

OPC of grade 53 confirming to IS: 8112:1989 and EFNARC 2005 for materials of SCC is being used. The physical properties of Cement is as follows-

Table 1: Physical Properties of Cement

Details	Normal Consistency (%)	Initial Setting Time (min)	Final Setting time (min)	Specific Gravity
OPC	29	35	535	3.05

b. FINE AGGREGATE

The aggregate passing through 4.75 mm sieve and retaining on 150 micron sieve is termed as fine aggregates. Sand confirming to IS 383:1970 is being used. The properties of sand are as follows:

Table 2: Properties of Sand

Details	Specific Gravity	Water Absorption (%)	Bulk Density (kg/m^3)
Sand	2.392	1.2	1332.72

c. COARSE AGGREGATE

Fractions of aggregate between 12.75 mm and 4.75 mm are being used as coarse aggregate. The maximum size of aggregate is 12.75 mm. Coarse aggregate confirming to IS 383:1970 have been used. The properties of aggregate are as follows:

TABLE 3: PROPERTIES OF COARSE AGGREGATE

Details	Specific Gravity	Water Absorption (%)	Bulk Density (kg/m^3)
Coarse Aggregate	2.55	0.8	1267.59

d. ADMIXTURE

Super-plasticizer is used as admixture. It is used to produce high workability, segregation resistant, durable and pumpable concrete.

e. WATER

Water is a crucial part of concrete as it reacts with cement and produces gel. Good quality salt free water has been used in concrete.

5. MIX DESIGN

Mix design of M30 grade of concrete is done for the construction of prototype. The w/c ratio was maintained 0.40 throughout the experiment. 10mm aggregate was used for this mix proportion.

TABLE 4: MIX PROPORTION (per m^3)

Mix	C (kg)	F.A (kg)	C.A (kg)
M30	390	653	1135

Where C= Cement, F.A=Fine Aggregate,

C.A=Coarse Aggregate, SP= super-plasticizer

The amount of admixture is 7.8 kg/m^3 and that of water is 156 kg/$m^3$for the desired design mix and W/C ratio is 0.40

TABLE 5: MIX RATIO

	Concrete Design Mix proportions			
	C	**F.A**	**C.A**	**SP**
M30	1	0.38	0.62	0.006

6. EXPERIMENTAL INVESTIGATON

The testing consists of fresh and hardened concrete tests. The fresh concrete tests are done to check the workability of concrete and hardened concrete test are done to check the strength parameters of concrete. The fresh concrete tests are Slump flow test. The hardened concrete tests include compressive strength test.

a) SLUMP FLOW TEST

Slump flow test is conducted for evaluating the workability and flowability of concrete. The test was conducted on concrete mix M30 and following result was obtained.

TABLE 6: SLUMP FLOW

MIX	**SLUMP FLOW (mm)**
M30	66

b) COMPRESSIVE STRENGTH

Compressive strength test is conducted on Compression Testing Machine on cube specimens of 150*150*150 mm dimension. Cubes were casted in cast iron moulds and then moulds were removed after 24 hours. Compressive strength was determined after 7 and 28 days of curing respectively.

TABLE 7: COMPRESSIVE STRENGTH TEST

MIX	COMP. STRENGTH	
	7 DAYS (N/mm^2)	28 DAYS (N/mm^2)
M30	21.78	31.56

c) RESULTS

The value of compressive strength after 7 days and 28 days was found to be 21.78 $N/mm^2$and 31.56 N/mm^2

d) CONCLUSIONS

In terms of technical capabilities to face this challenge, the potential is enormous; it only needs to be judiciously exploited.

MIVAN serves as a cost effective and efficient tool to solve the problems of the mega housing project all over the world. MIVAN aims to maximize the use of modern construction techniques and equipments on its entire project.

We have tried to cover each and every aspect related to aluminum (MIVAN) form construction. We thus infer that MIVAN form construction is able to provide high quality construction at unbelievable speed and at reasonable cost.

Thus it can be concluded that quality and speed must be given due consideration with regards to economy. Good quality construction will never deter to projects speed nor will it be uneconomical. In fact time consuming repairs and modification due to poor quality work generally delay the job and cause additional financial impact on the project.

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