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A Comparative Study of Aluminum Form Work (MIVAN Shuttering) with other Conventional Form Work

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Abstract: ***A commonly used timber and MS shuttering is very heavy and is difficult to use for work at large level, where the Aluminium Shuttering is light in weight and can be used in industry for construction of Structural members of the building including the walls. This Aluminium shuttering is commonly known by the name Mivan shuttering in industry. The Mivan shuttering is revolutionary in construction industry in many phases like this reduces the time of construction, material consumption, construction cost ,increases spaces in buildings and most importantly increases the durability of Structure . The study on these factors is done and compared in such a way that how both shuttering differs each other, also which among the both is efficient in terms of time, cost & strength.***
Keywords: ***MS- Mild Steel, &- and, fig- figure, sqm- square meter.***

I. INTRODUCTION

A commonly used ms shuttering is very heavy and is difficult to use for work at larger level, where the aluminium shuttering is light weight and can be used in industry for construction of structural members in a building including walls. this aluminium shuttering is commonly known by the name MIVAN shuttering. MIVAN shuttering is an aluminium shuttering which is developed by construction company situated in Europe. In 1990, a company in Malaysia named as the MIVAN company ltd. started to manufacture these shuttering. In present, more than 30,000 sqm of shuttering from MIVAN company ltd. is used throught the world. There are many buildings in India at present, which are being constructed using the MIVAN shuttering. MIVAN shuttering is proven cheap in expenditure as well as satisfactory for the construction environment in our country. One of the best examples is xrbia which uses MIVAN shuttering to achieve dream “a house for every Indian”. The technology is widely used in middle east, Asia and other parts of the world. MIVAN technique is good to construct a room in one time so in very less time large number of houses can be constructed. In this shuttering type floor, walls, straircase, beams all are constructed in monolithic system at the continuous pour of concrete is done at same time. Using hot air curing and other construction technique the construction speed can be increased be early removal of forms. Shuttering of each floor walls and slabs are erected at site during construction. These shuttering are fabricated with accuracy and easy to transport due to its light weight. The ready mix concrete is prepared generally at site under quality control and transported to building location. The shuttering for windows, doors and ducts for the services are placed in the position before concreting. In this shuttering type staircase fights, chajja and other members are constructed monolithic with the system. Good quality MIVAN shuttering panels ensure the consistency of dimensions. After removing the shuttering a good quality finished surface will obtain with minimum tolerance and verticality. No further plastering is required for tolerance of the finish.

II. MIVAN SHUTTERING

MIVAN shuttering is an aluminium shuttering which is developed by construction. It is depends on 3S System of Construction i.e. Speed, Strength, Safety. Uses, advantage and disadvantage of this type of shuttering is described in this section.

A. Uses of MIVAN Shuttering

1) Column and beam construction are wiped out
2) Walls and slabs are cast in one task
3) Simple to deal with because of light weight pre-engineered aluminium forms, specially designed shuttering
4) Fitting and erecting the area of shuttering
5) Walls and slabs concreting can be completed together

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B. Construction Methods of MIVAN Shuttering

1) *Setting Up The Wall Strengthening With Steel:* The wall strengthening with steel is used to give a structure to the building and support the concrete until the point when they increase half of the required strength. The aluminium shuttering are cast around the steel mesh, Which is industrial facility and directly erected on the development site.

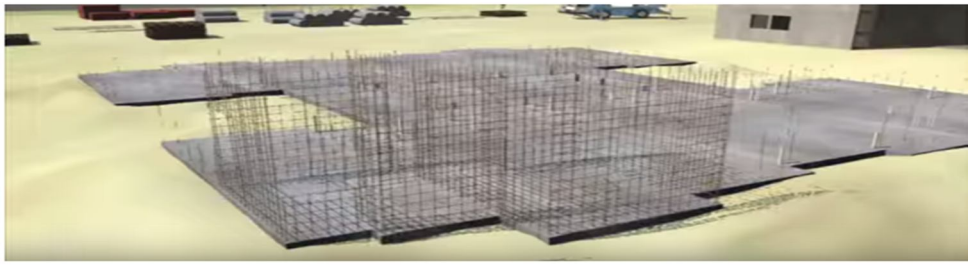

Fig. 1 Wall reinforcement steel

2) *Placement of Aluminium Shuttering:* Along the wall strengthening with steel, pre-assembled room measured walls and floor slabs are erected. These aluminium compound slabs are precisely made and are not difficult to deal with. Spaces for windows, conduits, entryways and different highlights, for example, staircases, façade boards and so forth are coordinated in these structures. The structures are joint together utilizing the stick and wedge framework, which can be destroyed rapidly after the concrete structure is made.

Fig. 2 MIVAN Shuttering Placement

C. Pouring Concrete: After casting the structures, concrete of high quality is poured. This concrete takes the form and mould of the cast, which is later evacuated to clear a path for a structure made totally of cement concrete supported by wall strengthened with steel. The aluminium forms can be reused no less than 250 times, bringing about least waste from the development site.

Fig. 1 Pouring of concrete

D. Merit List of Mivan Formwork

1) MIVAN shuttering requires moderately less work
2) Earthquake resistance in building is more
3) Durability of the building will increase
4) Number of joints and spillages are less
5) Carpet area is high
6) Wall and floor finishing is good with very less tolerances
7) Unnecessary maintenance
8) Completion time is very less

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E. Drawbacks of Mivan formwork

Despite the fact that there are such a significant number of focal points of MIVAN shuttering the drawback can't be ignored. Anyway the constraints don't represent any difficult issues. They are as follows: –

1) Due to couple of little sizes completing lines are seen on the concrete surfaces.
2) Services after completing become marginally troublesome because of the little width of parts.
3) It requires uniform arranging and additionally uniform elevations to be cost effective.
4) Mivan formwork needs the number of wall ties, spacers etc., these create issues of drainage, leakages during monsoon.
5) Because of box-type development, compression breaks are probably appear
6) Due to shear walls high heat of hydration will be produced
7) It is inflexible in configuration once placed, as any alteration becomes tough later.

III. CONVENTIONAL SHUTTERING METHOD

The timber used is a plywood board which is made up of water resistant particles. These plywood boards are used widely at sites where the labour cost is cheaper.

Timber Shuttering is basic material utilized for the conventional formwork due to its ease of use by slicing easily on site. While the life span for this shuttering is not so large. The placing of shuttering is again a task for the workers and the finishing is poor.

A. Merits of Timber Shuttering

1) Simple to deal with because of its light weight.
2) Deconstruction is easy.
3) Broken timber parts can be replaced with new timber parts.
4) It has high thermal resistance quality which makes it good for use in cold atmospheric regions.
5) Decrease man-power at site.
6) Timber shuttering can be manufactured for design life more than sixty years.

B. Drawbacks of Timber Shuttering

1) Can't be used for longer time period and have very less reuse.
2) If the timber used for shuttering is dry, the timber will absorb the water content from the concrete which results to weaken the structural members.
3) If the timber used for the shuttering is wet and having moisture content greater than 20 percent, the shuttering will shrink which results in opening of joints and expulsion of concrete.

IV. COMPARATIVE ANALYSIS BETWEEN MIVAN BUILDING AND CONVENTIONAL BUILDING

The table given below shows the general comparison between both the shuttering types used for building of similar type.

TABLE I
GENERAL COMPARISON BETWEEN MIVAN AND CONVENTIONAL SHUTTERING TYPE FOR SIMILAR BUILDING

Sr. No.	Content	Mivan shuttering	conventional shuttering
1	Grade of Concrete	M 15, M25, M40	M 15, M 25, M30, M40
2	Wall Thickness (in mm)	140,160, 300, 310	100, 150, 160,200, 230
3	Steel Diameter (in mm)	8,12,16,25,32	8, 12,16,25
4	Slab thickness (in mm)	110, 130, 180, 200	110,130,150,175
5	Number of floors	12	12
7	Total Cost	INR 45000000	INR 54000000
8	Wastage of Shuttering	Very less	More
9	Resistance to earthquake	More	Very less than MIVAN Shuttering

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V. RESULT AND CALCULATIONS

On the bases of study, calculation of both type of shuttering is done. Cost and time taken in completion of building is calculated. Cost is given below and time calculation is given in Table II.

A. Cost of MIVAN Shuttering building

1) Foundation cost of building =INR.6000000
2) Cost of 12 floor plus Ground floor of area 790 Sqm=INR.45000000
3) Total cost of building=INR.51000000

B. Cost of Conventional Shuttering building

1) Foundation cost of building =INR.6000000
2) Cost of 12 floor plus Ground floor of area 790 Sqm =INR.54000000
3) Total cost of building=INR.60000000

TABLE III
COMPARISON BETWEEN TIME OF COMPLETION OF MIVAN AND CONVENTIONAL SHUTTERING TYPE

Type of work	MIVAN Shuttering building (in days)	Conventional Shuttering building(in days)
Excavation	38	37
RCC work	400	348
Brickwork	Nil	150
Internal Plaster	Nil	135
Ceiling POP	Nil	120
External Plaster	Nil	90
Total Time (in days)	438	880

VI. CONCLUSION

Mivan formwork building's cost is approximate 20 percent lesser than the Conventional formwork building's cost. Using the Mivan shuttering the time of construction is reduced to half the time period consumed using the conventional shuttering for a twelve floors building. It can be said that Mivan shuttering is economical and speed up the construction with a quality finished surfaces. Using Mivan shuttering technique we can construct the walls which will act like shear wall and due to these shear walls the time period of building in earthquake conditions will be reduced. As compared with brick walls RCC walls are better in resisting weather conditions, increase carpet area, prevent dampness in building etc.

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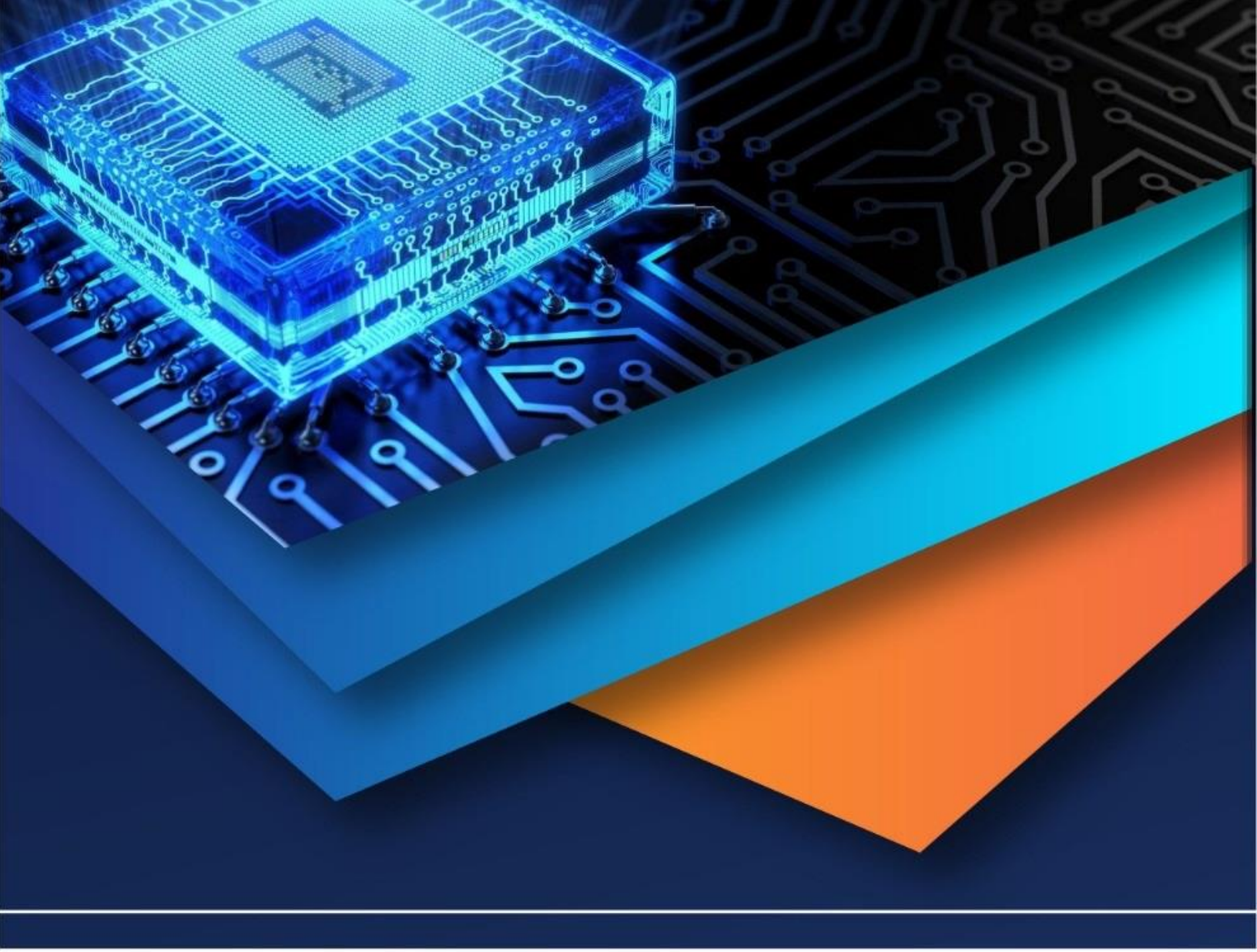

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