LOW COST HOWING – VIGYAN ASHRAM APPROACH

At present the types of housing vary from "nearly zero coat" zopadpatti 'built out of scrap, to very expensive urban housing. In this context what do we mean by Low Cost Housing?

We aim at minimizing the cost of housing that would be acceptable to the lower middle class urban and. rural population, who normally lead the society in the adoption of new ideas and products. This housing should be acceptable to lowest wrongs of society twenty years into the future. To day it should be better than what the poorer sections can afford, in existing designs.

The Approach:
A break up of the housing costs indicates the following potential areas for cost reduction.
1. Specifications: area; amenities; strength
2. Choice of materials steel; cement; mud; plastics
3. Design parameters:
4. Productivity
5. Factors of Ignorance
6. Contractors excess profits

Our approach may be called the "Ford T" approach and la as follows:
a) We have chosen 2530 sq. meters area as the minimum a family of the future Indian should have at the end of the century. The amenities should include sanitation and plumbing.
b) After trying mud/cement combinations, we settled for Ferro cement concept but the choice is open for ether materials.
c) We found a lot of scope for reducing material consumption by changing design parameters. The use of the strongest 3-D shape, the sphere, and the strongest 2-D - shape, the triangle, led us to the Geodesic structures. We have still ideas on rectangular structures to be explored.
d) A majour cost arises from low productivity of labour utilised. Modular designs, prefabricated components to be assembled. There are many ideas 'we are trying to improve productivity. This is inevitably going to affect the labour: materials ratio.
e) Factor of Ignorance: Urban housing in RCC has often excessively heavy columns and beams - yet disasters occur. We believe the proper choice of design parameters can save costs here.
f) Contractors margins: A contractor has a useful role to play. But because' of lack of competition, the contractors extract excessive margins. The best way to counter this and bring down the costs is to demystify all knowledge and make the skills widely available.

The Geodesic Dome:
We can illustrate the above points with respect to the dome houses. Geodesic is the great circle or an "equator line". It is the shortest distance between two points on the surface of a sphere. In 1885, a Chinese Dowager Empress built a palace that has a geodesic dome. In 1922, Carl Zeiss Glass Works commissioned Dr Walter Bauers field to build a planetarium dome. He built a 40-m lightweight dome in Ferro cement using the icosahedra shape.

Buckminster Fuller gave the name Geodesic and. made it popular in USA, By 19411 an equivalent of $0,000 domes of 6-m dia were constructed in USA.

The inherent strength of the sphere allows considerable reduction in steel without sacrificing strength. B. Fuller claims that for a conventional wall and roof, the structural weight required to shelter 1 sft is about 50 lbs whereas for his geodesic designs, it is a mere 0.78 lbs. Thus the two well-known domes in Italy - the dome of the St Peters and the Pantheon were both about 150 ft in dia and weigh about 30,000 tons. In contrast Fullers geodesic dome of 150 ft dia weighs only 30 tons, 1/1000 th in weight. In an earthquake, both the heavy dome would fall, but fullers will remain. Because of the small surface area for the volume enclosed, the heating and cooling effects are minimal, so also wind and cyclone effects.

After getting some experience of building and living in a dome house, 16 designed a kit that is: Modular - common components for all sizes
Easy to assemble - colour code and nut-bolt assembly
Core gives the strength - assured strength
Potential to generate employment in rural areas, whoever the client.

The 280-sft domes require a maximum of 85 man-days to errect the steel and cement shell on a film foundation, and another 40 man-days for the "finish" to make it attractive. We believe there is scope for reducing this to 50 and 30 resply. The kit production is economical to rural areas only and brings new skills to the village that could be used elsewhere.
The construction is simple enough to train local boys in a few weeks. It can also be built through self-instruction. There is scope for local boys to emerge as contractors.
Future Scope: We hope to be able to adopt the franchise system. That is we can give a standard production system for producing these kits anywhere, with a minimum of training. There is ample scope for local initiative in use of different materials as also use of the dome. We hope to be able to give a kit for the internals also on a modular basis. We hope to considerably reduce the time for completion of the dome by improving the productivity. Simultaneously this will demystify the skills. Finally we would like to find alternate methods of applying the mortar so that centering is avoided or simplified.

Break up of a 280-sft-dome house Cost.

Steel etc	3491	Labour 2505
Meshes	1470	This include steel doors and windows with steel shutters, a
Cement	2960	ventilator, oil paint, enamel for the steel work, and cement
Sand	605	paint from outside and water bound distemper from within.
Rock	300	
Miscel	897	
	9731	The flooring is 4" mass concrete finished with 1:3 mortar.

The cost in Sept 1988 is Rs 43.7 / usable sft. or 41.1/sft of plinth area.

Rectangular Structures:
We have also tried prefabricated RCC columns and Ferro cement channels, with built in windows, to build walls, then a steel truss roofing with asphalt/cement sheet roofing. We built a workshop shed of 800 sft (72 sq meters) at a cost of Rs 27,000. It has gone through the last monsoon very well. The cost break up is as follows:

Steel bars, angles etc.	7923.9
Water, electricity	992.5
Meshes	1330.0
Labour	3065.13
Cement	5051.25
Sand and gravel	785.0

Bricks	1530.0
Roofing sheets	5315.0
Misc (nuts, wire, weld)	1468.0

Rs 27,460