

ALTERNATIVE BUILDING MATERIALS

Efforts have been made in developing alternative building materials in the Central Building Research Institute, Roorkee. These would be helpful in saving our precious forest and environment efficiently and economically from commercial exploitation. The developed materials are mostly wood alternatives used in construction for door shutters, frames, false ceiling, thermal insulation and similar other applications. Developed innovative materials are good economic replacement of wood and other reconstituted wood products commercially available and would be helpful in cost effective constructions suitable for Indian habitat. The article encompasses information on technical aspects of such developed building materials.

In building construction industry, it has been seen that materials, which were being used about a century back, are still very popular. Variety of alternative building materials are available which provide better, efficient, durable and cost effective construction and also ensure judicious utilisation of available limited resources with least possible degradation of environment. Some of the materials are manufactured by using various waste materials such as fly ash as the raw material for their production. Besides being eco-friendly, the other advantages of using these materials for construction are;

1. Better functional efficiency
2. Cost effectiveness
3. Better durability
4. Ease of construction
5. Better finish
6. Minimum waste
7. Less maintenance cost
8. Minimum defects
9. Less energy intensive

Thus, the new materials, which are available for use in construction, have many advantages over conventional materials being used presently.

The demand for building materials has been continuously rising with the increasing need for housing both in rural and urban areas. Commercial exploitation of traditional building materials by various industries has aggravated the situation. It has, therefore, become necessary to think over this problem seriously and to provide some sustainable solution to make the alternative materials available to solve the housing problem. The government of India is committed to the cause of bringing about rapid and sustainable development in rural as well as urban areas. In this context it should be mentioned here that as per the new housing and habitat policy 1998, 13 lakh houses are proposed to be constructed in rural areas every year at the cost of around Rs. 4000 crores per year.

ALTERNATIVE BUILDING MATERIALS DEVELOPED AT CBRI

1. Bagasse – Cement Building Boards

Numerous composites (Medium Density Reconstituted Boards) have already been developed using different natural and synthetic and man-made fibers in polymer matrix. Most of the boards are being used for replacing wood and other conventional reconstituted wood products. Some of these fibers have also been used for making high density fiber-board using cement (inorganic) as binder. The development is aimed to develop building boards and door shutter using bagasse fiber. Building board is suitable for partitioning, paneling etc.

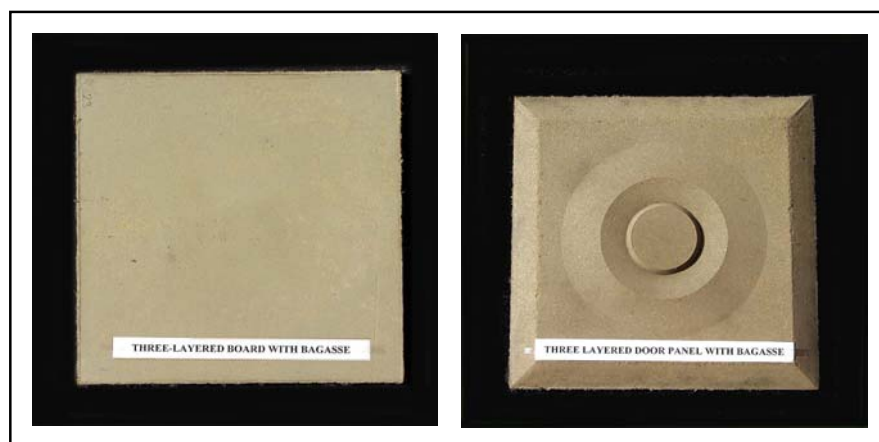


Fig.1: Developed Bagasse-Cement Boards and Panels

The developed product and process are prototype and laboratory level respectively. The physico-mechanical behaviour of the developed building board (prototype) passes most of the requirements of general purposes high density board and is cost effective too. Developed bagasse – cement boards and panels are shown in Figure 1.

2. Arhar Stalk – Cement Board

Composites have great potential in replacing wood in building industry, but their development is associated with problems related to their processing, production and performance. The work carried out is intended to explore the possibilities of using fibrous biomass such as Arhar Stalks, Groundnut Shells etc. for the production of composite materials. Composite panels developed using Arhar Stalks meet the requirements of ISO, BS, and BIS specifications. The output of this article will help utilize fibrous biomass and preserve environment due to conservation of wood in building and construction industry. Arhar Stalk – cement boards and panels are shown in Figure 2.



Fig. 2: Developed Arhar Stalk-Cement Boards and Panels

3. Coir – CNSL Board

The Coir-CNSL Board is a wood alternative which can be used for surfacing, door and window shutters, partitioning, false ceiling, panelling, furniture, cabinets, packaging etc. It is a single layer flat pressed class Medium Density Fiber (MDF) Board. It has low water absorption, negligible change in dimensions due to water absorption, workable with normal wood working tools, paintable, pre-laminable, nailable and screwable, passes IS-3087. The board is eco-friendly and can replace wood or re-constituted wood by 100%.



Figure 3: Coir-CNSL Board and Its Applications

Salient features of Coir-CNSL Board are as under;

- i) Both the starting materials i.e. coconut fibre and cashew nut shell liquid are available substantially in coastal areas and are renewable agro-wastes.
- ii) Technology is developed at pilot level and ready for transfer.
- iii) The technology and product both are patented.
- iv) Technology is techno-economically viable as per pre-estimates

4 Lightweight Sandwich Panels

The cellulosic refuse of paper industries are rich in small fibres and can be used to make value added product, which can be used for acoustics, thermal insulation and false ceiling purposes in buildings. The laboratory scale developed technology yielded a light-weight sandwich panel which is very much suitable for above mentioned purposes. These developed panels have their end applications in partitioning, panelling, thermal insulation and false ceiling with its unique aesthetics. The technology as well as product has been patented. The estimated economic viable capacity is 2 tones per day and most suitable for paper industries as a down stream process.



Figure 4: Lightweight Sandwich Panels with Different Textures

5. Coir-CNSL Thermal Insulation Boards

This is a composite material, which utilises the coconut fibres as reinforcing material and CNSL as the natural binder. The density of the board is kept very low i.e. around 350-450 kgs/ mtr³. The product can be given suitable shape to be fitted with equipment or surface to be insulated. The thermal conductivity is 0.0745 kcal/hr.m².°C.

6. Rigid PVC Foamed and Un-foamed Boards

Variety of products made up of PVC are available commercially for use in building construction such as pipe, sanitary wares, tiles, electric switches, and wires etc. there is another product made of PVC is board which is a wood alternative. The product and technology has been developed in the Institute at pilot level using industrial PVC scrap. In this developmental work emphasis has been given to keep the dependency on imported equipment and chemicals lowest. This helped in keeping the overhead expenditure at lower side leading to lower product cost.



Figure 5: PVC Un-Foamed Board

Other Alternative Building Materials Under Development At CBRI

In the process of development CBRI continues to put in its best efforts in developing new alternative building materials using other un-exploited natural resources as well. A few such materials include;

1. Plywood/ Veneer waste – lignin composite Boards
2. Bagasse-Plastic Composites Boards
3. Oil palm fiber – cement boards

Causes of Poor Acceptability Of Alternative Building Materials:


1. Lack of knowledge about new materials.
2. Non-inclusion in various National codes and specifications.
3. In-appropriate environment for research and development.
4. Non-availability of proper forum for promoting new materials.
5. Ineffective and improper publicity.
6. Unawareness among users.
7. Poor competition among new material manufacturers.
8. Higher price structure of new materials.

9. Lower emphasis on research on eco-friendly materials.
10. Negative attitude of engineers/ architects towards non-scheduled items.
11. Lower confidence on quality.
12. Negligible technological thrust for wider acceptance and adoption.

Conclusion

Therefore, Central Building Research Institute, Roorkee took a lead to overcome some of the above facts and put its concerted efforts in developing alternative eco-friendly building materials and technologies at various levels. This will not only reduce the cost of construction but will also ensure no depreciation of world's natural wealth.

Now there is a need to put in organised efforts in the direction of using eco-friendly materials by replacing traditional materials. It is desired a positive role to be played by various government agencies, leading engineers and technologists, major users and entrepreneurs to bring sustainable development process in construction industry.

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