TECHNOLOGY PROFILE OF MONOLITHIC CONCRETE CONSTRUCTION SYSTEM USING PLASTIC - ALUMINIUM FORMWORK



Building Materials & Technology Promotion Council Ministry of Housing & Urban Poverty Alleviation Government of India New Delhi

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System in Brief

In this system, instead of traditional column and beam construction; all walls, floors, slabs, columns, beams, stairs, together with door and window openings are cast in place in one operation at site by use of specially designed, easy to handle (with minimum labour and without use of any equipment) modular form work made of Aluminium Plastic composite. Using the formwork system, rapid construction of multiple units of repetitive type can be achieved.

Basic Material	Formwork system	Concrete	Reinforcement	
Requirements	,			
Whether Indian	No	Yes	Yes	
Standard Available	However, IS 14687 : 1999	IS 456:2000	IS 1786:2008	
	Guidelines for falsework for			
	concrete is available.			
	This does not cover			
	requirements by special type			
	of formwork system.			
Specification as per	No,	Yes	Yes	
Indian Standard	Formwork system is			
	propriety system and			
	designed as per requirements.			
If IS not available,	The formwork made of Alumir	nium Extruded	Section conforming	
what is the	to IS 733:1983 and PVC conforming to Grade PVC 67G ER01 of IS			
specification for used.	10151:1982. It consists of different sections including starter of MS			
	Angle, top frame of aluminium channels, wall panels, lab panels			
	& truss.			
			n the structural	
	requirements of building units. Sintex manufactures the			
	formwork in their plant at Kallol. A quality control scheme is			
	followed for quality of raw materials used and formwork			
	<u> </u>		mance Appraisal	
	Certification Scheme, the Formwork has been evaluated and			
	certified by BMTPC.			
Structural	TI M 1:11 C C		1 1 1 11	
	The Monolithic Concrete Construction is considered as shear wall			
Requirements of the	type construction. The maxin	num spacing b	etween cross wall	

Construction	shall be limited to 1.5 times the floor height if supported on two edges and 2.0 times the floor height, when supported on all four walls.	
	Walls are designed for vertical loading in plane shear loading and out of plane loading due to wind load and earthquake forces as per relevant Indian Standard Code IS 875(Pt.3):1987 and IS1893(Pt.1):2002 respectively. For out of plane loading, the plate can be assumed to be supported by floor slabs / diaphragm and cross walls and continuity can be assumed, wherever applicable.	
	The detailing requirement is as per IS 456:2000 code of practice for plane & Reinforced Concrete and IS 13920:1993 Code of Practice for ductile detailing of reinforced concrete structure.	
	A Guideline on Monolithic Concrete Construction with material requirements & design aspects has been prepared and circulated to manufacturer & user agencies by BMTPC.	
Durability	Durability of concrete structure can be achieved by using proper ingredient, Grade of concrete & mix design as per IS 456:2000.	
	Thickness of the wall is generally 100 mm with the reinforcement placed in the middle. Therefore adequate cover is likely to be maintained.	
Thermal Behaviour of Structure	100 mm RCC Walls and Roof has thermal transmittance value as 3.59 W/m ² k) (as per IS 3792:1978)	
	Since, it is more than brick wall, it is advised that implementing agency shall ensure proper planning for air ventilation provisions in housing units.	
Acoustic	Average Sound reduction for 100 mm concrete is ≥ 45db (as per IS1950:1962)	
Ease of fixing services	All electric and plumbing fixtures, lines has to be pre-planned and placed before concreting is done. Post construction alternation is not durable.	
Scale of Economy	Scale of economy depends upon the volume of work and number of repetition of the formwork. For very small project of less than 500 units, this may not be economical. Minimum 100 repetitions are desirable.	

Other features	 Pre designed formwork acts as assembly line production and enables rapid construction of multiple units of repetitive type. A Slab cycle of 3 days can be achieved, which reduces the construction time considerably. Not much saving in construction in one storey structure.
Limitation	 A lead time of about 3 months is required for initiation of work, as the formwork are designed and manufactured. Post construction alterations are not possible. All the service lines are to be pre-planned in advance.
Major Project	1) 5008 No. of houses at Kanjhawala Narela, Delhi for DSIIDC.
Completed	 512 No. of houses in Bawana, Delhi for DSIIDC. 3000 houses in Ahmedabad for Ahmedabad Municipal Corporation at Ahmedabad. 3000 houses in Lucknow for Lucknow Development Authority & other project in major Indian Cities.

Standards/Guidelines referred:

IS 456:2000	-	Code of Practice for plain and reinforced concrete.
IS 733: 1983	-	Wrought Aluminium and Aluminium Alloy Bars, Rods
		and Sections (for General Engineering Purposes)
IS 875 (Pt.3):1987	-	Code of Practice for Design Loads (Other than
		Earthquake) for Buildings and Structures - Part 3 : Wind
		Loads
IS 1786:2008	-	High strength deformed steel bars and wires for
		concrete reinforcement-
IS 1893 (Pt.1):2002)	-	Criteria for Earthquake Resistant Design of Structures -
		Part 1 : General Provisions and Buildings
IS 1950: 1962	-	Code of practice for sound insulation of non-industrial
		buildings
IS 3792: 1978	-	Guide for heat insulation of non-industrial buildings
IS 10151:1982	-	Polyvinyl Chloride (PVC) and its Copolymers for its
		Safe Use in Contact with Foodstuffs, Pharmaceuticals
		and Drinking Water
IS 13920: 1993	-	Ductile detailing of reinforced concrete structures
		subjected to seismic forces - Code of practice
IS 14687:1999	-	Guidelines for falsework for concrete structures
BMTPC Guidelines:	-	Guidelines on Monolithic Concrete Construction
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