CENTRE FOR DEVELOPMENT STUDIES

Working Paper No.31

THE ADAPTIVE BUILDING TECHNOLOGY COURSE AT THE CENTRE FOR DEVELOPMENT STUDIES: A SUMMARY AND EVALUATION

By

R.J.S. Spence

Centre for Development Studies
Ulloor Trivandrum 695 011

September 1975

THE ADAPTIVE BUILDING TECHNOLOGY COURSE AT THE CENTRE FOR DEVELOPMENT STUDIES: A SUMMARY AND EVALUATION

WHy adaptive building technology?

The need to bring down the cost of construction of buildings in India has recently been receiving a lot of attention; there seems to be a general agreement that clients - whether private or Government - are not getting their money's worth, either in the quality or quantity of what gets built for them. At the macro-economic level, investment in construction now eats up one-third of the gross investment in the economy; but a very small proportion of this goes into housing, and for the poor and those on low incomes, there seems to be absolutely no hope of ever obtaining decent accommodation.

These problems are neither peculiar to India, nor are they entirely - or perhaps even primarily - related to the type of technology used. Yet, understandably, among engineers cost reduction tends to be seen largely in technical terms. There seem to be two opposing viewpoints on how to achieve it.

On the one hand are those who look for cost-reduction through modernisation along the lines of the construction industry in the richer countries. They believe that if the level of technology and technical training in India could be brought up to that in western countries, modern construction materials made available, quality control measures introduced, advanced design techniques used, and site personnel trained to work more efficiently, then a higher standard of construction at a much lower cost would be possible. This may be described as the 'imitative' approach.

On the other hand are those who believe that the pursuit of western-style modernisation is mistaken. They argue that western technology is inappropriate to the resource endowments - capital, labour, raw materials - of India; they point to the fine achievements of India's traditional master-builders in the days before sophisticated modern materials were available, or the Engineering Colleges set up. And they believe that India should develop new construction technologies by adpatation from this tradition, through application of the new understanding of the properties of materials and behaviour of buildings that is now available. This may be called the 'adaptive' approach.

It is clear from a superficial look at recent construction in India, whatever type of building is examined, that the imitative approach has dominated the thinking of its engineers - and no doubt its clients too - in recent times. The modern constructional materials - cement and steel in particular - have achieved such a hold that reinforced concrete frames are considered essential for any building over two stories - and many smaller ones - and any building whose walls are not plastered both inside and out is considered unfinished or temporary. In the Engineering Colleges too, both the teaching and research is modelled on that of equivalent institutions in the western countries, and emphasises the finer points of analysis and design in steel and concrete, to the exclusion of older materials such as brisks and lime.

Yet this dependence on the modern materials has led to a demand for them which greatly exceeds the capacity of the industry to supply them, and is one of the main underlying reasons for the shortages, delays and high costs which currently afflict building everywhere.

Because of this, the arguments for a new approach have recently been gaining strength, and are increasingly accepted at the highest levels But so far, examples of amplimentation of such an approach are few. It requires considerable boldness to venture into experiments in building technology which run counter to the experience of a generation of builders, and the institutional structure of the building profession severely restricts such initiatives.

Some of the new State Housing Boards - faced with the problem of building houses which middle and lower income groups can afford - have begun to develop an innovative attitude.

But perhaps the clearest and best-known example of the use of a building technology derived from "adaptive" thinking is the work of the architect Laurie Baker in and around Trivandrum; and the controversy between the 'imitative' and 'adaptive' schools of thought has increasingly centered itself around his work.

Background to the Course

In 1972, Baker was asked by the Government of Kerala to join an expert Committee whose task was, broadly, to look into the procedres and techniques used by the State PWD, and recommend what changes in

practice should be made in order to bring down building costs. The other members of the Committee were K.S.Parikh, Head of the Planning Unit of the Indian Statistical Institute, (Chairman), K.Madhavan, Director of Hydro-Civil Designs in the Central Water and Power Commission, and K.C.Alexander, Regional Engineer for the Kerala State Housing Board at Cochin. The report of the Committee, entitled "Performance Approach to Cost Reduction in Building Construction", was published in January 1974. In its introduction, the report states the case for a new approach based on minimisation of use of scarce resources and of the products of capital-intensive industry, and greater use of labour. It argues that this approach must apply to all building, not just to a special category of low-cost construction. It makes detailed technical recommendations as to how this approach could be implemented in the context of Kerala; and concludes with some suggestions for institutional and procedural changes which would need to accompany the changes in technology it proposes. On training its recommendations are that:

(a) Training courses of four to eight weeks duration for young engineers to impart to them awareness of economic and social context of their work and the potential for local materials should be conducted.

(b) Short-term special courses for senior persons will help in promoting the ideas in this report.

The report was accepted by the Government of Kerala, but at a seminar held at the Centre for Development Studies to launch the report, its recommendations were attacked on numerous grounds by the Engineers of the Public Works Department who would be responsible for implementing it, and some of the obstacles to its adoption became clearer. (See the report of the Seminar on Cost Reduction in Building Construction, May 20/21, 1974, available in mimeo from C.D.S.)

The seminar further emphasised the need for a process of reeducation among building professionals, to expose them to the economic realities underlying the need, for an alternative approach to technology, to demonstrate the existence of viable alternatives, and to give them some confidence in making use of these alternatives.

As the Centre for Development Studies had been active in support of the expert Committee's work, and its buildings were designed by Baker, it was considered by the Government to be a suitable place for training

programmes for engineers to take place and was asked to organise them. The Centre agreed to organise an experimental three-week course in June 1975; the course was organised by a Visiting Fellow from the Intermediate Technology Development Group of the United Kingdom, Dr. Robin Spence, and the four members of the Kerala Government's Expert Committee agreed to act as instructors.

Objectives of the Course

The major objective of the course arose directly from the recommendations of the Expert Committee report. It was to provide a reorientation for engineers and architects concerned with the choice of technology in building, to help them to understand the necessity for an alternative 'adaptive' approach, and to demonstrate the practical feasibility of such an approach. It was decided that the course should be open, without distinction, to all with professional training in building, at whatever present level of responsibility.

As the course appeared to be the first of its kind, certain other objectives seemed desirable. A single course for less than 30 people could not in itself expect to make much impact on building practice; but if it was successful, the course could become a model for further to courses of the same type elsewhere. To make this possible teaching materials were, as far as possible, to be duplicated for wide distribution and a number of teachers from engineering colleges were invited to participate, so that some of the teaching material used could became incorporated in due course into the colleges' teaching syllabus.

It was also thought worthwhile to attempt to monitor the reactions of the participants, to get an indication of the effect of the course on their attitude to building technology. This would both help in improving the course for subsequent occassions, and provide a means of assessing the problems that would need to be overcome by individuals in different types of professional situations in attempting to introduce a new approach.

Course Participants

Twenty six participants were selected for the course. Of these nine were from Government agencies, Public Works Departments and Housing Boards, two from Public Sector Co-operatives; eight were from large private or public-sector industries; two from engineering colleges; and five from private architectural practice. By geographical origin, eleven were from Kerala, six were from the other three southern States of Tamil Nadu, Karantaka, Andhra Pradesh, and the remaining nine were from other parts of India, including Bengal, Gujarat and Delhi. By training, nine were architects and seventeen were engineers. The full list of course participants is given as Appendix 1.

Structure and content of the Course

It is clear that an ' adaptive building technology' is not defined by a particular set of construction techniques. The adpative technology appropriate for one region and set of conditions may be quite different from that for another. The area from which the 26 course participants were drawn contains vast differences both in climate and materials, and further differences in technology will be demanded for different types of building and client. Thus, although the particular set of techniques used by Baker and recommended by the Kerala Government Expert Committee for Kerala was the starting point of the course, a course concentrating primarily on these techniques would prove of little immediate relevance to some of the participants. It was therefore felt that an important place in the course should be given to methods of analysing situations, by which alternative technologies could be evaluated and appropriate choices made. Some study of the background, the economic and social context, in which building goes on was also considered essential for an understanding of the need for a new approach. A course with three rather distinct elements therefore emerged:

1. First of all, a series of background lectrues, mostly concerned with the economic situation, and the choices which must be made, but also covering the wastefulness and inappropriateness of much of today's building technology and leading on to a presentation of the approach and recommendations and of the Expert Committee report.

2. Secondly, a series of lectures on methods of analysis appropriate to problems of low cost building: economic analysis, introducing the ideas and methodology of social-cost benefit analysis as applied to choice of building technology; elámatic analyais, methods of moving from site climatic data through to specific recommendations for building design; and structural analysis, simple methods of making use of the results of recent research findings to optimise the size and reduce cost of roofing and walling elements.

3. The third element of the course was concerned with specific construction techniques, with particular emphasis on techniques with a broad adpatability, rather than these appropriate to particular localised conditions. Brickwork and use of timber were dealt is some depth; but other topics dealt with were alternative cements; stabilised soil, and alternative materials and methods of roofing including tiled roofs and concrete filler slab roofs.

Lectures on these topics were supplemented by four seminar discussions introduced by outside speakers on the subjects:

- Alternative technology: the need for an alternative pattern of Growth, with Professor A.K.N. Reddy of IIS, Bangalore.
- What's wrong with our building?, with a panel of speakers.
- The one-lakh housing scheme with Mr.Thomas Paulose, Chief Town Planning Officer, and Mrs.S.Gopalan, District Collector, Trivandrum District.
- Experiences into low cost building technology with Mr.V.A.Phillipose, formerly engineer of the Rural Housing Wing, Government of Kerala.

Two practical planning exercises were set, a short one early in the course, and a longer one later, in which participants were asked to consider a particular building problem in the context of their own conditions and devise a solution using an appropriate technology. Classroom activities were interspeceed with a few practical sessions on the use of bricks and with visits to a number of buildings nearby mostly those designed by Mr.Baker, but including the Padmanabhapuram palace, a fine 18th century building which incorporates many examples of technologies appropriate Kerala's conditions. A short survey of local housing condition was also conducted.

The complete course programme, the list of staff and speakers, and the list of duplicated material circulated, are attached as Appendix 2.

Reactions of the Participants

Participants' reactions were explored in two ways. At the end of the course, groups were formed, of people from the same sort of geographical area and type of job, to discuss the changes in the practice of building in their own situation which they though 1) desirable, and 2) feasible, and what their own personnel responsibility for such changes, should be. These groups then presented their reports which incidently constituted an evaluation of the course content. Subsequently each participant was also asked to evaluate the course individually by filling in a questionnaire, which dealt both with the content and with the structure and organisation of the course.

The group reports contained a great variety of ideas and views, which it would be impossible to summarise adequately. But reactions did tend to fall into four broad groups, according to the type of job situation of the participants.

A first group consisted of the engineers and architects working in the building agencies of Government, the Public Works Departments and the State Housing Boards. These individuals were aware of many technical changes which could be made by their departments in order to reduce costs and unnecessary use of materials. It was even stated that none of the technologies suggested by the Expert Committee or demonstrated on the course were prohibited by existing codes or regulations. Yet the institutional obstacles to change in their organisations were so great that they were generally very pessimistic about the possibility of implementing new ideas. Many already had a long and depressing experience of attempting, but failing, to introduce worthwhile changes. An exception to this general rule was the State of Tamil Nadu, whose PWD had recently set up an 'Economy Cell' to provide a 'technical audit' to all work carried out by the department, in order to reduce waste and cut costs. The Executive Engineer of this group had high hopes of being able to use this office to effect a number of significant economies for that State.

A second group consisted of the engineers and architects from large private or public sector industries, who had responsibility for the building of those industries, including townships for their employees. Thisgroup was generally given more freedom and opportunity to experiment than the PWD group, as well as being under greater pressure to reduce gcosts. This group took a keen interest in many of the techniques demonstrated, and it was clear that they had every intention and expectation of implementing such these techniques as were appropriate to their own conditions on return; further, some of then had clearly become excited by the 'adaptive' approach and reported that they would thinking along new lines in the future.

A third group consisted of several of the younger private architects. This group was deeply concerned that their work tended to bring them into contact with only the most affluent 1% of the population and that their clinets were often very little concerned with cost reduction, in fact tended rather to specify expensively constructed and finished buildings, for reasons of prestige. These architects felt that they should now be asking the question - even if the client can afford to pay, should we allow him to build this way? They also felt that the relevance of the architect's professional code - particularly in relation to fees - needed questioning. They realised that implementation of new cheaper techniques - particularly in the use of brickwork - would mean that the architect must become very much more involved with the actual construction of the building; and were crtical of the architecture schools for teaching design for absurd situations and the failing to deal with the real world. The main question raised for them by the course was how to find ways of serving the other 99% of the population - the real people.

A fourth group consisted of people already involved in some way in development - oriented work with the rural or urban poor. This group pointed out that the cost-reductions of the magnitude made possible by following all the recommendations of the Committee report would not reduce costs by more than at most 50%; and that this was not enough to be able to meet the needs of great masses of people who were in need of better housing. What was needed by these people was the resources - institutions, tools and methods - for improved self-help building. The role of the professional in this situation was not to design or build <u>for</u> people, but to find ways to give them access to these resources. This was an aspect which the course had failed to deal with.

The comments made on the questionnaire form provide further insight into the reactions of the participants. An analysis of the evaluations of the different parts of the course, and a selection of the views expressed are summarised in Appendix 3. It is clear that although there were many valid criticisms, both of content and structure, the participants on the whole regarded the course as having been very worthwhile.

Evaluation and Conclusion

On the basis of the participants reactions, it wouldseem that the course was of some value. One might try to use some sort of cost-effectiveness criterion to judge its value. The total cost of the course including all travelling - was around Rs.30,000.00 Lost working time would bring this up to about Rs.50,000.. Will this much have been saved to the Indian economy as a result of the course? As an indication, the sum of Rs.50,000 represents the cost of plasters, which might now be eliminated, in 100 small houses. It is not possible to be sure, but it seems likely from the participants' reactions, that savings very much more than this will in the future be achieved, partly though not wholely as a result of the course.

But the aims of the course were much broader than this. It was intended to provide a model for subsequent courses elsewhere in India or other developing countries. How far did it fulfill this aim?

As a model, clearly the course had many failings, For a start, it was too expensive. Rs.600 for a three-week course (the course had to be self-financing) is prohibitively expensive for great many potential sponsors. One way in which the course would have been made cheaper would have been to shorten it. There were certainly some subjects whose treatment could have been improved by shortening, and a few which could perhaps have been eliminated at no great cost. On the other hand, participants and staff were constantly aware of the shortage of time which prevented many important topics being adequately discussed, and resulted in a new topics being constantly introduced before earlier ones had been adequately absorbed. In one sense, a rather longer and more leisurely course with a less crowded timetable, more time for individual work, reading and projects, and for groups discussion, would have been preferable. But such a course would need adequate official sponsorship to attract participants.

A more serious failing of the course as a model was the extent that it depended for its success on the use of certain scarce - and perhaps even 'non-renewable' - resources. These included the time of its staff-members - the members of theExpert Committee - all of whom are heavily committed to their professional responsibilities and could be expected to be involved in only a limited way in teaching, and also the use of the premises, residential and administrative facilities of the Centre for Development Studies, an academic institution that would not normally be expected to become involved in matters of technology at all (Indeed, an application for funds to the ICSSR, which has provided some support to other programmes of the Centre, was in fact turned down, on the grounds that building technology does not come within the range of interest of a Social Science Research Council.) The preparation of extensive duplicated teaching material, and the invitation to teachers in Engineering Colleges to participate, were intended to be the means of over coming these 'resource constraints'. Unfortunately however, neither of the two engineering college teachers who did attend was primarily a teacher of building technology, and the obstacle presented by the 'imitative' approach of the Engineering Colleges still remains. In this respect therefore, the resultsof the course have not been so encouraging

Lastly, what of the fundamental objective of the course - to help participants to understand the need for an alternative adaptive approach and to demonstr te its practical feasibility? It is only possible to say again on the basis of the participant's reactions (Appendix 3), that some changes in habits of thinking had begun during the course. But a further comment made by one of the participants warns against any complacency about this:

> "I wish to add that the implementation of change does not end with this course. Change is a continuous process. By attending this course the mechanism of change in one's system has been set into motion. It is important that this maintained and one does not go back to the level of stagnation....."

Thus we are not only faced with the problem of how to provide reorientation for the mass of todays professionals who would benefit from it, but of providing for those who have been exposed to, and accepted, a new approach the information and encouragement that they need to maintain the momentum of change. This is a substantial task, but one which must be accepted (and met with sufficient funds and official support) if the ultimate aim of building more cheaply and rationally is to be achieved in any widespread or sustained way.

APPENDIX I

115380

List of Participants

1. Sri B.K.Chakrabarty, Project Officer, Housing and Urban Development Corporation Limited. 21-1 Jamnagar House, New Delhi 1.
2. Sri P.Kaliaperumal, Executive Engineer, Economy Cell, Public Works Department, Madras.
3. Sri S. Seshan, Assistant Architect, Office of Chief Engineer, Public Works Department, Madras.
4. Sri K.N.Chandrasekhar, Executive Engineer, Karnataka Housing Board, Bangalore.
5. Sri K. Narayana Rao, Assistant Engineer, Karnataka State Housing Board, Bangalore.
6. Sri P. Sreekumaran Nair, Design Assistant, Chief Engineers' Office, Public Works Department, Trivandrum.
7. Sri M.K.Narayanan Namboodiri, Assistant Architect, Chief Engineers' Office, Public Works Department, Trivandrum.
8. Sri P.Sugathan, Assistant Engineer, Kerala State Housing Board, Trivandrum.
9. Sri K.V.Krishnan, Junior Engineer, Kerala State Housing Board, Trivandrum.
10. Sri A. Rajamoney, Lecturer, Civil Engineering Department, Engineering College, Trivandrum.
11. Sri K. Nagabhushanam, Head, Civil Engineering Division, Electronics Corporation of India, Limited, Cherlappally, Hyderabad 40.
12. Sri. S.Ravikumaran Nair, Technical Assistant, Encos Construdtion Division, Trivandrum.
13. Sri P.K.Mitra, Engineering Assistant, Town Engineering Department, Hindustan Steel Limited, Rourkela 1.
14. Sri N.K. Sharma, Architect, Hindustan Steel Limited, Durgapur, West Bengal
15. Sri Subrata Roy, Civil Engineer, Indian Iron and Steel Co. Limited, Burnpur, West Bengal.
16. Sri B.V. Nandedkar, Senior Design Engineer (Arch.) Bhilai Steel Plant, Bhilai, M.P.
17. Sri H.Bandyopadhyay, Divisional Engineer (Design) Hindustan Steel Limited, Alloy Steel Project, Durgapur, West Bengal.
18. Sri S.M. Patel, Architect and Civil Engineer, Jyoti Limited, Baroda.
19. Sri I.F. Patel, Manager, Civil Engineering Department, Alembic Chemical Works, Co. Limited, Alembic Road, Baroda.3. Gujrat
20. Sri K. Purushothaman, Civil Engineer, Chitralekha Film Studio, Aakulam, Trivandrum.
21. Sri K.S.Jagdish, Lecturer, Civil Engineering Department, Indian Institute of Science, Bangalore.
22. Sri R.J.Tharakan, Private Architect, Alleppey District, Kerala.
23. Sri Mani George, Private Architect, Trivandrum.
24. Sri Jai Sen, Private Architect, Calcutta.
25. Sri G.F. Diwakara Prakasa. Private Architect, Martandam, Tamil Nadu.
26. Sri P.G. Varghese, Private Architect, Cochin.

APPENDIX 2

Programme

WEEK 1

Tuesday 17th

9.30 a.m.	Introductory session	R.J.S. Spence
11.00 a.m.	"Trends in the Indian economy having implications for building activity"	K.N. Raj
2.30 p.m.	Economic background lecture 1.	K.S. Parikh
4.00 p.m.	Group Discussion	

Wednesday 18th

9.30 a.m. 11.00 a.m.	The Expert Committee Report 1. Approach 2. Objections/obstacles	K.S. Parikh, L.W.Baker K.C. Alexander
2.30 p.m.	Economic background lecture 2.	K.S. Parikh
4.00 p.m.	Group Discussion	
5.30	Visit to Centre Buildings	L.W.Baker etc.

Thursday 19th

9.30 a.m.	Practical Planning exercise	L.W.Baker
11.00 a.m.	Modern construction methods - an architect's view	L.W. Baker
2.30 p.m.	Economic background lecture 3.	K.S. Parikh
4.00 p.m.	Survey: Introduction and first visit	R.J.S.Spence, M.D.Nalapa

Friday 20th

9.30 a.m.	Economic background lecture 4.	K.S. Parikh
11.00 a.m.	Group and general discussion	
2.30 p.m.	Economic background lecture 5.	R.J.S.Spence, K.P.Kannan
4.00 p.m.	Survey: Second visit	R.J.S.Spence, M.D.Nalapa

Saturday 21st

9.30 a.m.	Visit to Loyola School Buildings	L.W.Baker
2.30 p.m.	Survey: Presentation of reports	R.J.S.Spence, M.D.Nalapa
5.30 p.m.	Panel discussion "What's wrong with our building"? Chairman, Dr. P.K.Gopalakrishnan, Member-Secretary, State Planning Board	
8.00 p.m.	Special dinner	

WEEK 2

Monday 23rd

9.30 a.m.	Technical lecture: Brickwork I	L.W.Baker
11.00 a.m. 2.00 p.m.	Tour to local buildings Visit to one-lakh houses sites	L.W.Baker R.J.S. Spence
4.30 p.m.	Technical lecture: Brickwork II	L.W.Baker

Tuesday 24th

7.00 a.m.	Brickwork - practical exercise 1.	L.W.Baker
10.00 a.m.	Lecture: "Building Materials Resources - a Case study of Kerala"	K.C.Alexander
12.00 a.m.	Technical lecture "Design of load-bearing brick work"	K.Madhavan
2.30 a.m.	Practical design exercise in load-bearing brickwork	K.Madhavan

Wednesday 25th

7.00 a.m.	Brick work - practical exercise 2	L.W.Baker
10.00 a.m.	Lecture: "Use of timber in building	L.W.Baker
12.00 a.m.	Technical lecture: " Design of slab roofs"	K.Madhavan
2.30 p.m.	Practical design exercise in slab roofs	K. Madhavan K.C.Alexander

Thursday 26th

7.00 a.m.	Brickwork - practical exercise 3.	
10.00 a.m.	Technical lecture: "Design for climate"	K.Madhavan
12.00 a.m.	Practical design exercise in climatic design	R.J.S.Spence, K.Madhavan
2.30 p.m.	Design exercise (contd.)	

Friday 27th

7.00 a.m.	Brickwork - practical exercise 4.	L.W.Baker
10.00 a.m.	Tour of local buildings	L.W.Baker
2.00 p.m.	Visit to Poonthura fishing village scheme	L.W.Baker

Saturday 28th

9.30 a.m.	Technical lecture: floor finishes	L.W.Baker
11.00 a.m.	Practical design exercises (Completion)	R.J.S. Spence
2.00 p.m.	-do-	-do-
4.00 p.m.	Visit to Ulloor Housing Board site;	Sri V.A.Phillipose

Sunday 29th		
8.00 a.m.	All day visit to Padmanabhapuram Palace, Kanyakumari	L.W.Baker
WEEK 3		
Monday 30th		
9.30 a.m.	Technical lecture: Drainage, Water supply, electricity	L.W.Baker
11.00 a.m.	Practical planning and design exercise	L.W.Baker, R.J.S.Spence
2.00 p.m.	-do- (Contd..)	
4.00 p.m.	Lecture "Experiences with low-cost housing technology"	Sri V.A.Phillipose
Tuesday 1st		
9.30 a.m.	A case study of low-cost housing the one lakh houses scheme	R.J.S.Spence M.D. Nalapat
	Visitors: Sri M.Varghese Smt. S.Gopalan	
2.00 p.m.	Practical planning - design exercise (contd.)	
Wednesday 2nd		
9.30 a.m.	Filler slab - casting demonstration	L.W.Baker
11.00 a.m.	Practical planning and design exercise (contd.)	
2.30 p.m.	-do- (Complete)	
4.30 p.m.	Presentation and evaluation of planning exercises	L.W.Baker
6.30 p.m.	Special entertainment and dinner	
Thursday 3rd		
9.30 a.m.	Strategies for change - 1*	Sri M.Ramaswamy Iyer
11.00 a.m.	Strategies for change - 2	Sri D. Ambrose
2.00 p.m.	Group discussion	
4.00 p.m.	General discussion	
Friday 4th		
9.30 a.m.	Alternative technology	Prof.AKN Reddy R.J.S.Spence
11.00 p.m.	Group discussion	
2.00 p.m.	Group reports 1	
8.00 p.m.	Special dinner	
Saturday 5th		
9.30 a.m.	Group reports 2	
11.00 a.m.	Course evaluation	R.J.S.Spence, L.W.Baker K.C.Alexander
12.00 noon	Closure	

*In the event, this programme was cancelled owing to the sudden unavailability of its main speakers. A visit to the Trivandrum Engineering College, to see work on low-cost construction techniques being carried out there, was substituted.

Course Leaders and Staff

Sri L.W.Baker is a private architect and builder in Trivandrum. He is an architect, and Associate Fellow of the Centre for Development Studies. He was a member of the Kerala Government Expert Committee on Cost Reduction in Building Construction.

Dr.K.S.Parikh is Professor, Planning Unit at the Indian Statistical Institute. Author of several books on economics and planning, he was Chairman of the Expert Committee.

Sri K.Madhavan is a structural engineer, and Director of Hydro-Civil Designs, Central Water Commission, New Delhi. He was a member of the Expert Committee.

Sri K.C.Alexander is a structural engineer, and at present Regional Engineer, Cochin, for the Kerala State Housing Board. Recently appointed Special Officer of the Public Works Department for development and experimental work. A member of the Expert Committee.

Dr. Robin Spence is a visiting Fellow of the Centre for Development Studies. A Civil Engineer, he was formerly Research Officer for the Intermediate Technology Development Group in London. Recently appointed Lecturer in Architecture at Cambridge University.

Dr. K.N. Raj is a leading economist, and Fellow of the Centre for Development Studies.

Sri K.P.Kannan and Sri M.D.Nalapat are Research Associates of the Centre for Development Studies.

Visitors:

Sri Mathew Varghese is Chief Town Planning Officer for Kerala State. He was responsible for the design used for the one lakh houses scheme.

Sri V.A.Phillipose is formerly Chief Engineer of the Rural Housing Wing, kerala State. He is now a private consultant and builder, specialising in low-cost buildings and materials.

Smt. S. Gopalan is District Collector for Trivandrum. She was responsible for one of the most successful areas of implementation of the one-lakh houses scheme.

Sri M.N.Govindan Nair is Minister for Power and Electricity, Kerala State. As Minister responsible for housing, he took the initiative in launching the one-lakh houses scheme.

Sri D. Ambrose is Chief Engineer, Buildings, Public Works Department, Madras, and has been responsible for a number of initiatives in cost reductio

Sri M. Ramaswamy Iyer is Senior Architect, Public Works Department, Trivandrum and is actively concerned with local low-cost housing schemes.

Professor A.K.N. Reddy is Professor of Electrochemistry at the Indian Institute of Science, Bangalore. He is Convenor of the Cell for Application of Science and Technology to Rural Areas (ASTRA) of the Institute. He is an Associate Fellow of the Centre for Development Studies.

List of duplicated Material

1. Papers etc. published elsewhere

Baker, L.W. "Cementlessness", Hindustan Times, November 4th, 1974

Baker, L.W. "Does building cost reduction mean sacrifice of quality" Symposium of Cost-reduction techniques in building construction, March 22, 1975, Department of Technical Education, Trivandrum.

Spence, R.J.S. "The Scope for Manufacture of lime-pozzolana cement in Kerala", Symposium of Cost-reduction techniques in building Construction, March 22, 1975, Department of Technical Education, Trivandrum.

Reddy, A.K.N. "An alternative pattern of growth", excerpt from "Is Indian Science Truly Indian"?, Science Today, January 1974

Schumacher, E.F. "Social and economic problems calling for development of Intermediate Technology", from Small is Beautiful, Blond and Buggs, 1973.

Correa, Charles M. "Housing: Space as a reserve, Times of India.

Government of Kerala, Performance Approach to Cost Reduction in Building Construction, Expert Committee Report, January 1974

United Nations, excerpts from Climate and House Design, United Nations, 1971

Koenigsburger O, and Lynn R., excerpt from Roof in the Warm Humid Tropics Architectural Association, London, 1965.

Meterological Survey of India, excerpts from Climatological Tables of Observation in India, 1931-1960.

2. Papers, notes etc. not published elsewhere, (available from Centre for Development Studies)

Spence, R.J.S., and Kannan, K.P. "Social Cost Benefit analysis and choice of technology in building construction", June 1975.

Madhavan K. "Impact of developments in structural research and analysis in housing", June 1975.

Alexander, K.C "Building materials resources and requirements of India with Special reference to Kerala", June 1975.

Nalapat M.D., "The one-lakh houses scheme", March 1975.

Spence R.J.S. "A note on yield line design of filler slabs", June 1975.

3. Information, exercises etc.

Course programme
Course leaders and visitors
List of participants
Questionnaire for participants
Inventory of resources and constraints on building technology
Course evaluation questionnaire

APPENDIX 3

Participants' Evaluation of Course

Rating:

Participants were asked to consider

(a) Quality of presentation, etc.

(b) Usefulness,

of the course as a whole, and the different parts of the course and rate the them according to the following scales.

Quality:	A Excellent	B Good	C Mediacre	D Poor
Usefulness:	Very valuable	Valuable	Some use	Pointless

The numbers of evaluations in each category are shown in the table. A "score" for each part of the course has been calculated by taking A=+1 B = 0, C = -1, D= - 2.

Detailed Criticism of Course:

Participants were asked whether the course should have been longer or shorter, what they would have wanted to spend longer on orinclude, what they would have wanted to spend less time on, or leave out, whether they would have preferred a wider selection of viewpoints on cost reduction technology, and what other changes in course structure or content they would propose.

Of 27 participants, 9 would have preferred a short course, 3 a longer course.

The topics they wanted to spend less time on or leave out included the survey, the practical planning exercise, the economic background lectures (a general comment was that they could be compressed), and "unnecessary speaches". There was a wide range of suggestions about what should be given more time or brought into the course, including multi-storey buildings, "technical matters", characteristics of building materials, structures, prefabricated construction, quality control, labour managment, research of CBRI etc. building materials, processes, ventilation, philosophy of structural form, design, stonework, a complete design/construction project, foundations in expansive soils, "new technology".

No less than 23 of the participants would have preferred a wider selection of viewpoints on cost-reduction technology.

Participants' rating of different parts of the course

(In the Table a score for each part of the course has been calculated by taking A=+1, B=0, C=-1, D=-2)

	USEFULNESS					QUAD		
	A	B	C	D	SCORE	A	P	C
Course as a whole	10	15	2	0	+8	9	17	-
Economic background lectures	10	11	5	1	+3	11	14	1
Lectures on brickwork, timber etc.	13	13	1	-	+12	10	16	-
Lectures/exercises on structural designs	9	10	8	-	+1	4	10	10
Lectures/exercises on climatic design	12	11	4	-	+8	14	9	1
Practical planning exercise	4	11	10	2	-10	4	18	4
Morning brickwork sessions	7	18	2	-	+5	8	18	-
Visits to buildings	15	10	2	-	+13	12	11	2
Survey	3	11	10	3	-13	3	13	6
Session/visit to one-lakh-housing	7	12	8	-	-1	4	18	2
Alternative technology session	14	11	2	-	+12	13	10	2
Visit to engineering college	5	15	5	2	-4	3	18	1

Course organisation and domestic management:

Participants were asked whether they were generally satisfied or dissatisfied with the domestic management and the course organisation & administration and to give detailed criticism. General satisfaction on both counts was almost universally expressed, and very few detailed crit were made.

Learnings from the Course:

articipants we e asked what were the major things they had le from the course. This provoked a wide variety of responses, some of re quoted below:

"A range of information about materials and processes relevant to building construction. Economical implications of housing problem. Housing conditions in Kerala. Possibilities of 4½" brick walls and folded plate roofing forms. Possibilities of mud block construction".

"To ask question - why it is required, how much is required? Is there an alternative way to attack the problem? To go to market and do market survey and find out the behaviour of materials. Use of traditional technology in modern context and conservation of resources for wider uses."

"To have a new approach to use to the fullest extent of technology, uses of available local materials, avoiding scarce material, uses of more labour (unskilled, etc.) from social point of view and to have interdisciplinary approach (implementing of Economics, Statistics, etc.) to reduce the cost of a project."

"We were made aware about how poor we are!"

"I have learnt to think in terms of adopting alternative technology to suit the conditions, social, climatic and financial, of my place."

"I learnt to economise on constructional activity to some extent like adopting one sided plastered 4½" brick walls, filler slab construction. Social cost benefit analysis, and climate planning are very useful. Very much impressed with Mr.Baker's construction technique especially his own house and the house at Azhagiyapandipuram.

"The necessity of cost reduction in construction activities is the important thing I studied: and I secured enough courage to implement such things in my future work by seeing the specimens. The study of climatic conditions and resources are very much useful lessons."

"Various ways in which cost of construction can be reduced - viz. by taking into consideration small things which ultimately amount to collosal sum. And that use of a bit of common sense is essential-besides following established norms."

"The most important factor in attending this course was realisation and changing one's inherent attitudes and approaches which when compared in the light of the national perspective one finds extremely self-centred. One was aware that the majority of our people were near and some below the poverty line, however one always tended to ignore or forget such situation. One attending this course one was confronted with naked truths and statistics. This will definitely influence one's approach to design and construction. The importance of cost reduction in terms of building was the most significant factor that one realised, and ways and means of implementation of this cost reduction through an adaptive building technology."

"That the very low costs achieved by Baker are very much the result of application of common sense and imagination, as well as of a very unusual (person and) arrangement. A very rigorous evaluation system needs to be developed to look at how cost reduction and performance improvement can be achieved - but also to understood fully where Baker's achievements (quantitatively) lie. At the moment there is unfortunately uninformed comparison of his work with conventional arrangements. One of course is promoted to realise that "conventional arrangements" are very wasteful Baker's initiative is a very valuable lead".

"The course itself - and meeting others in building etc. suggests that the idea of "cost-consciousness" is very important and sadly lacking. But it needs to be emphasized that building technology is not the only area of potential change, nor is reduction the only possibility - improvement in performance (eg. by multiple use of spaces - i.e. program) is equally significant."

"The need for planning for poor. The millions of poor who's problems are left to themselves are brought to notice. The avoidable wastes, the inadequacy of codes of practise, the indifference of present needs of public in the wake of western technology and its poor adaptations are revealed. The need for re-thinking in the present context of austerity measures, ecology, and environmental problems. The need for development of more research in the utilization of indigeneous materials is stressed, and a vast fields opened for enterprising engineers."

"Social-cost-benefit analysis and the climatic design and some introduction to the economics of housing are some of the things worth learning. The real construction of brick work timber has been exhibited by Mr. Baker, have opened our eyes how these two materials can be usefully put into economical use. In this respect the benefit of the course is amazing."

"Importance of cost consciousness at every level of implementation of building projects."

Other Comments

Participants were asked about what other comments they would like to make about the course. Some of these comments are quoted below:

"Course content including duration of the course should be suitably modified to fit the requirement of participats of different level. For example - for senior personnel - course should be shorter duration mainly to give a new direction in their approach to decision making and each topic need not be covered in greater details whereas for junior personnel it should be of longer duration covering all technical aspects of each topic".

"Instead of restricting to the low cost housing, some time could have been spared for the reduction of cost in multistorey construction etc."

"You should organize such course for the politicians also to stress the importance and vastness of problems with stress on the economic background

"Extension of this course - by developing information channels, collection etc. - should be attempted. An inventory of regional resource material, techniques and technologies patterns - would be very valuable."

"Lastly I wish to add that the implementation of change does not end with this course. Change is of continuous process. By attending this course the mechanism ofchange in one's system has been set into motion. It is important that this is maintained and one does not go back to thelevel of stagnation. To enable this I feel that there should be a follow up on this course. Participants should be given access to information in the way of technical data and economic data. Period of retrospection of examine one's actions over a period of time and evaluate one's work is also important. "

"The participants should have included more 'Students'. It would have been more profitable to have included larger number of students because they in future would form the decision making group and to make them realize the implication of adopting such techniques wouldsubsequently help in changing the system as a whole."

"This type of course is very necessary to change ideas and views of engineers, and architects. It helps them in many ways."

"15 minutes time to explain and present a paper prepared by participants regarding their experience on low cost techniques in their own area so that we could have more information."

"Some presentations were not very coherent and useful. Couldavoid these by selecting personnel who not only know, but also can present what they know reasonably well. I would stress the point regarding such training to people at other levels of administration and power including secretaries, Industries Department personnel and POLITICIANS. To attract the latter, create the necessary background, so that it becomes a must for them."

"From the'Public Works' point of view, the only way to effect economy in building construction is to have wider knowledge on economy of Framed structures, Multi-storeyed buildings, Building complexes like large Hospitals, Colleges, Factories, etc. because "Housing", (especially the single-storeyed low-cost houses) is handled by other Agencies like Housing Board. This Problem was not fully discussed either in the Expert Committee Report or during the Course conducted now".