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A STUDY ON COMPARATIVELY USE OF VARIOUS TYPES OF FORM WORK FOR ACHIEVE SUPERIOR CONCRETE

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ABSTRACT
Concrete formwork is the use of support structures and moulds to create structures out of concrete which is poured into the moulds. There are many different types of formwork used in construction, usually differing according to what the building requirements and challenges are. Formwork is used by creating moulds out of wood, steel, aluminium or prefabricated forms into which the concrete is poured. This is then allowed to harden and set after which it is stripped, or in the case of stay-in-place formwork it is left as part of the structure. Formwork allows contractors to cast and construct the main parts of a building which are required to be strong and support the structure such as floors and walls, as well as smaller parts of a building such as stairs relatively quickly. And now in modern era consumer is using or choosing formwork based upon the maximum possible uses, cost, and its maintenance. For adopting formwork with making mixing of two different materials which is suitable to condition, it is beneficial for the construction work. By combining two different materials we can save erection and dismantle time and primary cost and maintenance cost.

KEYWORDS: Steel Formwork, Aluminium Formwork, Wooden Formwork, Cost, Safety

INTRODUCTION
Formwork is a die or a mould including all supporting structures, used to shape and support the concrete until it attains sufficient strength to carry its own weight. It should be capable of carrying all imposed dead and live loads apart from its own weight Formwork has been in use since the beginning of concrete construction. New materials such as steel, plastics and fiber glass are used in formwork. Greater attention is being given to the design, fabrication, erection and dismantling of formwork as a structure, Temporary which is designed to contain fresh fluid concrete. Form it into the required shape and dimensions. Support it until it cures sufficiently to become self-supporting.
TYPES OF FORMWORK

The material most commonly being used to date is timber. However, due to the depleting forest reserves and increasing cost of timber the use of alternate materials such as plywood and steel has become prominent. More recently, materials such as plastics and fiberglass are also being used for pre-fabricating formwork. The type of material to be used depends on the nature of construction as well as availability and cost of material. The constraints on the project such as overall cost, time of completion also play a major role in the use of a particular material for formwork.

A. TIMBER FORMWORK

Timber is required for practically all jobs of formwork. The timber bring used for formwork must satisfy the following requirements. It should be durable and treatable. It should have sufficient strength characteristics. It should be light weight and well seasoned without warping. It should hold nails well. It is economical for small construction jobs. It is design flexible and easy to erect. It has good thermal insulation which makes it useful to be used in colder Regions. It can easily be made into any shape or size. And it is easy for transporting purpose for in between sites.

Figure 1: Timber Formwork

Source: http://personal.cityu.edu.hk/~bswmwong/photo_lib/Formwork/image1_s.jpg

B. ALUMINIUM FORMWORK

Forms made from aluminum are in many respects similar to those made of steel. However, because of their lower density, aluminum forms are lighter than steel forms, and this is their primary advantage when compared to steel. As the strength of aluminum in handling, tension and compression is less than the strength of steel, it is necessary to use large sections. The formwork turns out to be economical if large numbers of reuses are made in construction. The major disadvantage of aluminum forms is that no changes can be made once the formwork is fabricated.
C. STEEL FORMWORK

Mostly used in large construction projects or in situations where large number of re-uses of the same shuttering is possible. It is suitable for circular or curved shaped structures such as tanks, columns, chimneys etc. & also used for structures like sewer tunnel and retaining wall. Strong, durable & have longer life. Reuses can be assumed to vary from 100 to 120. Wares timber varies from 10 to 12. Steel can be installed & dismantled with greater ease & speed resulting in saving in labour cost. Excellent quality of exposed concrete surface obtained. No danger of formwork absorbing water from the concrete and minimizing honeycombing.

D. PLASTICS FORMWORK

These forms have become increasingly popular for casting unique shapes and patterns being designed in concrete because of the excellent finish obtained requiring minimum or no surface treatment and repairs. Different types of plastic forms are available like glass reinforced plastic, fiber reinforced plastic and thermoplastics etc. The material allows greater freedom of design. Unusual textures and designs can be molded into the form.

It allows the contractor to pour structural and finished concrete simultaneously. Because sections can be joined on the job site in such a way so as to eliminate joints, there is no size limitation. If carefully handled, a number of reuses are possible making it highly & Economical. It is lightweight and easily stripped. The disadvantage of using plastic forms is that it does not lend itself to field fabrication hence, the design and planning of this form must be carefully carried out. Also care must take not to damage the plastic by the heat applied for
accelerated curing of the concrete. Trough and waffle units in fiberglass are used in construction of large floor areas and multistoried office buildings.

Figure 4: Plastics Formwork

Source: http://upload.wikimedia.org/wikipedia/commons/a/a1/Moladi-Re-useable_Plastic-Formwork.jpg

ESSENTIAL CONSIDREATION SELECTION OF FORMWORK

A. STRENGTH:
Formwork must be capable of safely withstanding without distortion or danger the dead weight of the fluid concrete is placed on it, labour weight, equipment weight and any environmental loadings.

B. RESISTANCE TO LEAKAGE
All joints in form work must be either close fitting of covered with form tape to make them grout tight. If grout leakage occurs the concrete will leak at that point. Leakages cause honeycombing of the surface.

C. ACCURACY
Formwork must be accurately set out so that the resulting concrete product is in a right place and is of correct shape and dimensions.

D. EASE OF HANDLING
Form panels and units should be designed so that their maximum size does not exceed that which can be easily handled by hand or mechanical means. In addition all formwork must also be designed and constructed to include facilities for adjustments, levelling, easing and striking without damage to the form work or concrete.

E. FINISH AND REUSE POTENTIAL
The form face material must be selected to be capable of consistently imparting the desired concrete finish (smooth, textured, featured or exposed aggregate etc.) At the same time it should also achieve the required number of reuse.

F. ACCESS FOR CONCERTED
Any formwork arrangement must be provide access for placing of the concrete. The extent of this provision will be dependent on the ease of carrying out the concrete operations.
G. ECONOMY

All the formwork is very expensive. On average about 35% of the total cost of any finished concrete unit or element can be attributed to its formwork; of this just over 40% can be taken for material for formwork and 60% for labour. The formwork designer must therefore not only consider the maximum number of times that any form can be reused, but also produce a design that will minimize the time taken for erection and striking.

SAFETY & HAZARDS IN FORMWORK

A. HAZARDS IN FORMWORK

Generally hazards occur due to incorrect or incomplete Formwork Design, Erecting Frames and Bracing, Erecting Bearers and Joists Placing Deck and Beam Formwork. Climbing up To or down from Formwork, Usually by Ladders Working at Height with Unprotected Edges on Platforms, Falling Through Gaps And Holes in Formwork, Falling From Incomplete or Badly Designed Formwork, Hit By Formwork Components, Carrying Heavy Loads, Struggling With Awkward Shapes, Fitting Damaged Connections and Components and Handling Sharp Objects and Corrosive Materials, Working in Harsh like Sunny, Cold, Wet, Windy, Dusty, Noisy Environments. Uneven, Sloping and Cramped work surfaces over loading of Formwork in addition to these, Dangers May Also Arise From Inadequate Supervision, Material Flaws Etc. To Cover All These In A Paper Would Be An Onerous Task. Above causes are the main reasons for hazards.

A. BASIC SAFETY FOR FORMWORK

Risk assessment and control, before work starts safe work procedure for every activity at the workplace which may involve in risk should be available. Permit to Work for all hazardous activities such as work at height with all safety equipments. Construction in a worksite, every open side or opening into or through which a person is liable to fall more than 2m, shall be covered or guarded by effective guard-rails, barriers or other equally effective means to prevent fall. Construction any formwork structure that exceeds 9m in height or consists of any formwork which is supported by shores constructed in 2 or more tiers or consists of any formwork where the thickness of the slab or beam to be cast in the formwork exceeds 300mm.
COMPARITIVE ADVANTAGE & DISADVANTAGE

<table>
<thead>
<tr>
<th>Item</th>
<th>Wood formwork</th>
<th>Steel formwork</th>
<th>Plywood formwork with steel frame</th>
<th>Aluminum formwork</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>30 (KN/m²)</td>
<td>65 (KN/m²)</td>
<td>50 (KN/m²)</td>
<td>60 (KN/m²)</td>
</tr>
<tr>
<td>Difficulty</td>
<td>Easy</td>
<td>Difficult</td>
<td>Average</td>
<td>Easy</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Low</td>
<td>Quite High</td>
<td>Average</td>
<td>High</td>
</tr>
<tr>
<td>Application</td>
<td>Wall, column, beam, Slab, bridge</td>
<td>Wall, column, beam, Slab</td>
<td>Wall, column, beam, Slab, bridge</td>
<td>Wall, column, beam, Slab</td>
</tr>
<tr>
<td>Recovery value</td>
<td>Rough</td>
<td>Smooth like dry wall</td>
<td>Smooth finishing</td>
<td>Smooth finishing</td>
</tr>
<tr>
<td>maintenance costs</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

INNOVATIVE IDEAS FOR COMBIND FORMWORK

In current scenario, consumer selects and uses formwork based upon the main criteria like primary and maintenance cost, Erection and Dismantling time, Easy in handling and maximum possible uses. Now by combining formwork with two different materials for vertical planks, kickers, wall panels, rockers etc. Now combining wooden and steel in vertical plank which beneficial with cost easy transportation and more durable and easy in handling during erection and dismantling. In vertical plank half section taken of a steel and half section of wooden so that it reduce the self-weight compare to steel and also we can adjust the relative suitable height for construction also at the time of storing in minimum space we can store also. And also if we are preparing some flexible section than also we can adopt various heights of components in steel and fix it.

CONCLUSION

Selection of formwork system is depending on the project type and project requirements. The structure form of the building is one of the critical factors to determine the choice of formwork because of various selection criteria and it is depends upon the past experience of the consumers. Also selection of formwork is critical issues for the users. But some times for reducing cost of temporary structure we have to implementing such types of tricks. By combining two or more material in one section it will be helpful for achieving cost affective formwork.
REFERENCES


