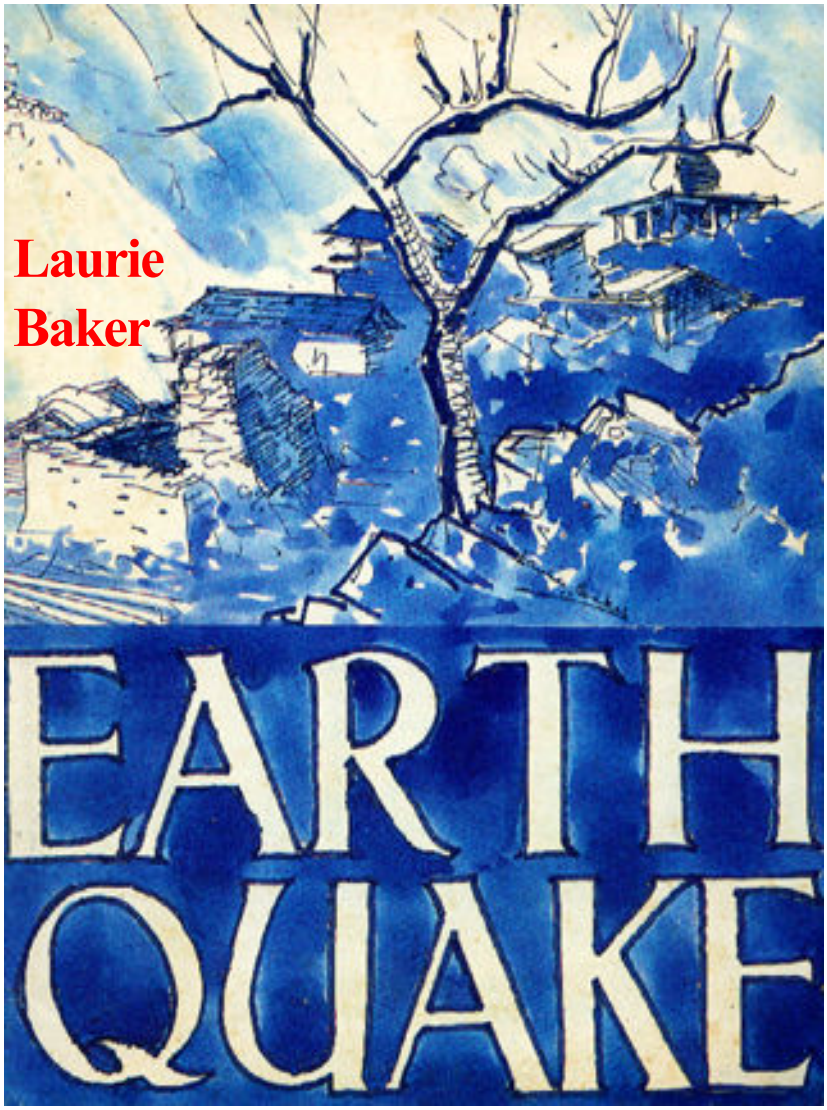


FOREWORD

Time and again, it has-been emphasized that pattern of demand for S & T knowledge base should orchestrate and fulfill the requirements for acceleration of rural development in general and any specific challenge in particular. And it was with this view that a team consisting of the famous architect Shri Laurie Baker, Shri T.R. Chandra Dath, COSTFORD, Trissur, Dr. Anil P. Joshi, HESCO, Kotdwara and Shri A.K. Sharma, DST was sent by DST for visiting quake-hit villages in Uttarkashi and Tehri / Garhwal region. It was really surprising to note that conditions have not changed even after three months of the tragedy. The report from the team also suggests that the construction techniques and materials have also not changed for decades. Damage range of 30-50% is crucial and it is obvious that people there are a confused lot. It will take little longer for them to come out of trauma, tension and mental agony.

I agree that the task of repair/rebuilding is important for salvation. Simultaneously, it is also pertinent that carefully selected short and long term strategies with clear cut S& T interventions are needed e.g. bonding techniques, use of buttress, proper shape and size of stone, incorporation of improved plans fitted to traditions and culture, better masonry and carpentry skills with suitable demonstrations. No less important is introduction of water harvesting/storage system, sanitary toilets, and energy efficient stove etc. for demonstrating the potential of S&T capabilities. But all this will be based on accessibility, affordability and appropriateness for ensuring solutions to existing problems. I strongly feel a combination of whole host of activities including the activities for self employment, income generation through by-product formation; value addition etc. can deliver goods. Therefore, considering the prevailing socio-economic milieu where the role, importance and effectiveness of S& T inputs as well as the direct financial inputs in making available alternative choices in the form of new technologies, physical assets, improved productivity of existing assets for economic contours are not a dilemma anymore and should be strived of at all costs.

Viewing against this background, this report is very exciting and stimulating. It has opened vistas for S&T interventions in hitherto unattended hill areas of Garhwal. The report is yet another marvelous piece of work from the great architect. I am really grateful to the team which against all odds visited the difficult terrain that are snow-bound and yet succeeded in its mission. We, in DST, value this report very much and promise for follow up action.

28th February, 1992
New Delhi-110 016

(Dr. Joseph P John)
Adviser
Department of Science and Technology

A STUDY OF THE CONDITIONS OF A VARIETY OF THE EARTHQUAKE HIT VILLAGES IN GARHWAL

MADE THREE MONTHS AFTER THE DISASTER

WITH OBSERVATIONS AND RECOMMENDATIONS BY

T. R. CHANDRA DATH & LAURIE BAKER

OF COSTFORD

WITH THE HELP OF DR. ANIL JOSHI OF HESCO

(Sponsored by Department of Science & Technology)

PREFACE

The Science & Society Division of the Department of Science & Technology (Government of India) is always on the lookout for alternative and appropriate technology for housing, especially in rural or difficult areas. Sri. C.J. Johny, Principal Scientific Officer of the Division has always shown an appreciation and even affection for work in these areas which COSTFORD has undertaken. The various reports about the damage and destruction caused by the earthquake in Garhwal were conflicting. Some felt that the indigenous traditional building was at fault & others felt that perhaps refabrication would be 'Safer'. So we were asked to go and investigate not only those areas accessible by road but the remoter higher devastated villages. Dr. Anil Joshi of HESCO (who hails from Garhwal) & Sri A.K. Sharma of D.S.T. helped us to cover a let of ground & visit these more inaccessible places & meet people affected by the disaster.

This report has been prepared especially with all who want to help to bring back normal life to the hill people of Garhwal in mind.

We wish to make known our sincere & heartfelt gratitude to Dr. Joseph. P. John, Adviser, and to Sri. C.J. Johny, Principal Scientific Officer of the D.S.T., but for whose encouragement & practical help we could not have done this report.

Laurie Baker
Director
COSTFORD

GARHWAL

THIS STUDY COVERED A VARIETY OF EARTHQUAKE HIT VILLAGES.
MEMBERS OF THE GROUP HAD INTIMATE KNOWLEDGE OF THE AREA INCLUDING PREVIOUS CONSTRUCTION WORK OVER A LONG PERIOD.

At the outset it should be made clear that this report is a combination of impressions on actually seeing and studying the present conditions in a variety of the earthquake hit villages in Garhwal, together with an intimate knowledge on the past of one member of the team of the conditions and patterns of living of people who live in this part of the Himalayan foothills, together with his actual involvement in building houses, hospitals and schools in such high places.

CONDITIONS NOT MUCH CHANGED IN FIFTY YEARS.
BUILDING MATERIALS AND METHOD UNCHANGED.

Since living there between the mid-forties and mid-sixties the life style of the villagers who live closer to the roads has superficially changed quite a lot, but the building materials and methods have NOT changed, except along the big motor able roads where reinforced concrete has been introduced as a roofing material.

EARTHQUAKE COUNTRY
RIVERS VALLEYS MOUNTAINS

This is Garhwal Earthquake country. Strong, swift rivers at the bottom of deep valleys. Slopes of the mountain side on both sides is steep, rocky and barren. Some of it is covered with narrow terraces for cultivation – other parts are covered with Chir pine.

LARGER VILLAGES NEAR THE BIG RIVERS

Sometimes fairly large villages are situated on flatter ground bordering the big rivers, though they are usually twenty or more metres above water level to avoid damage at flood times.

GOOD ROADS ALONG MAIN RIVER VALLEYS
OLD BRIDLE PATHS LINK VALLEY TO VALLEY.

The main river valleys have well maintained roads. Bridle paths are quite independent and were originally built for the use of foot and animal transport. They usually link the valley with others, are paved with stone and are often stepped up the steep slopes.

SOME ROADS GO OVER PASSES MORE THAN 6000 FEET HIGH

This sketch is much higher up the valley. On important routes the good road will wind up and up, often to a height of more than six or seven thousand feet, where it gives through a pass and over into the next valley.

BRIDLE PATHS ARE SHORTER AND STEEPER

The Bridle paths have taken a much shorter steeper route but cross over the pass at the same place. The old Dak Bungalows were also found in these passes.

ROAD SIDE VILLAGES RECEIVE AND DISTRIBUTE FOOD ETC.
TO REMOTE VILLAGES

On the road side there is an occasional village but usually it is mainly occupied by tea shops for travellers or for grain and merchandise which can be dumped from Lorries and then “head loaded” to the scattered villages.

RELIEF SUPPLES ALSO

Such villages have been used for unloading Relief items for distribution.

HOUSES ARE ONLY BUILT WHERE THERE IS PERMANENT WATER

People build their homes where there is a more-or-less permanent supply of water – mainly from springs coming out of the mountain sides.

MOST TRAVEL & TRANSPORT IS BY FOOT AND HEAD LOAD

As about 99% of all travel is by foot, and transport by “head and back” load, water is far more important than roads and is the main reason for choosing a house site.

HOUSES ARE BUILT EVEN IN PRECARIOUS PLACES IF WATER IS NEARBY

Homes nestle cosily in areas which are not too steep but water must be available and if necessary buildings can be perched precariously on spurs of the mountains or on what “plains folk” would call “impossible sites”.

FOOT PATHS LINK UP ALL VILLAGES

Some narrow steep foot paths link every village or hamlet to other settlements.

TERRACE-ABLE LAND IS CULTIVATED

Any other land that can be terraced is used for the cultivation of wheat, madwa, etc.

A CONFUSING LACK OF PATTERN ABOUT DAMAGED VILLAGES & HOUSES

The visual impact of the earthquake as you travel the length and breadth of Garhwal is confusing. You see the few well publicised villages which seem to be completely destroyed. These are near the larger towns, such as Uttarkashi. There are a few equally devastated villages in remote mountain areas which can only be approached on foot (and at the time of our visit through snow).

50 TO 70% UNDAMAGED / SOME CRACKS

Then there are a very large number of villages where 50 to 70% of the houses seem to be untouched, though a third of them may have typical cracks in some of the walls – some dangerous – others of little consequence.

OTHERS A RANGE OF DAMAGE FROM MODERATE TO TOTAL COLLAPSE

And then there are about a third of the houses where roofs have collapsed or, typically, the front walls of the houses have dissolved into heaps of mud and rubble.

DAMAGED AND UNDAMAGED VILLAGES FOUND ADJOINING EACH OTHER

The most extraordinary sight however, is that often, next to these badly affected villages there are just as many which appear entirely whole and undamaged. Often such a village maybe only a stones throw away from a very badly destroyed settlement!

SIMILAR DAMAGE (OR NO DAMAGE) WHETHER HOUSES IN VALLEYS OR ON GENTLE HILLSIDES OR ON HIGH MOUNTAIN SPURS

It is equally puzzling to find that damage has been done in big river side valley bottom villages, in somewhat level areas up on the mountain sides and on houses and hamlets perched high on rocky spurs of the mountains. Conversely – in some, even in many instances of villages in all these widely differing locations there has been no damage at all.

SIMILAR DAMAGE (OR NO DAMAGE) WHATEVER THE BUILING MATERIAL USED

Similarly houses with traditional stone-in-mud walls and slate or wood roofs fared no better and no worse than “modern” reinforced concrete structures.

OCTOBER 2OTH 1991

JANUARY 20TH 1991

THREE MONTHS HAVE PASSED SINCE THE EARTHQUAKE
MUCH OF THE RELIEF WORK HAS BEEN DONE
NOW COMES THE TASK OF REPAIRING AND REBUILDING

It is important to keep in mind that this report is being done almost three months after the earthquake took place – so most of the urgent relief work has been done and now there is the main task of getting back to normal – in particular – the repair of damaged buildings and the rebuilding of destroyed ones.

IN THREE MONTHS VERY LITTLE HAS BEEN DONE TO CLEAR UP THE MESS OR SORT OUT WOOD, STONE AND SLATE WHICH CAN BE REUSED.

What was most distressing and disturbing was that three months after the earthquake 95% of all the damaged and destroyed buildings we saw remained exactly as they were on morning of October 20th 1991.

Various explanations / excuses were offered and recommendations are made later in this report to deal with this situation.

A TYPICAL "TOTALLY DESTROYED" HOUSE

Three months after the earthquake this sketch was drawn of what was called a totally destroyed house in a village about 5000 ft. up. Some houses were also partially damaged and some untouched.

AFTER 3 MONTHS NO CLEARING UP, NO SALVAGING

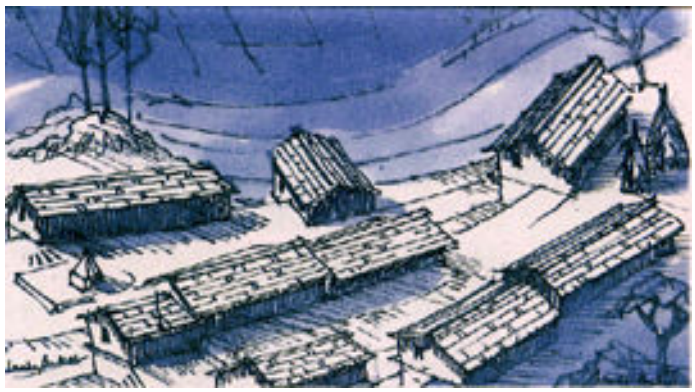
No effort has been made to clear away the mess and salvage good material like wooden ballis (beams), door and window frames, slates and stones etc. The upper walls of the house had fallen and of course the roof followed.

ALL ROOFING & FLOORING MATERIAL COULD BE SALVAGED & USED

In fact, the house is NOT totally destroyed. The lower sketch shows what it would look like if clearing – up a salvaging had been done. We crawled into the lower storey and found the walls undamaged.

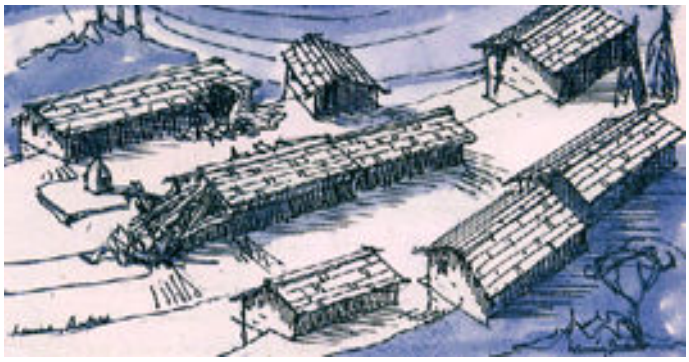
"IF WE CLEARUP, THERE'LL BE LESS COMPENSATION"

The occupants and other villagers said that if they cleared away all the mess they would get less compensation. This non – action and explanation for it was heard throughout our entire study.



A TYPICAL SMALL MOUNTAIN SIDE VILLAGE UNSCATCHED
BY THE EARTHQUAKE. MANY SUCH VILLAGES WERE SEEN

This is a sketch of an existing Garhwal Village which was untouched by the earthquake. Each long building belongs to a family and each brother will occupy one unit. We saw the majority of villages just like this – almost untouched by the earthquake.



THE SAME VILLAGE DEPICTEEDAS HAVING RECEIVED A TYPICAL MIXTURE OF
DAMAGED & UNDAMAGED HOUSES. MANY SUCH VILLAGES WERE SEEN.

The middle sketch is imaginary – it shows a certain amount of damage, the end of one row of houses collapsed: another with part of a wall, and the roof above it fallen in and several walls with cracks in them. There were many villages like this. Bad for the individual concerned but by no means a "Big disaster" for the village.

THE SAME VILLAGE DEPICTED AS "TOTALLY DESTROYED"
A RELATIVE FEW SUCH VILLAGES WERE SEEN AND VISITED.

The bottom sketch is similarly imaginary - that is, the top village "totally destroyed". We saw a few – but NOT a lot of such villages. As has been shown elsewhere – "totally destroyed", is an exaggeration – though there is no denying that it has been a great disaster for such villages.

A TYPICAL HOUSE
ANIMALS LIVE BELOW
A FAMILY ABOVE

The top picture shows a typical mountain-side house built on a narrow shelf of land about 6000 ft. above sea level. The lower storey houses the cattle and is cut back into the ground. There is a four foot high door only on the front side, and on other openings or windows. The back wall is cut out of "Mother Earth". The walls are of local stones set in mud mortar. The roof is of large slates bedded in mud above split pine carried by whole pine tree trunks. A family lives in two or three rooms on the first floor.

THE OTHER END OF THE SAME HOUSE AFTER THE EARTHQUAKE
ONE HALF DESTROYED THE OTHER HALF UNTOUCHED

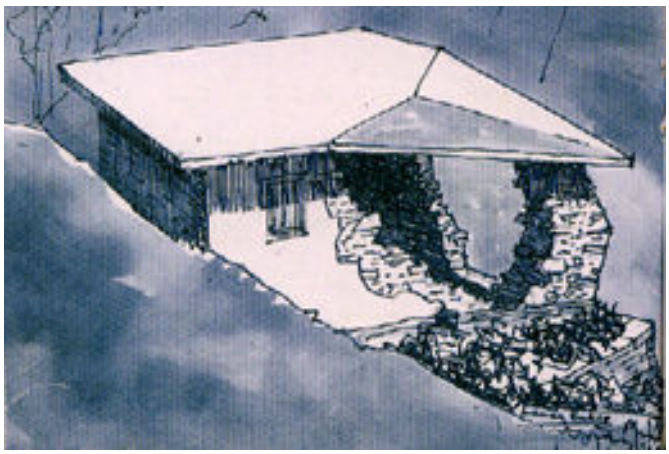
The bottom picture shows the other end of the same building after the earthquake. Both ends were built at the same time (about sixty years ago) by the same mason and carpenter using the same stones, mud, timber etc. The earthquake has destroyed one half and left the other half untouched.

CONCRETE ROOFS HAVE COME TO SOME ROAD SIDE VILLAGES

Some road-side villages have been able to use reinforced concrete (steel, sand and cement have been brought by lorry from the plains.)

BUT THEY ARE AS VULNERABLE AS THE TRADITIONAL WOOD AND SLATE ROOF

The lower picture shows clearly that a “concrete house” is just as liable to destruction or damage from the earthquake as is the old-fashioned wood, mud and slate roofed house.



WOOD & SLATE CAN BE SALVAGED AND REUSED

In fact, the components of the traditional roof can all be salvaged and re-used, whereas only the steel of the broken concrete slab can be, with a lot of hard labour and difficulty re-used.

ONLY STEEL WITH DIFFICULTY CAN BE REUSED FROM BROKEN SLABS

Most concrete roof slabs that were damaged were in far worse condition than the one shown in this sketch.

VIEW OF A TYPICALLY DAMAGED VILLAGE
ONE OR TWO HOUSES UNDAMAGED

This sketch is of a typical small hamlet of only four houses. The one on the right had a concrete flat roof and remained undamaged.
The long one, middle right, was untouched on one half and the front wall and roof had fallen in the other half. A "relief" plastic sheet had been placed over a slightly leaking roof.

OTHERS PARTIALLY DAMAGED

The thatched house on the right was untouched but a plastic had been draped over the thatch "in case it leaked."

BEING NEAR TO A ROAD RELIEF MATERIALS HAD ARRIVED
AND WAS BEING MADE USE OF

The building in the left fore front was under construction and what there was of it was undamaged. A "relief plastic sheet" was put over the top and it is being used by the occupants of the damaged roof house. They are not clearing up, except to retrieve household effects, for fear of not getting compensation.
The relief team "came to the village" so they put it up.

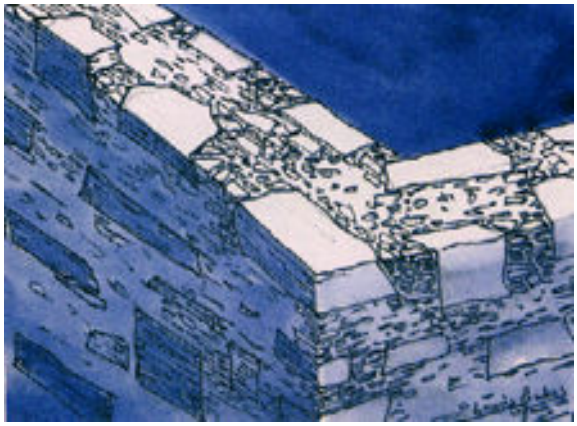
WALLS MAINLY MADE OF A FEW LARGE STONES
AND LOTS OF SMALL STONES BEDDED IN MUD

This sketch shows what a broken wall looks like. It also clearly shows how big stones or a lot of little bits of stone are set together in mud. Clearly, there is no attempt at "bonding" (interlocking stones on one side of the wall with stones on the other side.)

FATAL

WHEN THE WALLS FALL THE ROOF FOLLOWS

On the outside the wall looks very neat and nice but as can be seen every where, this lack of bonding has proved to be fatal, especially because if the wall collapses the roof also automatically falls down.

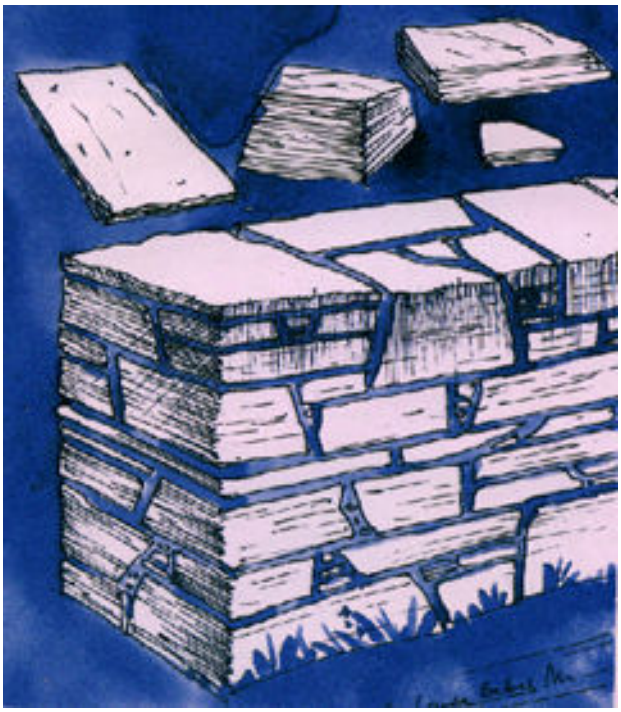


THE FEW COSTLY MASONS ARE WASTING THEIR TIME ON "LOOKS"
INSTEAD OF STABILITY

The lower sketch is of the painstaking work of the masons (who are few in number and were charging Rs 60 per day and now after the earthquake cannot be had for less than Rs 100 per day.)

VILLAGERS (NOT MASONS) SHOULD SALVAGE USABLE STONES

The good sized stones (anything as big, or bigger, than a loaf of bread) must be extracted and stacked ready for re-use. The small stones (many no bigger than sardines) must not be used.



STONES ARE GENERALLY OF A GOOD SHAPE

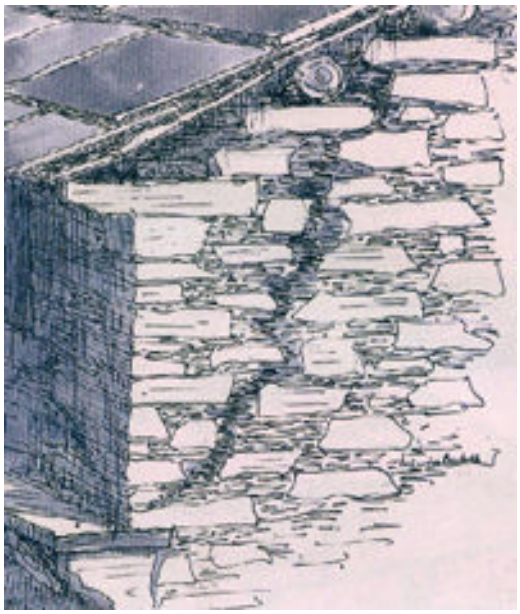
The stones in most areas (except along the lower river banks) are of an ideal shape for building. They are rectangular and cube like and could even strongly be built as dry-stone walls – that is, without mortar. People don't like this because of a fear that the cracks and spaces will provide housing for snakes, rats and other vermin.

SALVAGE THEM AND USE THEM FOR RE-BUILDING

The picture shows how the salvaged reasonably sized stones should and can be used for rebuilding.

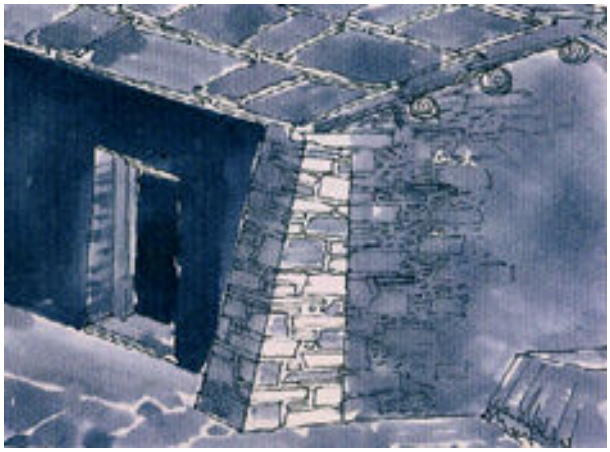
NO DEARTH OF NEW STONES ANYWHERE IN GARHWAL

There are mountainside open quarries near most villages and no special equipment or skill is required to get more stones.



THE TYPICAL "CORNER" CRACK SEEN EVERYWHERE IN THE DISTRICT

This sketch was drawn in a typical partially damaged village to show a cracked corner wall which could be seen repeatedly almost everywhere we went.



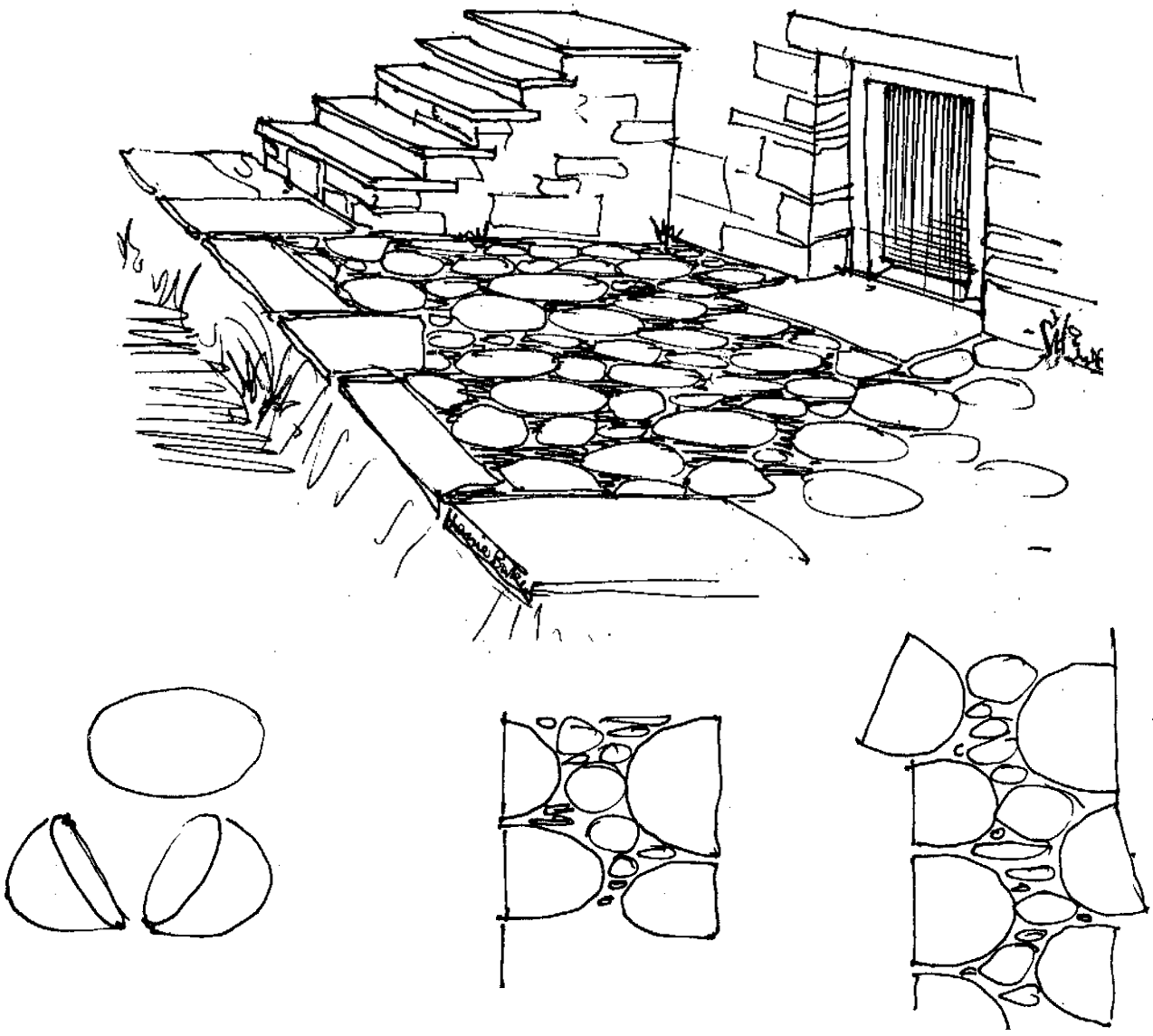
DUE TO LACK OF BONDING & USE OF TOO MANY SMALL STONES REMEDY BY ADDING A BUTTRESS

It shows very clearly that it is the lack of bonding and the excessive use of a lot of very small stones bedded in a mud mortar that makes the crack almost inevitable where and whenever there is any movement, shaking or subsidence. Some of these cracks are very big and are dangerous. They need taking down the corner and re-building it properly. When the crack is not big (i.e. in the majority of cases we saw) a simple new buttress, as shown in the lower sketch will prevent the further enlargement of the crack. The crack itself can then be systematically repaired and should give no further trouble.

RIVERSIDE STONES ARE SMOOTH AND ROUND AND DO NTO MAKE STRONG WALLS

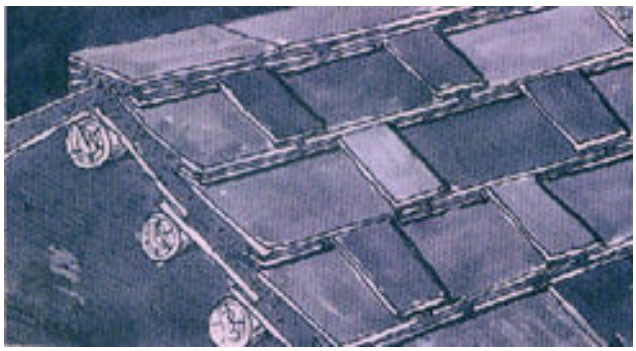
Along the sides of the rivers the stones are rounded, smooth and as big as footballs. They are broken into two halves and used for building walls.

As the sketch shows the flat inside is used as the facing stone of a wall and the spaces in between the stones are filled up with small stones and pieces of stones. Due to the smooth rounded shape of each stone it is easy for them to slip and slide out.



BETTER TO USE THEM FOR PAVING

We saw many such walls had fallen down with the vibrations from the earthquake. These stones could better be used for paving.

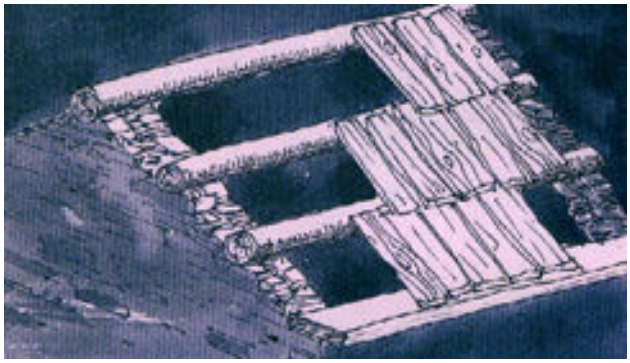


PEOPLE NEAR FORESTS USE TIMBER EXTRAVAGANTLY

In forest areas, naturally people of former generations knew nothing of our present concern about ecology. Timber was plentiful so it was used lavishly.

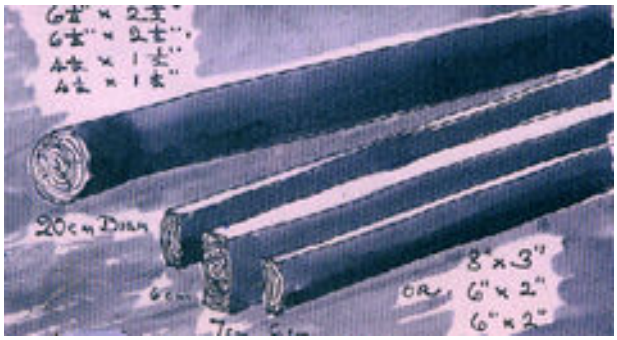
WHOLE LOGS STRETCH FROM WALL TO WALL AS RIDGE POLES AND PURLINS

These sketches show how whole tree trunks of pine trees are placed from wall to wall. Split pine planks are fixed from balli to balli. Slates are then carefully laid in mud mortar on top of the split pine.



EACH LOG CAN BE SAWN INTO TWO OR THREE STRONG PIECES

Using the whole trunk is of course extravagant and the existing ballis can be sawn into two or three pieces and still be able to carry the heavy weight of the mud and slates.

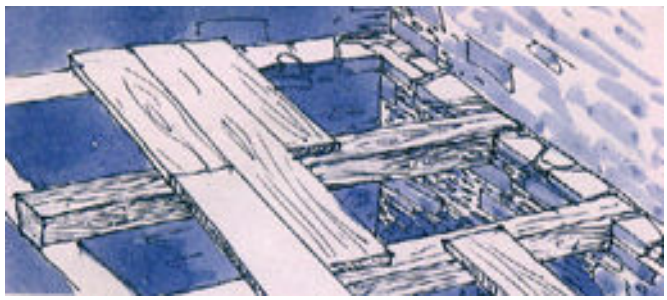


THESE BEAMS (BALLIS) MUST BE EXTRACTED AND RE-USED

Where houses had collapsed, we repeatedly found these standard length whole trunk ballis still bedded in the heaps of debris. All we saw and examined were in excellent condition and even in the "totally devastated" villages we found no broken ones.

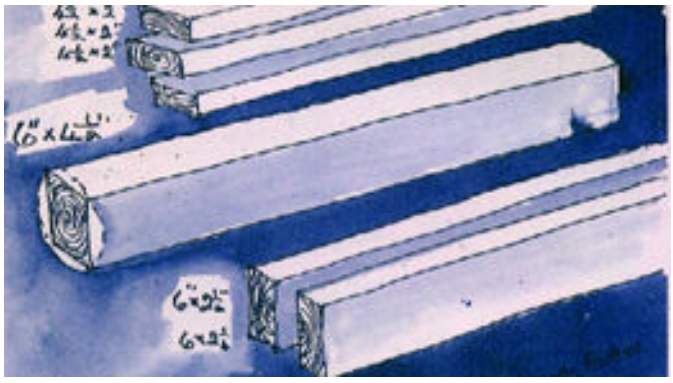
NO NEED FOR THE GOVERNMENT TO SUPPLY FURTHER TIMBER

They must be salvaged and they can do double the work they were doing before the earthquake and there is no good reason for the government to supply more timber.



WOODEN FLOORS ALSO USE OVER-LARGE SECTIONED TIMBERS

Similarly the timber used to carry the wooden floor between the lower and upper storey of the typical traditional house is equally extravagant. It is often the same whole tree trunk but the rounded sides are cut off to give a neat square section.
Thick wooden planks are then laid from beam to beam as flooring.



MOST OF THE BEAMS CAN BE SAWN INTO 2 OR 3 PIECES AND RE-USED

Many such beams we measured were more than 6-inches x 6-inches and as the sketch demonstrates, each such beam could be cut into two or three pieces and still be capable of carrying heavy loads on the floor above.

NO BROKEN BEAMS WERE SEEN

Again – we found no broken beams and again, many were still buried under the piles of mud and slates and should be extricated ready for re-use.

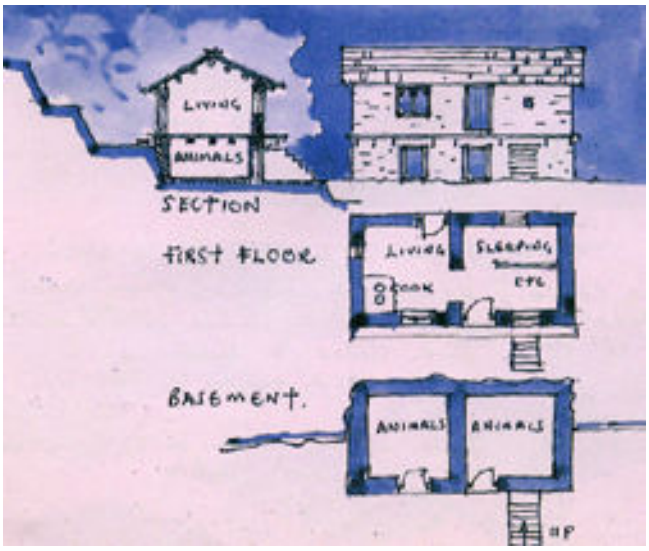
THEY MUST BE SALVAGED AND RE-USED

There is no need for the Government to supply new timber.

A NEW HOUSE PLAN IS MAINLY NOT REQUIRED

Regarding the request for new house plans, we are strongly of the opinion that, on the whole, new or different plans are NOT required.

Over hundreds of years the typical house pattern for mountain regions has been evolved and is mainly satisfactory.



THE PRESENT TYPICAL PLAN IS A RESULT OF USING LOCAL MATERIALS FOR PARTICULAR FUNCTIONS

Only local materials like wood, stone, slate and mud are used. Most housing sites are sloping and it is not possible to cut far into the rocky mountainside. So there is usually a low- ceilinged basement room used for the cattle, and above are the living rooms for the family. There is almost always a simple functional arrangement of two, three or four rooms – all bedrooms at night and all with their own functions by the day.

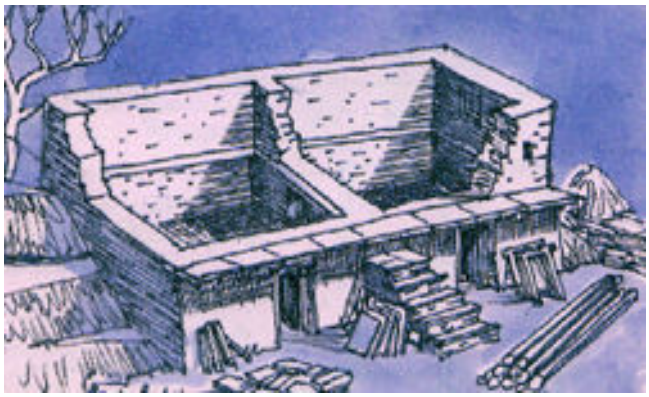
Warmth rises through the wooden floor from the animals below.

AFTER CLEARING, THE ORIGINAL HOUSE PLAN IS VISIBLE AND MAINLY SOUND AND RE-USABLE

As has been clearly shown, when debris is cleared away, even in the so-called "totally destroyed" houses – the foundations are still there, mainly intact, and the "plan" of the house is clearly shown, still existing.

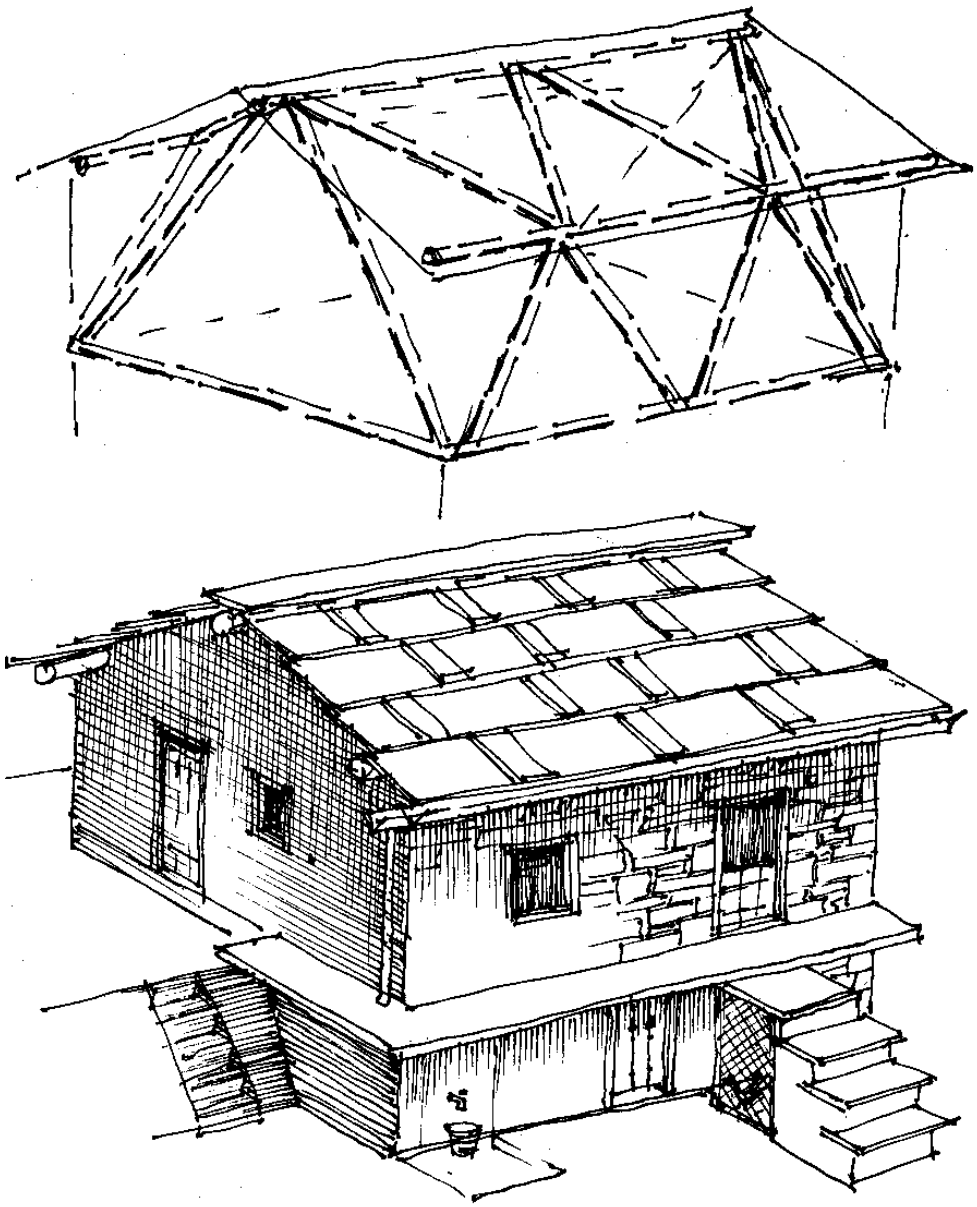
MOUNTAIN VILLAGE LAND IS STRICTLY DIVIDED AMONG BROTHERS EVEN NEW PLAN WILL HAVE TO FIT INTO EXISTING SMALL "SANDWICH" PLOTS

In most villages land is scarce and is already strictly and carefully divided up and apportioned out to each brother of a family. Any new or different plan or design mush still fit into the established areas and divisions. All the brothers of one family must give consent for change, or sale, or different usage of village land.



MORE IMPORTANT THAN A NEW PLAN IS TO INCORPORATE IMPROVEMENTS INTO THE ACCEPTED TRADITIONAL PLAN

So, far more important is to rebuild in a more stable way and incorporate improvements as and when required. For example, water storage can be incorporated in the lower basement, or energy efficient *chulhas* (stoves) can be built in to the rebuilt structures.



NEW HOUSES TO BE EARTHQUAKE PROOF OR NOT NECESSARY?

There is a controversy about whether new or re-built houses should be “earthquake proof” or not. One opinion is that a “big” earthquake never hits the same place twice.

BETTER MASONARY WORK SHOULD BE ENOUGH FOR ALL BUT MAJOR EARTHQUAKES

On the other hand over a period of nearly two decades the writer experienced several minor tremors in the area – enough only to rattle cups and saucers and shake a book or two off the shelf. The whole of Garhwal and Kumaon is used to these tremors and on the whole, the indigenous traditional house design has withstood this inconvenience.

TRADITIONAL DESIGN COPES WITH REGULAR MINOR TREMORS

We mainly believe that if walls were properly constructed with the same local materials but better bonding, 99.9% of all reconstructed work would not need any special “earthquake proofing”!

A SUITABLE TIME TO DEMONSTRATE AN EARTHQUAKE PROOF HOUSE WITH LOCAL MATERIALS?

Nevertheless, we think this is a suitable time and opportunity to make one or two demonstration houses, with local material, which would help withstand a major earthquake.

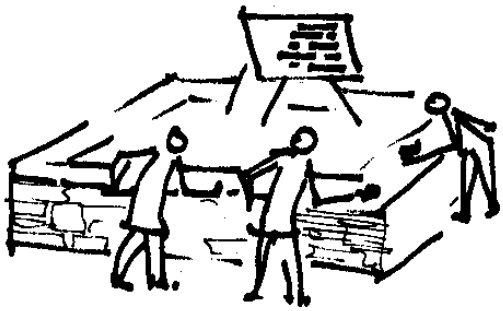
RECOMMENDATIONS

I. REMOVE COMPENSATION BOGEY
USE PHOTOS
GET ON WITH SALVAGE & CLEANUPS
ALL VILLAGERS PARTICIPATE

a) The Government must deal with this "compensation impediment".
b) If necessary take photographs now, settle compensation later.
c) Get on with salvage and cleaning up operations.
d) All villagers of whatever caste should participate.

II. TRAIN OLD & NEW MASONS
CONTROL WAGES
DON'T WASTE SKILLED LABOUR

a) Remedy the shortage of masons.
b) Train existing ones.
c) Train new ones.
d) Control wages.
e) Don't waste masons to do debris removal and clean-ups.



III. DEMONSTRATE ONLY ONE EARTHQUAKE PROOF HOUSE BUT MAINLY SHOW HOW TO RE-BUILD WITH EXISTING LOCAL MATERIALS

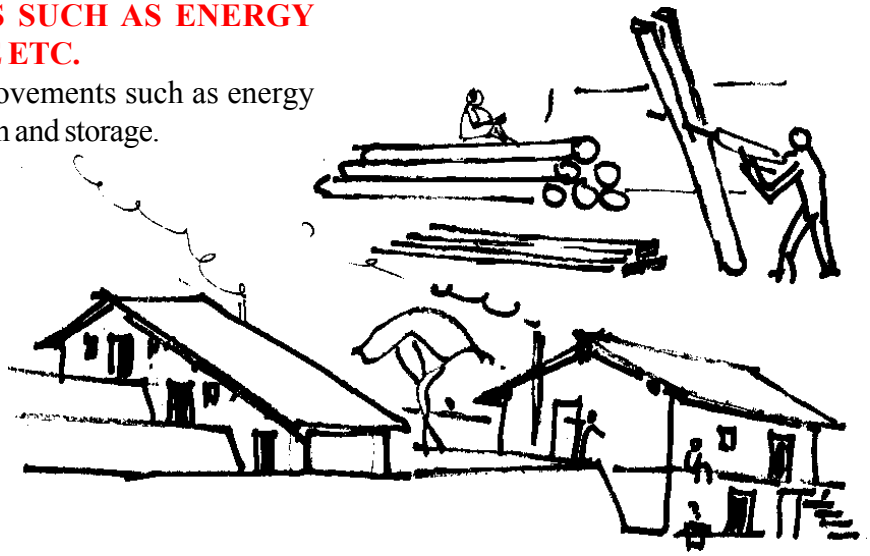
a) Demonstrate, first on ONE village how to re-build,
b) How to improve and economise,
c) How to use only local and salvageable materials.
d) Build an "Earthquake Proof" house.

IV. TRAIN CARPENTERS AND SAWYERS

a) Train Carpenters and Sawyers to use wood more economically and scientifically.

V. INCORPORATE IMPROVEMENTS SUCH AS ENERGY EFFICIENT STOVES, WATER STORAGE ETC.

a) Demonstrate how to incorporate improvements such as energy efficient chulhas (stoves), water conservation and storage.



THE AUTHOR

Laurie Baker was born in England in 1917 and after studying at the Birmingham School of Architecture became an Associate of the Royal Institute of British Architects.

His practice was interrupted by World War II and he became an anesthetist to a mobile surgical team! Later he became entirely involved in the treatment and control of Leprosy in West China. Trying to return to the U.K. in 1944 he had to wait for a boat three months in Bombay at a time when Gandhi was there. He was greatly influenced by him to return to live and work in India after a very brief spell at his home in England. In 1948 he married Elizabeth Jacob, a like-minded doctor from Kerala and until the mid-nineteen sixties they lived and worked in a remote Himalayan region where they built their own home, hospital and schools and brought up their children. It was during this period that Laurie Baker acquired his insight into the problems and actual conditions of rural India, together with his deep appreciation of indigenous architecture. After the death of his father in England, Laurie's Mother, at the age of 84, also came out to India to share her life with the family in the Himalayas, and she remained with them until her death ten years later.

Meanwhile, with the advent of "Development" into that Himalayan area, the Bakers decided to move south to Kerala and again they chose a remote mountain area among the neglected tribals and settlers to build another home and hospital. Baker acquired more knowledge of south Indian rural life and his architectural work showed this change. By 1970 they handed over their medical work to friends and settled in Trivandrum, continuing unto this day their mixture of medical, leprosy, architectural and building work. Laurie Baker has been closely associated with allied Government and quasi-government work including work with the Planning Commission and as a member of the Governing Bodies of HUDCO and the National Institute of Design, the Scientific Advisory Council of C.B.R.I etc. He also extended his work into the industrial field and was for many years architectural consultant to a large industrial firm. At the same time, and with these industrialists his work on alternative energy systems relating to building grew.

Still spurning offices and arm chair architecture Laurie Baker in his Seventy sixth year is mostly to be found working on his building sites or training workers in their own remote territories to use twentieth century techniques while maintaining principles acquired over centuries to cope with Indian's own climate, materials, terrain and culture, not to mention increasing economic and population problems.

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