

Earthquake and Shelters.

With the devastating earthquakes last Thursday, (30 Sept. 93), we can no longer treat the Deccan Plateau as an earthquake free zone.

Nearly forty thousand have been killed and many more injured and displaced, We have to start planning for the reconstruction of the entire area, and perhaps of other less affected zones also. Why did an earthquake of moderate intensity produce such devastating effects? The reason is that most people were caught in the debris of the collapsing houses.

It is common in our villages, to build houses of stone and mud. These have thick walls and roofs are supported on the nails. It is characteristic of such houses, that if some stones fall away, through rain or some other cause, the roof is endangered. While reconstructing, we should try and avoid any designs, which could be endangered, by heavy rain or earthquakes.

Vigyan Ashram, Pabal, a voluntary agency, which has been working for the last 10 years, in the field of relevant technical education) for the rural youth, has been training rural boys in manufacturing and erecting "**Geodesic Domes.**"

The Pabal Domes have, for some years, been commercially available, through some of the contractors under encouragement from Vigyan Ashram.

The Geodesic domes -

were first popularised by the American Engineer, Buckminster Fuller in the fifties. In his US Patent no 2,682,255 of Dec. 12, 1951, Puller states," When I invented and developed ay first clear span, all weather geodesic dome, the two largest domes in the world were both in Rome and were each 150 feet in diameter. They are St. Peter's built around AD 1500 and the Pantheon, built around AD 1. Each weighs approximately 30,000 tons. In contrast, my first 150 foot diameter geodesic all weather done installed in Hawaii, weighs, only thirty tons- one thousandth of its masonry counterpart. "**An earthquake would tumble both the Roman 150 footers, but would leave the geodesic unharmed.**" He also claims further that the **Geodesic dome design can stand cyclones of 250 ins/hr velocity.** We have a letter from Andhra Pradesh, stating that one of our domes erected there, withstood their cyclones. They have taken the know how from us for manufacturing Pabal Domes for their cyclone refugees. Such domes are also being made in Rajasthan and Arunachal, with our know how.

The above design first made by Fuller for housing in 1951 has turned out to be a fundamental structure in Nature and has turned up in most unexpected places! It has been found that the virus of AIDS has this geodesic structure. More recently, a new form of crystalline carbon, other than diamond and graphite, has been found- and it has the geodesic structure and so named "Fullerene". Geodesic structure is the pattern of pentagons and hexagons found on foot balls. Because of its inherent strength it can be Bade light and cheap.

The above information shows that the geodesic dome design is ideally suited for the reconstruction of the Earthquake ravaged area. The following specific advantages should be noted.

1. The geodesic dome can stand cyclones and earthquakes, better than other structures of conventional design.
2. Because of their strength, they use less steel and cement. Thus, even though they are all steel, cement construction, they are cheaper than other steel and cement

construction. Commercially, they are being built at around Ss 80-85 per sq foot of plinth area.

3. They are last in construction. The steel frame can be erected in one day. The complete cemented structure of 300 sft. has been erected by one contractor in one week, but on the average takes 5 weeks for a team of 8 people.

4. They are made in prefabricated kits, weighting about 200 kg. Therefore, they can be manufactured, in different workshops at the same time and then easily transported to site and erected.

5. They are simple to erect and can be erected as do-it-yourself kits. Local youth could be trained in a short period for large scale reconstruction. This will produce local employment as also self help for the calamity zone.

6. Because they are made from a traffic structure, the dome structure could be erected in 24 hours, after a plinth is made and used as a temporary shelter, by covering with plastic or thatch. The further work could be done in stages and the completed cement construction completed as needed. This will give flexibility in arranging other raw material and services.

7. A small workshop, having some welding facility, can make windows, doors and foundation angles. While another with a small fly press can turn out embossed junction plates and struts, without any need for electricity. The large scale production of these could be organised easily.

Vigyan Ashram has adapted the Fuller design for Indian conditions and for the last 6-7 years such kits are being manufactured in a rural workshop and sold commercially, in 2-3 places, The erection is done by at least 3 contractors on commercial basis, apart from more boys doing it as job work. Such kits have been sent as far as Kanyakumari and Ladakh.

Vigyan Ashram is a voluntary agency interested in technical education and will be happy to pass on (without charging technical or training fees), the technical information to any agency committing to make shelters for the affected zone. Interested parties should contact, Director, Vigyan Ashram, Pabal, Dist. Pune 412 403.