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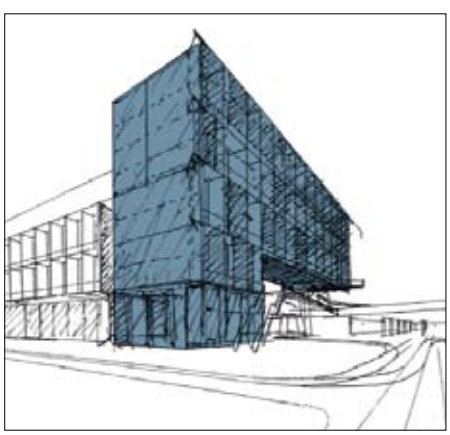
ALUMINIUM FORMWORK- AN INNOVATION IN CONSTRUCTION TECHNOLOGY

A Breakthrough in Affordable Mass Construction Sector
Fast, Simple, Adaptable and Cost Effective



Construction Industry

Construction is one of the significant sectors of Indian economy and is an integral part of the development. Today India's urban population is the second largest in the world and its future development leads to increased demand for housing .To cope with this problem India should desperately need to plan for acquisition of land and rapid creation of dwelling units.

Keeping in view the gigantic task of providing affordable shelter to masses, *adoption of a cost – effective technology* assumes greater significance. As a result of experimentation of innovate construction techniques and modern construction management it is now possible to achieve an *overall saving to the extent of 10% in the total cost of housing construction compared to the cost of traditional housing.*

Innovations in Construction

The traditional mode of construction for individual houses comprising load bearing walls with an appropriate roof above or reinforced concrete (RC) framed structure construction with infill masonry walls would be totally inadequate for mass housing construction industry in view of the rapid rate of construction. Further, such constructions are prone to poor quality control even in case of contractors with substantial resources and experience. "For undertaking mass housing works, it is necessary to have innovative technologies which are capable of fast rate construction and are able to deliver good quality and durable structure in cost effective manner".

Fortunately some of the advanced technologies catering to faster speed of construction are already available in the country. e.g. prefabrication, autoclaved blocks, tunnel formwork, aluminum formwork etc.

Present technologies available in India

1) Prefabrication Technology
2) Formwork Technology
3) Outinard Technology
4) Precast Technology

Formwork

Formwork usage has become very extensive in construction industry, thanks to the advantages it offers in terms of quicker execution and better results. Indian construction industry has started using some of the world class technologies. Several formwork systems are in use at different places in the world; eventually the systems which are reasonably economical and easy for operation with semi skilled labour are more useful in India.

CLASSIFICATION OF FORMWORK

a) According to size.
b) According to location of use.
c) According to materials of construction.
d) According to nature of operation.
e) According to brand name of the product.

Leading players in this industry are Doka, Mascon System, MFE Formwork Technology (Mivan), Meva, Waco, Forming Access and Support, Inc (FASI), Peri, BSL Scaffolding, Uday Structurals & Engineers, Paschal and Pranav Construction Systems.

In this article we are listing about aluminum formwork system. Different systems have their own advantages but one needs to choose a formwork which best supports individual project requirement.

ALUMINIUM FORMWORK TECHNOLOGY

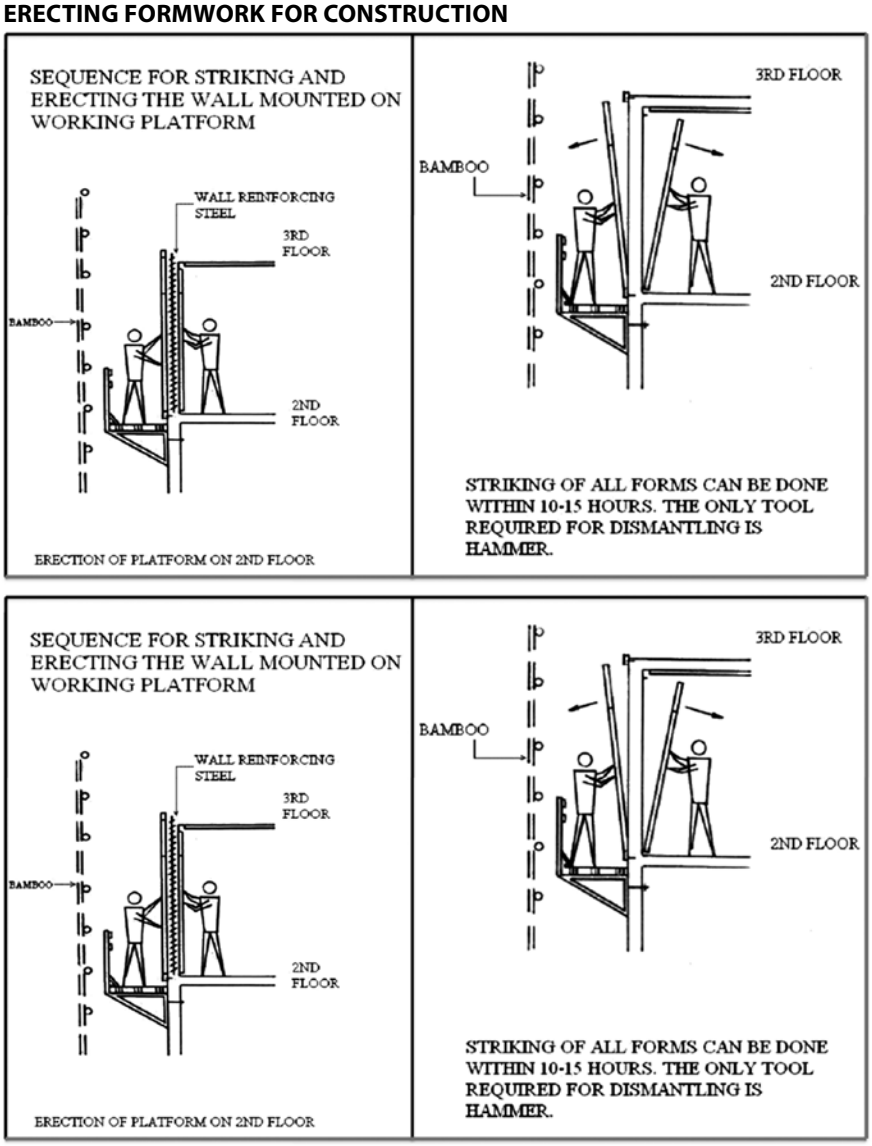
This technology is a revolutionary construction system, which has been quite extensively used in India. Using this unique formwork, walls, floor slabs, columns, beams, stairs, balconies together with door and window openings are cast in place

In India there are number of buildings constructed with the help of the above system which has been proved to be very economical and satisfactory for Indian Construction Environment

in a single site based operation. The resulting building structure is very strong, accurate in dimensions and tolerances, with a high quality of finished concrete surface. It is fast, adaptable and very cost effective. Formwork technology makes use of concrete as the principal building material for the prime reasons of cost and accessibility. It can construct all type of concrete structures.

The basic element of Formwork technology is the panel which is a framework of extruded aluminium sections, welded to an aluminium sheet. The panels are made from a high strength aluminium alloy, with the face or contact surface of the panel, from 4mm thick plate, which is welded to a framework of specially designed extruded sections, to form a robust component. It can be reused over 250 times, the initial cost appears high; however the ultimate cost per sft of forming area is less when compared to traditional methods.

ERECTING FORMWORK FOR CONSTRUCTION



The aluminium formwork provides an integrated scaffolding system which reduces the cost of scaffolding requirements. The mechanical and electrical installation is simplified as conduits are embedded in the structure by precise engineering of outlets and service ducts

The advantages of this System

1) Total system forms the complete concrete structure.
2) Custom designed to suit project requirements.
3) Unsurpassed construction speed.
4) High quality finish.
5) Cost effective.
6) Panels can be reused up to 250 times.
7) Erected using unskilled labor.

ECONOMICS OF MIVAN FORMWORK

Description	Construction Speed			
	A	B	C	D
Construction speed	3 flats/day	4 flats/day	5 flats/day	6 flats/day
Period of const.	23 months	18.7 months	16.2 months	14.2 months
Forming area	741.9	989.2	1236.5	1483.8
Misc formwork	55.5	55.5	55.5	55.5
Total formwork to be ordered	797.4	1044.7	1292	1539
Cost of formwork	14353200	18804600	23256000	27707400
Two third of the loaded cost	9568800	12536400	1550400	18471600
Profit & Overhead 15%	1435320	1880460	2325600	2770740
Total Rs.	11004120	14416860	17829600	21242340
Cost per flat, Rs	9825	12872	15919	18966

Formwork Technologies in India

Architects & developers are constantly looking for new technologies to achieve their goal. Many established architectural firms & housing development companies are using this technology. Many leading architectural firms are playing vital role in the country in bringing this technology to frontline.

Architects, planners, engineers are aiming at using this advance construction technologies to accelerate the speed & quality of construction. After an extensive research in this subjects, this solution was brought forward which will be beneficial with multiple repetitive units, like apartments, affordable houses, large scaled gated communities etc. Use of this technology in India will certainly help to increase awareness as well as the usage of system formwork.

Case Study of Buildings Using Formwork Technology

GREEN WOODS for LDA@ LUCKNOW.

Scope: 700 units

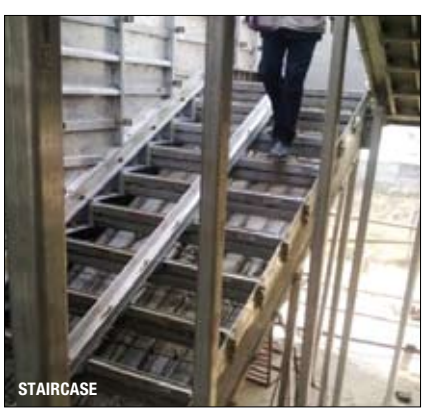
Design: concrete walls.

System formwork: 6000 sq.mt.

Project Type (s): High rise residential building.

Architectural consultancy: Team One India Pvt Ltd, Hyderabad

This affordable group housing in Gomti Nagar, Lucknow is designed with regular shapes, symmetry. Typical floor plan is followed considering all possible spatial needs. The Targeted Buyers are of Income range: 15,000 to 20,000 rupees (monthly house hold income) Middle Income Group.



Deshuttering of the panels

Stilt form in conventional style

Wall panels fixed with pins

On removal of the formwork mould a high quality concrete finish is produced to accurate tolerances. The high tolerance of the finish means that no further plastering is required.

- **Complete concrete structure**
- **Cost effective**
- **Erected using unskilled labor**
- **Because of small sizes panels finishing lines are seen on the concrete surfaces which can be treated with required finishings**
- **Large volume of work is there, which makes the project cost effective**

ELEVATION- WORK IN PROGRESS

CONSTRUCTION & FINISHING WORK IS DONE BLOCK AFTER BLOCK

Thus the project architect has concluded that quality and speed must be given due consideration with regards to economy

SEMI CONSTRUCTED HALL

KITCHEN AT CONSTRUCTION STAGE

Buildings are constructed quickly and easily by unskilled labour with hammer being the only tool required. The result is a typical 4 to 5 day cycle for floor – to – floor construction.

The project is completed not only on stipulated period of time but also paid off with its attributes.

Speedy & quality dwelling units were provided to the people of middle income groups at very reasonable costs

ELEVATION IN THE PROCESS OF FININSHING

By the time construction of one block starts other block will be ready to occupy

Spaghetti complex Mumbai Kharghar

Location: Navi Mumbai
Project Type: Residential building
Architect: Hafeez Contractor
Design: Load Bearing wall & slab
Cycle: 4 days per floor
System formwork: 6000 sq.mt.

JAYPEE GREENS SUN COURT, GREATER NOIDA

ORCHID WOODS, GOREGAON(E), MUMBAI

Buildings Constructed with Aluminum Formwork Technology in India

COMPARATIVE ANALYSIS

	FACTORS	FORMWORK	CONVENTIONAL
1	QUALITY	Superior (in housing)	Normal
2	SPEED OF CONSTRUCTION	Fast, as wall & floor cast together and curing overnight	Slow due to step by step completion
3	AESTHETICS	Smooth finish clean lines	Column – Beam show slight Projection
4	EXTERNAL FINISHES	No frequent finishing required (permanent facia finishing)	Finishing requires in every 3 years
5	RAW MATERIAL	Some what more than Conventional	Normal
6	MAINTENANCE	Repairing & finishing not required frequently	Repair & maintenance for plane walls, ceilings. Painting of outer & Inner walls.
7	COST	Less	Standard
8	TIME	Fast	14 – 21 days curing process

OUT LINE:

1) **Mass housing with repetitive design**
2) **Cost effective**
3) **Time saving**

Conclusion:

Architects & engineers not only build but also enhance the quality of life. Their creativity and technical skill help to plan, design, construct and operate the facilities essential to life.

It is the need of time to analyze the depth of the problem and find effective solutions. Formwork technology serves as a cost effective and efficient tool to solve the problems of the mega housing project all over the world. It aims to maximize the use of modern construction techniques and equipments on its entire project.

This technology has great potential for application in India to provide affordable housing to its rising population.

Thus it can be concluded that quality and speed must be given due consideration with regards to economy. Good construction will never put off 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. Thus, we can conclude that the overall cost of the project using aluminium formwork technology is lesser when compared to project using traditional methods.

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