GUIDELINES FOR OPTIMAL UTILIZATION OF ALUMINIUM FORMWORK

Change History

Policy No.	Version	Issued by	Issued on	Reviewed by	Approved by
STR 10	1	Structural Design	11 May 2021		
STR 10	2	Structural Design	31 Mar 2022	COO – UT Region, Procurement – Civil, Material Management Head, Lodha QA Team	MD, HoC – Structure Design
STR 10	3	Structural Design	31 Jul 2022 & 16 Sep 2022	Operations Committee	HoC – Structure Design COO – UT Region

Background

Company purchases large volume of formwork (aluminum, jump form etc.). However, due to lack of focus in upstream design and poor handling at sites, the utilization of formwork has been much lower than anticipated leading to increased costs for the company.

HoC – Structural Design will be responsible for ensuring highest level of utilization of formwork such that its investment cost is fully recovered.

A decision is made to shift to component – based approach from the existing typology – based approach of managing aluminum formwork inventory. Central Formwork Yard (CFY) at Upper Thane is setup and will have the necessary infrastructure for refurbishment, storage and modifications. A sub-facility (planned 2 – 3 year timeframe) is being created at Palava site for utilizing the existing stock and storing formwork.

Both formwork yards shall be overseen by HoC – Structural Design with a specialist team under him. The COO of the UT region will be accountable for the efficient operations of the yard and ensuring that the theft is kept to nil and scrap sales happen as per norms and in timely manner. HoC – Structural Design along with the COO of UT & Palava Region will be sole decision maker regarding this policy.

Process Standardization:

Architectural Design	1.0 Design Standardization for Formwork Efficiencies.pdf
Modularity Guidelines to New Vendors	2.0 Vendor Aluform Design Guidelines.pdf
Guidelines to Modification Vendors	3.0 Lodha Aluform Modification Guidelines.pdfShell
Drawings to Modulation Drawings	4.0 Drawing Management.pdf
CFY Operations & Organization	5.0 CFY SOP.pdf (under revision)
Scrapping Guidelines	6.0 Aluform scraping criteria.pdf

Policy Outline:

This policy should be read in conjunction with the above listed six documents.

1. New Formwork Target Costs (per sq.m. per repetition): Formwork cost is arrived at as **Purchase Cost** (PC) plus **Life Cycle Maintenance** (LCM) costs. LCM varies with number of storyes in the building and planned building repetitions. Budget Costs for new aluminum formwork are based on 80 repetitions with LCM cost premium added to Purchase costs as per the table below:

Life Cycle Maintenance Cost (LCM)

No. of Storeys	Planned No. of Buildings				
	1	2	3	4	5
15	69%	34%	23%	17%	0%
20	52%	26%	17%		
25	41%	21%	14%		
30	34%	17%	0%		
35	29%	15%			
40	26%	0%			
45	23%				
50	21%				

Suggested Formwork Type

Modified *New*

Cost of Formwork (INR per sqm per repetition)

No. of Storeys	Planned No. of Buildings				
	1	2	3	4	5
15	251	200	183	174	149
20	225	187	174	149	
25	210	179	169		
30	200	174	149		
35	192	170			
40	187	149			
45	183				
50	179				

Purchase Cost (as on 2021)	*11,880*
No. of Repetitions	*80*
0% LCM Premium case Rs	*149*

Example: 25 storey typology with 2 planned buildings in sequence -number of floor repetitions = 50. Modification is needed for the balance 30 repetitions. LCM Premium Rs 1530 is charged on first 50 repetitions. Budget cost = (11880x50/80 + 1530) = Rs 179 (LCM premium 21%) per sq.m.

2. Life Cycle Maintenance (LCM) costs (Modification Premium) gets credited to CFY budget to cover the expenses towards CFY overhead, Cleaning + Lacquering, Modification Charges for formwork reuse.

3. For a new building, a decision on new formwork or modified formwork or a hybrid model will be taken based on the above suggested framework by HoC – Structural Design and COO of UT region in consultation with respective project COO. In case of disagreement, the decision of unit CEO is final.

4. To achieve optimum cost, Design Standardization for Formwork Efficiencies shall be followed. Major deviations to the Design Standardization guidelines shall need approval from Chief Designer.

5. No changes to the shell drawings shall be accepted after the coordination and approval from architect/structure/CM team. That means request for changes post approval of Shell Drawings shall not be entertained.

6. Scrap Criteria – Each component entering into CFY will be examined for warping, surface unevenness, weld separation and other deficiencies. Necessary instrumentation will be kept in place for this purpose. Until such time manual inspections will continue. 15% of scrap costs will be credited to CFY budget towards service charges.

7. It is recognized that the scrapping criteria for small sized panels shall be different to large size panels. Further, items like GI props, aluminum prop heads, kickers, extrusion items (IC, ICE, MB, EB, SL, DP, RK, SSC and SSCE) need different scrapping/maintenance criteria. On this note, it is assumed that only 75% of the purchased material will get scrapped at the end of 80 repetitions and rest 25% will get scrapped after 160 repetitions. This approach helps in bringing down the embodied carbon in the construction.

8. Present minimum Scrap value at the end of 80 repetitions for 75% materials is estimated at INR 3,564/sqm. For the balance 25% material the asset value at 80 repetitions is estimated as INR 6,646 /sqm. Average increase in asset value = Rs 667/ sqm.

9. Duties of Central Formwork Yard (CFY):
   a) Coordination with CPT, Design, CM Teams on procurement of New Formwork
   b) Preparation of Shell drawings and Modulation drawings
   c) Material Management at Yard – Formwork panels, Props and MS Ancillary items
   d) Coordination with modification vendors and leasing modified formwork to projects
   e) Coordinates with CPT on scrap management and disposal

10. **Budget cost of modified formwork** – CFY arrives at the cost of modified formwork based on unutilized Purchase Cost of the material minus 85% of the scrap value. This value stands at **72% of Purchase Cost** per sqm per repetition (**present value Rs 111**).

11. **Budget costs for Hybrid model** – Future purchases of formwork are likely to be based on component based rather than typology based. In the hybrid model, CFY recommends use of certain percentage of new components and balance from the material at yard. The target costs for hybrid model will be based on weighted average of the two materials.

12. CFY will charge to the respective unit COO for any FW components required for miscellaneous works on the basis of modified formwork costs. Cost of shifting formwork (from site to yard and vice versa) to be borne by the project.

13. Modification vendors will assemble the FW at site and also will provide the assistance to the civil contractor for the first two repetitions. Cost of transfer of material to and fro from CFY to sites shall be borne by Projects and entered under relevant plant head.

14. Civil Contractor at site shall be responsible for returning the Formwork in clean and good condition to the CFY. Formwork that is not cleaned of sticky concrete material will be notified by the CFY controller and deductions will be effected at Rs 270 per sqm. In case of loss of material, the deductions will be made based on the Purchase Cost. Site CM shall be responsible to fill the Pre–Dispatch Check List Form to authorize the contractor to deliver the formwork at CFY.

15. For non-repetitive buildings, CFY and CM Teams need to inspect for quality, cleanliness and reconcile the formwork in use at the last typical floor (terrace) and set the guidelines for the contractor for decommissioning & transfer of the assets in an organized manner to the CFY (instead of dumping at CFY)
16. Purchase costs and scrap values are likely to change from time to time. All the associated costs are related to latest purchase costs and scrap values. CFY will declare LCM premium and modified FW costs 2 times a year.
17. COOs, CM – Heads as well as Structural Design associates will continuously emphasize good handling, cleaning, and good storage of formwork to all CM and MM associates.
18. Refer to Annexure for Formwork Delivery Timelines and process to be followed for every building

ANNEXURE to Policy No. STR10

1. Formwork Delivery Timelines mentioned below needs to be adhered to. CFY shall be able to supply modified or new formwork in 120 or 135 days respectively from the date of finalization of FDD Set by the Architectural & Structural Design Team and Requisition for Formwork

S No	Activity	Modified Formwork		New Formwork		Responsibility	Mandatory Documents
		Days	Cum. Days	Days	Cum. Days		
1	Architectural & Structural Drawings (FDD Set)	0	0	0	0	Architectural Design	Concept Design / FDD Set
	Requisition for Formwork	0	0	0	0	PMO	Singed RFF (Request for Formwork) / Mail
2	Preparation of Shell Drawings	18	18	18	18	CFY	Architectural & Structural Plans
3	Approval of Shell Plan	3	21	3	21	Architectural Design	Mail confirmation from Design to CFY
4	Preparation of Modulation Drawing	24	45	24	45	CFY	
5	New / Modified Formwork Fabrication	57	102	57	102	CPT (New) / CFY (Modified)	Modulation Drawing, Bill of Material, Accessory List
6	QC Inspection of material at yard	1	103	1	103	CFY + Site QC	Modulation Drawing, Bill of Material, Accessory List
7	Palette preparation for zone wise delivery	7	110	7	110	Supplier (New) / CFY (Modified)	Signed of Quality Report / Checklist
8	Delivery of Modified Formwork in phases	10	120	0	110	CFY / Store	Signed Acknowledgement of Documents by CM + Store
9	Delivery of New Formwork in phases	0	120	25	135	Supplier / CFY	
10	Receipt of formwork at site in the designated area	0	120	0	135	CM / Store	
11	First Set up on site	25	145	25	160	Supplier / CFY	As Built Checklist Sign Off for Plinth
12	Feedback from Site post First Slab	15	160	15	175	PMO	Signed Feedback Form
13	Feedback from Site post Second Slab	10	170	10	185	PMO	Signed Feedback Form
14	Closing Report	15	185	15	200	CFY	Closing Report
15	Inspection for Reconciliation before Terrace Casing	As per Schedule		As per Schedule		CM & CFY	Reconciliation Sign Off as per Bill of Material
16	Stripping, Formwork Lowering & size wise component stacking for inspection	As per Schedule		As per Schedule		CM, Site QC	QC Approval for Stripping, BoM, Packing List, Dispatch Schedule
17	Dispatch of used Formwork (Size wise only)	As per Schedule		As per Schedule		CFY & CM	Signed BoM, Packing List, Dispatch Schedule
18	Final Joint Reconciliation at yard	As per Schedule		As per Schedule		CFY & CM	Signed BoM, Packing List, Dispatch Schedule

2. Key Processes to be followed for every building

a) PMO to raise formal request to CFY along with estimated date of closure of shell plan thereby setting the Baseline for delivery of formwork. Central Planning Team shall incorporate required timelines of delivery in the project schedule for any new launches in coordination with the PMO.

b) Revision to shell drawings after it has been finalized will be entertained only based on signed request from the Head of Architecture duly considering the impact of the changes on the construction linked collection milestones. Delivery of formwork will be affected and shall have cascading effect on milestones.

c) Request for changing partitions walls in block or brick into walls with non-structural concrete or vice-versa by CM team will not be considered after the shell plans are finalized.

d) CFY to supply zone-wise material to sites in crates. Material Management team to arrange the loading, transport and unloading arrangement with hydra at CFY & site (dumpers or JCB or tractors are not permitted for loading & unloading). CM to take care of necessary site logistics i.e. availability of dedicated material stacking area near to the vicinity of the tower)

e) CM Team shall take responsibility of sending back the used material to CFY. Reconciliation with civil contractor needs to be done at terrace level followed by component-wise stacking of material at ground for dispatch.

f) Material Management Team at various projects sites will ensure that the formwork material is not shifted from or to the sites without package list.

g) There should not be visible gaps during formwork installation at site to avoid slurry / water leakages. CM team shall ensure that the civil contractor uses Duct Tapes to seal such gaps.

h) CM Teams to ensure that good quality shuttering oil is being used by the civil contractor while installing the formwork.

i) Single point of contact for all matters pertaining to Central Formwork Yard shall be the Head – Temporary Works.