

Comparative Study between Different Types of Formwork

Rabi Das, Indranil Bhattacharya, Raja Saha

Lecturer Civil Engineering Department, Technique Polytechnic Institute, Hooghly, West Bengal, India

Abstract— Formwork by name means “The Mold” which means it is the casing into which the casting material, usually concrete, is poured to obtain the desired structural shape. In construction industry formwork is similar to a mold to cast concrete member in different shape and sizes using different types of materials such as timber, steel, aluminum, plastic, etc. Shuttering is a synonym term used for form-work. Form work should have sufficient strength to carry dead load and live load coming on it during casting operation and after that till concrete gets hard and gain some percentage of design strength.

Keywords— Timber formwork, Plywood forms, Steel formwork, Aluminum shuttering, Plastic formwork.

I. TYPES

Various types of shuttering used in construction industry are listed below:

1. Timber Formwork

The Timber formwork is one of the mostly used in construction industry, fabricated on site using timber. It is easy to produce but time-consuming for larger structures. Plywood facing has a short lifespan. Timber is easy to fix, remove and lightweight. Timber Shuttering is most flexible type of shuttering; it can be used for any shape and size. Timber shuttering should satisfy the following requirement:

- Lightweight
- Well-Seasoned
- Free from termite attacks
- Easily Workable



Timber formwork in staircase construction

Advantages of using timber forms

- Timber Shuttering is easy to construct for any shape, size and height.

- It is economical for Small projects.
- It can easily be made into any shape or size.
- It can be constructed using locally available timber.
- It is light weight as compared to steel or aluminum Shuttering.

2. Plywood Forms (in combination with timber)

Plywood is an artificially manufactured wooden material available in different thickness and size used in formwork for concrete member. It is strong enough, durable and light weight. Plywood is one of the mostly used materials for sheathing, decking and form linings in shuttering.



Plywood forms in combination with timber

3. Steel Formwork

Steel formwork is now becoming popular due to its long life time and multiple time reuses. Steel formwork is costly but can be used for large number of projects. Steel shuttering give very smooth finishes to concrete surface. It is suitable for circular or curved structures such as tanks, columns, chimneys, sewer, tunnel and retaining wall.

Advantages of steel form-work over timber form

- Steel shuttering is strong, durable & has longer life.
- It gives very smooth finish to surface of member.
- It is waterproof and minimizes the honeycombing effect.
- It can be used more than 100 times.
- Steel formwork can be installed & dismantled with greater ease.



Steel formwork for RC wall



Plastic formwork concrete wall

4. Aluminum Form work

Aluminum formwork is similar in many respects similar to those made of steel. Aluminum forms are lighter than steel forms due to low density and this is their primary advantage when compared to steel. The shuttering is economical if large numbers of repeating usage are made in construction. The disadvantage is that no alteration is possible once the formwork is constructed.



Aluminum shuttering in roof slab casting

5. Plastic Formwork

Plastic form work is a lightweight modular, interlocking system and can be used more than 100 times. It can be used for simple concrete structures. This type of shuttering is becoming popular for similar shape and large housing scheme.

Advantage of plastic form work:

- It is light weight shuttering hence requires less handling cost.
- It can be used for large section.
- If carefully transported and used, multiple reuses are possible making it highly economical.

6. Fabric Formwork

Fabric formwork is emerging technology in shuttering industry for construction of irregular shape and complex member. The flexibility of this material makes it possible to produce concrete at any shape.

7. Coffor Formwork

Coffor is a stay in place formwork system. It is composed of two filtering grids which is reinforced by vertical stiffeners and linked by articulated connectors which can be folded to transport on site. Coffor remains in place after concrete is poured and acts as reinforcement. Coffor is transported to the site prefabricated from the factory. This type of shuttering can be used for any type of structure like houses, multistory buildings etc.

II. TYPES OF FORM WORK BASED ON STRUCTURAL MEMBER

1. Wall Formwork

Wall formwork used for concreting of shear or RCC wall in dams, wing walls, basement rcc walls etc. Wall shuttering made up of vertically arranged upright timbers (bearers) to which plywood sheeting boards are nailed at the inner side. The upright timbers are diagonally braced with the help of boards at both sides.

2. Beam Formwork

Beam is the most important member in RCC framed structure. Beam formwork has prefabricated form work includes sheeting bottom and side sheeting panels. The individual parts of form-work are manufactured based on the beam size. For prefabrication of the sheeting parts, a table for fabrication must be manufactured on site.

3. Foundation Formwork

Foundation formworks designed according to foundation type. Shuttering design for foundation depends on foundation type like footing, combined footing, raft. Basically there is a difference in the design for individual foundations, and

shuttering for strip foundations. The design of shuttering is dictated by the size, mainly by the height of the foundation.

4. Column Formwork

Formwork arrangement for column may differ on the basis of column outline like rectangular, circular, and hexagonal or any other shape. The sheeting of column shuttering is constructed according to the column dimensions. The panels are placed in a foot rim, anchored in soil with the help of bolts.

III. FORMWORK STRIKING PROCEDURE

- Ease all supports by 1-2 turns for each prop
- Starting from mid-span, remove the props towards columns or walls
- This will ensure no negative hogging bending moment induced in the concrete slab if the last few supports were left at the mid-span as intended in the original design.
- Cracking due to reverse
- bending will occur otherwise

STRIKING OF PLATFORM



Striking of all forms can be done within 10-15 hours. The only tool required for dismantling is hammer.

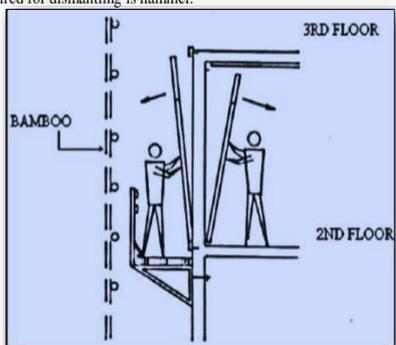


Fig.4 - Striking of Platform

Image Courtesy: Google

IV. CONCLUSION

After detailed study about formwork we have come to know that there are various types of formwork which are functionally same but it has a great impact on economy i.e on the cost of the project. If we use aluminum formwork, it can be used several times with the benefit of reduction in cost of use in each time. A rough estimate of cost deduction for the use of several times given below

Number of Uses	Cost Per Square Foot of Contact Area
1	1.00
2	0.62
3	0.50
4	0.44
5	0.40
6	0.37
7	0.36
8	0.34
9	0.32

Though the initial cost is very high but alumina shutter is more and more economical than others.