Annexure -1
Questionnaire for the clients of Cost ford

1 Name: ____________________________

2 Sex   Male   Female

3 Tel No./Mobile: ____________________

4 Zone   Southern zone   Northern zone

5 Address for communication: ____________________________

5 Age group
20-30   ○  31-40   ○  41-50   ○  51-60   ○  Above 60   ○

6 Your monthly income
<10000  ○  10000-20000  ○  20000-35000  ○  35000-60000  ○  >60000  ○

7 Education
   Pre Degree   ○  Diploma   ○  Degree/PG   ○  Professional Degree   ○  Doctorate   ○
   Degree

8 Occupation
   Ministerial   ○  Supervisor   ○  Engineer   ○  Administrative   ○  Others-Specify   ○

9 Costford can complete the construction works within the agree time
SA   ○  A   ○  NO   ○  D   ○  SD   ○

10 Costford can complete the construction works within the agree rate
SA   ○  A   ○  NO   ○  D   ○  SD   ○

11 Quality of construction by Costford is good
SA   ○  A   ○  NO   ○  D   ○  SD   ○

12 The approach of Costford towards cost effectiveness is commendable
SA   ○  A   ○  NO   ○  D   ○  SD   ○

13 Employees of Costford are very conversant with cost effective aspects and are knowledgable
SA   ○  A   ○  NO   ○  D   ○  SD   ○

14 The Technology adopted by Costford for the cost effective construction is Good
SA   ○  A   ○  NO   ○  D   ○  SD   ○

15 Costford can complete the construction works within the agree Cost
SA   ○  A   ○  NO   ○  D   ○  SD   ○

16 There is good and effective interaction of Costford employees towards the customers
SA   ○  A   ○  NO   ○  D   ○  SD   ○

(Hint: SA-Strongly Agree; A-Agree; NO-Neither Agree nor Disagree; D-Disagree; SD-Strongly Disagree)
Annexure -2

Questionnaire (for the employees of Cost ford)

1 Name:

2 Sex  Male  ☐ Female  ☐

3 Tel No./Mobile:

4 Zone  Southern zone  ☐  Northern zone  ☐

5 Age group  20-30  ☐  31-40  ☐  41-50  ☐  51-60  ☐  Above 60  ☐

6 Your monthly income  <7000  ☐  7000-15000  ☐  15000-25000  ☐  25000-40000  ☐  >40000  ☐

7 Education

  Pre Degree  ☐  Diploma  ☐  Degree/PG  ☐  Professional Degree  ☐  Doctorate  ☐

8 Occupation

  Ministerial  ☐  Supervisor  ☐  Engineer  ☐  Administrative  ☐  Others-Specify  ☐

9 Service in Cost ford  <2 years  ☐  2-5 years  ☐  5-7 years  ☐  7-10 years  ☐  >10 years  ☐

HR Practices (Training Related)

Hint: SA-Strongly Agree; A-Agree; NO-No Opinion; D-Disagree; SD-Strongly Disagree

1 Is there any training department in Cost ford at present
   Yes ☐  No ☐

2 Are you getting training regularly
   Yes ☐  No ☐

3 If yes, please indicate the regularity of training
   Once in two Monthly ☐ months  ☐ Quarterly  ☐ Half yearly  ☐ Yearly  ☐

4 How long will the training schedule last
   Less than 3 days  ☐  3-6 days  ☐  6-10 days  ☐ more than 10 days  ☐

5 Have you got induction training from Cost ford
   Yes ☐  No ☐

6 Do you feel monotonous during training
   Always  ☐  Often  ☐  Occasionally  ☐ rarely  ☐ never  ☐

7 Do you feel that the training is necessary
   Yes ☐  No ☐

8 How do you think about the regularity of training
   Very Good  ☐  Good  ☐  Moderate  ☐  Poor  ☐  Very poor  ☐
9 Opinion about Time schedule
   □ Good    □ Moderate    □ Poor    □ Very poor

10 Satisfaction with the content of training
   Highl □ Moderat □ Satisfied □ Dis satisfied
   y satisfied \n
11 What do you feel about the regularity of training programmes conducted
   SA □ A    □ NO    □ D    □ SD   □

12 Opinion about the time schedule of training programmes conducted
   SA □ A    □ NO    □ D    □ SD   □

13 Feel about the content of training programmes conducted
   SA □ A    □ NO    □ D    □ SD   □

14 Opinion about the construction knowledge imparted by the Training
   SA □ A    □ NO    □ D    □ SD   □

15 Feel about the Knowledge of cost effectiveness imbibed by the Training
   SA □ A    □ NO    □ D    □ SD   □

16 Opinion about the satisfaction level about the training programme
   SA □ A    □ NO    □ D    □ SD   □

17 Opinion about the Enhancement of efficiency level of labour through training
   SA □ A    □ NO    □ D    □ SD   □

18 Did you have chances for improvement of academic qualification after getting into Costford
   Yes □ No □

19 If Yes mention the qualification you acquired

20 Computer skills acquired from the Costford on the job training (Please tick the relevant ones)
   Excel □ Word □ Autocad 2D □ Autocad 3D □

   (Job environment related)

1 I have good relationship with my peer groups
   SA □ A    □ NO    □ D    □ SD   □

2 The working time for the employees in Costford is very lenient
   SA □ A    □ NO    □ D    □ SD   □

3 The labour problems like strikes etc... are very rare in Costford
   SA □ A    □ NO    □ D    □ SD   □

4 There is very good client relationship exists in Costford
   SA □ A    □ NO    □ D    □ SD   □

5 The employee turnover in Costford is less
   SA □ A    □ NO    □ D    □ SD   □

6 The flow of vertical communication in Costford is very effective
   SA □ A    □ NO    □ D    □ SD   □

7 There is sufficient staff strength in Costford to manage the works
   SA □ A    □ NO    □ D    □ SD   □
8. The job experience that I get from the Costford activities is excellent
   SA □ A □ NO □ D □ SD □

9. In Costford, the job environment is such that the employees can very well utilize their knowledge and abilities
   SA □ A □ NO □ D □ SD □

(Job satisfaction related)
1. Opinion about the Job security that exists in Costford
   SA □ A □ NO □ D □ SD □

2. Monetary benefits received from the Costford is good
   SA □ A □ NO □ D □ SD □

3. Opinion about the chance for the promotion and growth prospects
   SA □ A □ NO □ D □ SD □

4. Feel about the appreciation of work done in Costford
   SA □ A □ NO □ D □ SD □

5. Opinion about the chances for effective utilisation of knowledge and abilities
   SA □ A □ NO □ D □ SD □

6. The job experience that I get from Costford is excellent
   SA □ A □ NO □ D □ SD □

7. The working condition and atmosphere in Costford is good in all respects
   SA □ A □ NO □ D □ SD □

8. Is there any incentive schemes in Costford
   Yes □ No □

9. If yes the periodicity of incentive payment
   Monthly □ Quarterly □ Half yearly □ Yearly □

10. Is there a good system for the appraisal of works you have done in Costford
    Yes □ No □

11. If yes, the type of appraisal system in practice
    Written □ Oral □ Observation □ All of these □

(Technology related)
1. There is substantial saving in labour with cost effective construction techniques
   SA □ A □ NO □ D □ SD □

2. Cost effective techniques can save time when compared to the conventional techniques
   SA □ A □ NO □ D □ SD □

3. There is substantial saving in material component in cost effective construction techniques
   SA □ A □ NO □ D □ SD □

4. Durability of the structure can be assured with cost effective construction techniques
   SA □ A □ NO □ D □ SD □

5. The acceptance of cost effective technology by the public is more
   SA □ A □ NO □ D □ SD □
6 Do you think that there is substantial savings in natural resources through Cost ford technologies

☐ SA  ☐ A  ☐ NO  ☐ D  ☐ SD  ☐

(Inventory related)
1 Do you think that proper inventory management is done in Cost ford
   Yes  ☐  No  ☐

2 A reasonable forecast of level of inventories is made during construction works
   Yes  ☐  No  ☐

3 Is there any regular suppliers of materials for cost ford construction
   Yes  ☐  No  ☐

4 Do you think that the materials of construction are received in time at sites
   SA  ☐  A  ☐  NO  ☐  D  ☐  SD  ☐

5 Is there any warehouse or godown space for storing of materials
   Yes  ☐  No  ☐

6 If yes, is the storage space is a rented one which demands additional cost
   Yes  ☐  No  ☐

7 Purchasing of materials for the construction sites is centralized
   SA  ☐  A  ☐  NO  ☐  D  ☐  SD  ☐

8 Extended time for completion of work is necessitated because of the non availability of materials
   at site
   SA  ☐  A  ☐  NO  ☐  D  ☐  SD  ☐

(Fund related)
1 A full fledged finance wing exists in Cost ford to look into the financial aspects of projects
   SA  ☐  A  ☐  NO  ☐  D  ☐  SD  ☐

2 Tick the source of fund for Cost ford projects

   Own fund  ☐  Borrowed fund  ☐  Funds received in advance  ☐

3 Cost ford is getting advance fund for carrying out the construction works
   Yes  ☐  No  ☐

4 Cash flow is always carefully attended by the finance wing
   SA  ☐  A  ☐  NO  ☐  D  ☐  SD  ☐

5 Cash budget is prepared for each and every project
   SA  ☐  A  ☐  NO  ☐  D  ☐  SD  ☐

6 Fund raising is done only through the advance receipt of project cost
   SA  ☐  A  ☐  NO  ☐  D  ☐  SD  ☐

7 Advance receipt of funds are settled in the succeeding part bills
   Yes  ☐  No  ☐
8 How do you slow down the cash outflows

- Payment by Cheque
- Payment on last date
- Inter bank transfer
- Centralization of payment
- Any other (Specify)

9 Do your suppliers give you materials on credit

- Yes
- No

10 Maximum care is exercised while utilisation/allocation of funds to the construction sites

- SA
- A
- NO
- D
- SD

11 From where do you arrange cash in urgency

- Banks
- Clients
- Shares
- Material advancement
- Others (specify)

12 Extended time for completion of work is necessitated because of the shortage of fund

- SA
- A
- NO
- D
- SD
Annexure 3

List of Publications by the Candidate:


REVIEW OF SOCIAL SCIENCES

Review of Social Sciences is published Bi-annual-January and July Every Year
All rights are reserved to the Kerala Academy of Social Sciences.

President
- Prof. Dr. P. Sathyaseelan (Mob : 09447862428)

General Secretary
- Prof. Dr. J. Rajan (Mob: 09447097116)

Editorial Advisors
- Prof. Dr. M.K. Ramachandran Nair
- Prof. Dr. K.N. Panikkar
- Prof. Dr. K. Raman Pillai
- Prof. Dr. N.A. Karim
- Prof. Dr. M. Sarngadharan
- Prof. Dr. N. Kunhaman
- Prof. Dr. R. Venkatapathy

Editorial Committee
- Dr. P. Sathayseelan
- Dr. C.N. Somarajan
- Dr. M. Jayaparakash
- Dr. L. Vinayakumar
- Dr. B.S. Jamuna
- Dr. Meena T. Pillai
- Dr. K.R. Ushakumari
- Dr. Sebastian Joseph

Assistant Editor
- Dr. S. Ajitha (Mob: 9447259150 / dr.ajithas@gmail.com)

Editor
- Prof. Dr. S. Sivadasan (Mob: 9496014142 / sdsivadas3@gmail.com)

Chief Editor
- Prof. Dr. J. Rajan (Mob: 09447097116 / jrajanimk@gmail.com)
# REVIEW OF SOCIAL SCIENCES
Peer Referred Research Journal

ISSN 0974-9004

Vol. XIV  No. 2  July - December 2013

Published on 1st July 2013

## CONTENTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Authors</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>J. Rajan, Ambili G.S.</td>
<td>E-Tailing: A Virtual Channel For Shopping</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>Arun Lawrence, Shijina A.S.</td>
<td>Indian Stock Market - A Study on Recent Development</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>J. Rajan, Biju J.J.</td>
<td>Customer Perception on Retail Industry in Kerala</td>
<td>23</td>
</tr>
<tr>
<td>5.</td>
<td>J. Vijayan</td>
<td>E-Waste Management – Problems and Solutions</td>
<td>40</td>
</tr>
<tr>
<td>6.</td>
<td>J. Rajan, Jyotheendranath C.S.</td>
<td>Construction Management towards Cost effectiveness</td>
<td>57</td>
</tr>
<tr>
<td>8.</td>
<td>J. Rajan, Salini.C.R</td>
<td>Role of Financial Institutions in the Development of Women Entrepreneurship in Kerala</td>
<td>74</td>
</tr>
<tr>
<td>10.</td>
<td>J. Rajan, Udaya Kumar A</td>
<td>Water Management and Sustainable Development</td>
<td>90</td>
</tr>
<tr>
<td>11.</td>
<td>Miss Sani. S, Manoharan Nair</td>
<td>Occupational stress a study among female employees in Kerala</td>
<td>102</td>
</tr>
</tbody>
</table>
Construction Management

towards Cost effectiveness

J. Rajan* & Jyotheendranath C.S. **

Introduction

From the very beginning of the existence of human being on earth, man has been constantly searching for and devising means of safeguarding himself against the ill effects of nature and attack from wild animals. In the ancient times man has no other means but to live on trees and in caves. With the advancement of knowledge and civilization, man realized the benefit of living in groups and devising means for safe living. He started constructing huts and then small houses and sooner, shelter has become one of the basic needs of human being along with food and clothing. With the passage of time, new techniques of construction has been evolved with the changing trends of mind sets of human being and gradually, the construction activity turned into an Industry.

Construction sector

History of construction activities can be traced back to 4000 BC when the sole means of construction were the human labour, without any sophisticated equipment. The monuments of cave temples at Ajanta and Ellora are the testimony of the skill and craftsmanship in construction in those days. The construction industry is one of the oldest and largest industries (perhaps the second largest economic activity next only to agriculture) in India and the construction activity provides employment on a large scale. The Government of India's policy of planned investment in the form of five year plans gives emphasis on the development of the country. In almost all the five year plans, more than 50% expenditure

*Professor & Head, Institute of Management in Kerala, University of Kerala
**Assistant Executive Engineer, Kerala PWD / Research Scholar, MS University, Tirunelveli
incurred is related to construction work in one form or the other such as dams, power and irrigation projects, roads, communication, housing sector etc... With the advancement in all spheres of technology, the civil engineering has also developed tremendously, utilizing all the modern techniques and management concepts.

With the increase in population, the need for housing and industry also increased. Thus, the volume and scope of construction industry has a direct linkage with the population and size of the country and, and plays a vital role in the overall development of the country. Thus it can be said that our national development is directly linked with the development of construction activities which in turn is responsible for the economic progress of our country.

The construction sector has major linkages with the building material industry since construction material accounts for sizeable share of the construction cost. Construction materials like cement, steel, bricks, fine and course aggregates, rubble, paints, timber, aluminium, glass etc. play a major role jointly as well as individually in the construction industry as a whole.

**Present Scenario**

As technological innovations are taking place at a faster pace, the style and standard of living of people are also changing very rapidly. As the construction is vital to improve the standard of living of people, it needs to be faster, active, quality and cost conscious. As mentioned earlier, the volume and scope of construction industry has a direct linkage with the population and hence, as population increases day by day, the construction activities have also become manifold, becoming more complex and capital intensive. So, the expected growth of construction volume demands sophisticated managerial talent to properly manage these big projects.

The construction sector provides employment on a large scale. At the same time, the industry is facing a shift from the labour intensive style of construction which was being practiced in the ancient times to the highly mechanised style during recent years. The use of machines and equipments have become part and parcel of construction in modern times. They have not only reduced the time of construction but also improved the quality of construction. In most of the developed countries, scientific tools such as construction management techniques are being used. The use of plants and machinery and the adoption of the latest construction management methods should be the essential features of construction industries in modern times.
In this context, it is highly essential to carry out a detailed study on the cost effective and quality oriented construction technologies and, practice the same for the sustainable growth of construction industry and the infrastructure development of the country.

Objectives
The present study is focussed on the following objectives.

1. To review the construction industry with respect to the present scenario with an emphasis on the role of construction management
2. To study application of cost effective and quality oriented technologies in the construction sector and the effect of construction management towards cost effectiveness.

Methodology
The study is empirical cum analytical in nature where the facts of information already available has been used. Data collection has been based on the literature survey and only secondary data has been used for preparing the study report.

Relevance of Construction Management
Management can be considered as a universal process. In every aspects of life, we can see the application of management in one form or other; whether it is an individual, a family, a club, a government, or an organisation. The approach and style of management may differ from one to another. The success and survival of an organisation largely depends upon the persons serving in the key levels. According to Terry, management can be defined as ‘a distinct process consisting of planning, organising, actuating, and controlling performed to determine and accomplish the objectives by the use of people and resources.’

As far as construction industry is concerned, it can very well be seen that the management plays an important role in its success and survival. In every day to day activities, whether it is financial matter, or human resource matter, or inventory control matters, the concerned responsible persons must be very alert, keen, future oriented and opportunity capturing. In financial aspects, the money value gets fluctuated within short periods, and there are lots of price variations as far as construction materials are concerned.

For every construction projects to be undertaken, the rate of return is a key factor to decide whether the project should be undertaken and when to start the project. The cash flows should also be well managed. As far as human resource aspects are concerned, labourers will be somewhat unpolished and there may be both skilled as well unskilled ones among them. It needs different types of tactics to get the works done by them.
Moreover, the managers must be well aware about the labour laws and must be capable of solving union problems.

**Importance of Construction Management**

- In construction industry, the work should be started and finished in a predetermined manner. For this to achieve, recruitment of right people at right time is very essential. Planning & scheduling help in such recruitment.
- Labours will be somewhat unpolished in construction industry and there may be both skilled as well unskilled ones among them. Hence wastage of labour is a common phenomenon in the construction industry. The leadership, decision making ability and proper directing the subordinates help to avoid the wastage of labour.
- Communication and co-ordination skill helps to maintain the continuity of work and avoid delays.
- In order to extract the maximum and increase the efficiency of labour, motivating the workers with various schemes and awards plays an important role in construction industry.
- Proper monetary control helps to optimize resource utilisation and to keep the construction cost minimum.

**Duties and responsibilities of Construction Managers**

A construction manager has got so many tasks to perform. Prior to the beginning of a project, so many jobs are necessarily needed to be done like acquisition of land, planning process, obtaining permits, hiring of labours etc... The labours will be interviewed by the manager, hired and disciplined prior to the work and during the work, and even fired in case it is found necessary. Any problems created by the labours should be viewed seriously and dealt with tactically in order to keep the project going without any delay.

A construction manager should review the project in depth and should be very conversant with each and every stage of work so that he can thoroughly understand what will be needed along the way and can act accordingly.

Construction managers are responsible for forming a budget for the project. The two major factors which largely influence the budget are wages and materials. He must order the various supplies required for the project keeping in mind the budget of the project and without compromising the quality of materials.

A construction manager must manage the construction as per the schedule in an effective and efficient manner. This is very crucial as any delay in any part of the project may cause the construction cost to boost up. Hence he must be able to resolve any issues arising during the construction project in order to stay as per schedule.
Construction Management towards Cost effectiveness

The construction manager is the one who should supervise the project in a regular manner, to give proper directions, and to correct in case if there are any discrepancies. He must review the entire project as and when necessary and ensure that the work is being done as per schedule. If there appears to be any deviation from the planned construction project, it is up to the construction manager to get the project back on the right track.

Need for cost reduction

The rising cost in civil construction industry has become a real menace these days. What contribute to this high cost are not only the high cost of materials and the high rates of wages prevailing in our state, but also the insane craze of the present generation for the new fashionable frills and designs. This high cost of operation not only affects the construction industry directly, but also the overall economy indirectly. Not only that, this high cost of infrastructure translates into higher user charges which again reduces the surplus that can be ploughed back into construction technology upgradation and labour welfare.

More over to that, with the construction work using with traditional building materials like cement, sand, steel etc... the environment is becoming more and more polluted and sophisticated. Building materials like sand, timber etc. are becoming scarce and the cost of production of cement and steel is rising steeply. Trenching of river beds for sand collection, and mining of iron ores, lime stone and clay etc. for steel and cement manufacturing, and felling of trees for wood work in buildings have posed a serious threat to the environment and we will have to face serious set backs in the near future on account of disturbing the environment.

Within a short time, these conventional building materials will become scarce and it is high time to think of non conventional, cost effective and environment friendly approach in the construction process without any compromise on quality aspects. The concept of green architecture has already come into existence and we will be forced to practice the same in constructing our own buildings in the near future. Green architecture, also known as sustainable design, is a method of design that minimizes the impact of building on the environment. Green buildings are not only designed for present use, but consideration is also been given to future uses as well.

Cost effective technologies

Rat trap Bond

This is basically a double-wall technique with bricks are laid on edge and a cross brick connection between each. It produces a 9-inch thick wall with an insulating air cavity in between. This technique reduces the number of bricks required by 25%, thereby
reducing material used, including mortar (1:8 mix), and overall cost. Rat-trap technique is equal to the strength of a solid 9-inch wall in either Flemish or English bond.

Finishing of such walls is not generally required and exposed brick themselves are appealing and form beautiful patterns. This saves the cost of plastering, painting, and maintenance. By avoiding unnecessary plastering, savings can be made up to 10% of the brickwork cost.

**Filler Slab**

Lightweight, inexpensive materials such as low grade Mangalore tiles, bricks, coconut shells, glass bottles, etc. are used as filler materials in filler slabs to replace the redundant concrete in tension zones.

These materials are laid in the grids of steel reinforcement rods (6mm or 8mm dia.), and concreting is done over them. The concrete mix used is that for the reinforced cement concrete. The grid size depends upon the design, span, and the material used. For Mangalore tiles (size 23cm by 40cm), the grid size is 33cm by 50cm. The slab thickness is 10 centimeters. This technique saves energy-consuming concrete. Roofs and intermediate floors account for 20-25% of the total cost of the building. This type of roofing costs 30-35% less than conventionally used concrete roofing. Thus a considerable amount is saved in terms of materials, energy, and cost.

This technique also reduces the unwanted dead load of roofing. Compared to other roofing systems, it is thermally comfortable and has no health hazards. Galvanized iron and asbestos cement sheet roofs dissipate too much heat and are difficult to live under. Also, asbestos cement sheets are long associated with diseases such as lung cancer, hence must be avoided.

**Arches**

One of the most effective ways of spanning an opening is by constructing arches. Arches can be a cost-effective alternative to the lintels. In addition, they look more appealing than flat and dull lintels. Arches can be of different shapes and sizes depending upon span and availability of skilled masons. Most common arch shapes come in semi-circular, pointed, corbelled, and bell shapes.

The easiest of the arches is the corbel arch. It can be constructed without any framework and needs less skilled labour. Each row of bricks projects 4-1/2 inches beyond the course below it, until the bricks meet together in the middle. Corbel arches can span openings up to 5 metres. Flat brick arches can span openings up to 1.2 metres. Labour management and type of framework are two essentials in construction of arches.
Rubble Masonry

Random rubble masonry is extensively used as foundation at places where stones are readily available. An 18" (45 cm) foundation base is adequate for most soils and single or double storey buildings. Depth and size may vary with the addition of number of floors. In case of weak soil, the trench can be widened to the tune of 50 to 70cm and the bottom can be laid with concrete of suitable proportion.

For the foundation, a trench 50cm wide is dug and laid with rubble. It can be dry masonry or mud mortar. For higher masonry walls, cement mortar of 1:10 proportion can be used. By proper management, the excavated soil can be piled between the plinth walls to prevent cost of future filling. Proper joints (dovetail) must be provided for stronger bonds as in the case of any other masonry works. Stones must be large in size and the gaps between stones must be filled with smaller stones for proper bonding and stability. Care must be taken to ensure bonding of stones along the length of the wall. Bamboo in lime concrete can be used for foundations, especially in the sandy areas along the sea coast. It is resistant to sea water. It remains intact whereas other foundations will crack with shifting sands.

Bamboo Construction

For most parts of the India, bamboo is a locally available material and has been used as building material for centuries. It can be easily grown and is one of the cheapest construction materials. A good bamboo cut into strips has the tensile strength almost equal to that of steel. It is used for reinforcement, shuttering, scaffolding, roofing, piles, filler material and much more.

Bamboo in lime concrete can be used for foundations, especially in the sandy areas along the seacoast. It is resistant to seawater and remains intact whereas other foundations will crack with shifting sands. For places where stones and bricks are not available, foundation for mud walls can be of moist soil with layers of split bamboo reinforcement inserted. However it needs experience to know about the quality of the bamboo and it is difficult to calculate the exact strength of slabs with bamboo reinforcements.

Jali walls

Creative bricklaying is an art and at the same time very appealing and cost effective also. These provide natural ventilation instead of costly and environmentally damaging air conditioning systems. Jali walls also provide privacy, security, cost reduction in windows needed, and — most dramatically — aesthetic appeal.
Hollow Concrete Blocks

Hollow concrete blocks are made using cement, sand and metal chips. Normally this is made in a yard and a hydraulic or manual pressing and vibrating machine is used for making these types of blocks. About 23% cost reduction can be achieved by using hollow concrete blocks when compared to country burnt bricks. It consumes less time for construction with less number of joints. By using superior quality materials, plastering can be avoided and it provides good thermal insulation also.

Conclusion

The above techniques are the results of scientific and rational studies of the pre-existing technologies and approaches of constructions. New results and innovations are the outcome of systematic studies in the relevant field. A lot of technology options may be available for cost effectiveness and through continuous research, arrays of new technologies can also be found out. But it is not as easy as developing a technology to make them practice in the real life. Through proper and well defined management techniques the cost of construction can be definitely reduced to certain extent.

Scientists, engineers and policy makers should make all efforts whole-heartedly to popularise any new technology. Better and proper understanding of the various materials and technology options are to be ensured, their effectiveness and efficiencies are to be assessed and improved, and new methodologies for their implementation are to be sorted out.

References:

3. Dr. S. Seetharaman, 2009, Construction Engineering and Management, Delhi, Umesh Publications.
5. Laurie Baker, 1986, HOUSES – How to reduce building costs, Thrissur, Centre of Science and Technology for Rural Development.
6. www.censusindia.gov.in
7. www.costford.com
8. www.nirmithi.kerala.gov.in