

CONSTRUCTION ALTERNATIVES

S.S.Kalbag
Vidyan Ashram,
Indian Institute of Education,
Pabal, Dist Pune
412 403

1. In our effort to choose construction alternatives for low cost rural applications, we considered the following parameters: 1) cost 2) capital cost 3) suitability for training of unskilled boys 4) amenable for quality check and standardisation. 5) Labour component should be adequate.

The different alternative were to be evaluated on the above criteria, after in use experience has proven its usefulness. Most of the alternatives are still in the development /in use to testes and only broad inlisations available.

2. Soil based Products:

Soil – Block: Soil blocks of 300x140x100 mm by compacting with ASTRAM have been tried. Productivity as also quality were not as per-target (175-200 for 3M/8 hrs) Cost needs to he brought down by avoiding transport of clay.

Soil-cement blocks: Soil cement looks with 5% cement were prepared by using hand moulding process. About 6000 blocks of 300x200x100 have been used. Quality control was difficult. compacting machine to be tried.

Soil Cement concrete: Cement (1 part) Soil (7 parts) and gravel (8 parts) has been used as a concrete and was found very useful and better than soil cement blocks of the same cement usage. We have east walls of 100-200mm thickness and 150-200 mm appears adequate for strength and rigidity and insulation properties. We have used this for steps on the outside and they seem to stand well.

3. Fibre based products?

Cotton –cement: This has been found extremely useful and interesting. It is very hard, sets well, stands water, and can be used for plugging large holes, without shuttering. Balling of the cotton makes it difficult to handle large quantities.

Paper-cement mortars Dry paper pulp (1 part by weight) with cement (6 parts by weight) gives an easy to apply mortar, which cures well, because the paper releases the water slowly, this gives ferrocrete panels, with a good sheen, do not crack easily, do not heat up in sun. These panels have stood well in sun and rain for one year. They don't burn at lower paper proportions than 1:1, but discolour by charring, when a flame is applied continuously. They may also be suitable for window and door shutters if fixed in an iron frame.

Paper-coir-cement: Cast in the form of beams-rigid but not strong enough. Can be drilled or sawed, Need to be developed as wood substitute.

Paper-cement-soil: (1:1:8) was used for making insulating panels for indoor use. Shrinkage is the major problem. Good workability and applicability, Coarse woven jute + cements: Has been made as tray for poultry cages, (for corrosion resistance) and is now in test use. May be suitable for moulded products like We pans, wash basins etc. perhaps with a water proofing resin finish.

4 Ferrosrete:

We have made 1x 0.5 m ferroerete panels with XPM reinforcement, nominal 10 mm thickness. Using 183 mortar. They were prepared on plastic sheet and covered with

Jute bagging wet, for three days and then immersed in curing tank for 1 week. They develop micro cracks, through which damp can be noticed. They have been drilled, out and bolted on angle iron frame and the joints plastered, for low cost housing, Coated with waterproofing cement paint (1 part Assoproof; 2 parts cement) to stop seepage of water.

These have been satisfactory for walls but not for veiling. Curved panels have-been tried but satisfactory shape has not been achieved.

Ferrocete/water tanks have been made and used in house units. Also we have made and used we pans, wash basins and sinks and sinks and kitchen table top. bio-gas plant, drainage channels, etc.,

5 Asphalt Sheets:

Made of paper pulp sheets, impregnated with asphalt, these are light, tough, flexible, do not heat as much as A.C. sheets, are self-sealing and cost only Rs.2.5/sq. ft. If properly anchored with J- hooks they stand weather very well. They might be improved if chicken mash reinforcement could be embedded. We now purchase these sheets but we have also made small samples for development work.

6. Plastics:

He feel plastics have good potential In rural areas; we have made only only a few random attempts to use urea- formaldehyde and phenolformaldehyde and polyester resins. We are intersted in using paper pulp and urea formaldehyde resins for corrugated roofing sheets. Cotton matting with polyester resins for moulded articles (FRP analogs) have been attempted.

7. Angle-iron frame houses:

With a small work shop with only Rs. 7500 investment, one can easily build modular frames that can be assembled to nabs a house in 3-4 days. The wall frames are made from 30x30x30mm anls and corners with 40x40x5 mm. Each frame is 1x2.5m and has three segments for ventilators, windows and for brisk wall with sill at the bottom. Roofing is also angle iron frame with trusses, rafters and purlins. The grid of 20x20x3mm with 30x30x3mm rafters gives good rigidity to the structure, Rigidity of walls is increased by brisk walls upto 1 m height.

8. Doors & Windows: These are still presenting a problem. Panel doors and window shutters, are not only expensive, but also unsatisfactory because of excessive shrinkage, expansion and warping. The labour cost is also more. Block board has been easier to use, is light, looks neat and is entirely satisfactory for indoor use. We are testing out door use with protective coats. Painting of plywood and block board consumes more paint and there-is scope for treatment of these for standing weathering (urea- formaldehyde resins?)

We have tried angle iron frames with paper cement panels for We/bath doors. They are not very rigid (twist) but otherwise satisfactory.

9 Geodesic Domes:

Geodesic domes of angle iron frames with chicken mesh skin and mortared after centering from Inside, may be an approach for reducing cost still further. At present we have used this kind of structure only fora cover for well (7 m dia.) and for a biogas dome.

This brief account should be enough to convince that there is an unlimited scope for innovation in the construction industry in the rural areas.