"TECHNO ECONOMIC FEASIBILITY REPORT ON BAMBOO MAT CORRUGATED ROOFING SHEET"

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Ministry of Housing & Urban Poverty Alleviation
Government of India
New Delhi

TO THE USERS

This Techno-Economic Feasibility Report has been prepared on the basis of information available. The intention here is to provide preliminary information to the prospective entrepreneur. Prior to making a firm decision for investment in the project the entrepreneur must verify the various feasibility aspects together along with the addresses for the procurement of plant and machinery and raw materials independently. The information supplied in this report is obtained from the reliable sources.

INTRODUCTION

Housing Stock and Development

One of the three basic needs of humans other than food and clothes is shelter. The most prominent characteristics of housing in India are its heterogeneity. Over the years, construction of variety of houses using wide range of materials has taken place. The sum total of all the available dwelling units in our country is of the order of 110 Million out of which 33.6 million pucca and 38.6 million semi pucca and 38.8 million is kucha as against 148 million of dwelling units required leaving a straight deficit of 39 million units. In other words, 200 million or about 20% of our population does not have a roof over their heads. This however does not reflect a true picture as all kutcha units and some 15% of others need rebuilding. The backlog of housing shortage is increasing every year, as the rate of construction has not kept pace with the population growth

Bamboo In-Housing

It is no longer possible to depend only on standard materials like cement, steel, brick and primary timber from natural forests for construction of houses as the cost of construction is beyond the reach of lower strata of the population. Consequently, the concept of **green building materials** - which are derived from renewable materials, consume less energy, are less polluting, cost effective, and are environmentally sustainable in life cycle analysis – is gaining significance. It needs no emphasis that wood and other natural lingocellulosic fibers and agro/forest residues satisfy all the requirements of being green building materials.

In addition to these materials, in recent times bamboo has emerged as a highly promising green building material. Bamboo is the fastest growing plant harvestable in 2-4 years cycle. It is superior to wood in some physical and mechanical properties and is highly versatile for application in construction activities. It has been estimated that during processing it consumes even less energy than wood and at the same time possess high strength to weight ratio. Bamboo has traditionally been used in many regions of the country in temporary constructions, have not only re-established versatility of bamboo as a structural material but as a material eminently suitable for making highly efficient composite materials for application in several vital sectors including housing, construction, transport etc. Due to plethora of uses, bamboo has been aptly described as “poor man’s timber”, “green gold”, “friend of people”, and the cradle to coffin timber”, “Green Gasoline” is now gaining importance as “material of the future”.

Environmentally Sustainable Natural Product

India has the second largest resource of bamboo both in terms of diversity and distribution (about 13% of the forests or app. 10 million ha.). India accounts for around 136 of about 1250 species of bamboo found in the world. Of these only 30 species are known to be commercially important. Natural bamboo is found in practically all States of India. Major bamboo areas and species are given in **Table 1 and 2**. Apart from being available in natural forests, bamboo is also raised as plantations, both pure and as under planting, and also in homesteads. Bamboo is also suitable for restoration of degraded forest and other wastelands as well as of abandoned shifting cultivated areas.

Table 1
Distribution of Bamboo in India

Sl. No.	State/Region	Area %	Growing Stock %
1	North –East	28.0	66
2	Madhya Pradesh	20.3	12
3	Maharashtra	9.9	5
4	Orissa	8.7	7
5	Andhra Pradesh	7.4	2
6	Karnataka	5.5	3
7	Others	20.2	5

Table 2
Distribution of Some Important Bamboo Species in India

Species	Availability % Growing Stock	States
D. strictus	45	Meghalaya, Manipur, Nagaland, Orissa and **Maharashtra**
Bambusa bamboo	08	**Maharashtra**, Tamilnadu, Karnataka
M. baccifera	20	Assam, Manipur, Meghalaya, Mizoram, Tripura
B. arundinacia	13	Nagaland, Karnataka, Orissa
D. hamiltonii	07	Arunachal Pradesh, Assam, Nagaland
B. tulda	05	Arunachal Pradesh, Nagaland, Tripura
B. pallida	04	Arunachal Pradesh, Nagaland, Tripura

Bamboo, a fast growing woody grass continues to be an important cultural feature in many parts of India. Since the beginning of the civilization

bamboo has played an important part in daily lives of people in India. Bamboo has been put to use for various applications ranging from construction to household utilities.

For slivering and mat weaving 2-3 years old bamboo is ideal. Bamboo should be fully grown, but still green and contain more than 40% moisture in it. Bamboo, more than four years old, becomes hard and its moisture content comes down. Such bamboo is difficult to process into smooth sliver. Immature bamboo, less than two years old will shrink after slivering and hence not suitable for weaving.

In a new culm, it is about 6 to 7 years required for a full grown bamboo to appear. Hence it will be suitable for harvesting after 9 to 10 years. Harvesting can be continued every year till bamboo starts flowering.

Opportunity for Rural Employment

Bamboo addresses three of our major national concerns:

- **Ecological Security** by both conserving timber through substitution, increasing carbon sequestration through planting and providing an alternate to non-biodegradable materials like metals and plastics. The social forestry activities not only ensures clean environment but also generates employment opportunities to local people
- **Sustainable Food Security** through promotion of bamboo based agro forestry systems and the use of bamboo in soil and water conservation and watershed development. This prevents soil erosion and availability of land for farming.
- **Livelihood Security** through generation of eco-jobs at the village level particularly for women in mat weaving and a wide range of other market driven products.

Bamboo Mat Corrugated Sheet [BMCS]

Under a project funded by BMTPC/MoEF a technology for manufacturing BMCS has been developed at IPIRTI where pilot scale/experimental BMCS production facility has also been established and commercial scale of production has been established at M/s. Timpack Pvt. Ltd., Byrnihat, Meghalaya. The sheets have been found to be water proof and resistant to decay, termites/insect and fire. BMCS are light but strong and possess high resilience. They have very high use potential as ***eco-friendly roofing*** alternate to asbestos cement, galvanized iron and aluminum corrugated sheets. Since they are manufactured from woven bamboo mats, BMCS are not only environment friendly but also people friendly and are expected to revolutionize house construction activity, particularly in disaster prone areas and in prefab houses.

More than 2000 BMCS made at the pilot facility at IPIRTI have already been used for roofing in several structures. Some of them are: a rain shelter at the National Zoo, New Delhi; an specially designed terrace café at the DFID India office, New Delhi; pantry near Glass House at Karnataka Raj Bhawan, Bangalore; Bamboo houses constructed at Bangalore under DFID funded project "Bamboo Shelter – Demonstration of Best Construction Practices" implemented by IPIRTI in collaboration with TRADA Technology of UK.

BMCS has several other potential uses like Walling, Container/Packaging, Sandwich construction, Pre-fabricated houses, Flooring and Structural Components like Stress skin panels, Web beams.

Materials and Methods

Bamboo mat is the basic raw material. It is woven from slivers cut open from split bamboo/reed culms. The entire process is manual, mostly undertaken by women in rural or tribal areas as part time vocation to supplement family income. In species with long internodes like *Ochlandra travancorica* & *bambusa bambose*, the internodes are cut or sawn and slivers are made. The nodal portions are mostly used as fuel. The bamboos are cut to size and after cross cutting into required lengths and splitting, epidermal layer is removed/peeled off. 0.6mm (±15%) thick slivers are made either mechanically or manually. Slivers are woven into mats in herring-bone pattern.

An important precaution to be taken in making mats for BMCS production is that slivers with the glossy (epidermal) layer should be avoided as they are resistant to bonding. Such slivers can however be used in basketry etc.

The moisture content (m.c) of freshly woven mats is in the range of 40% - 50%. On drying them in sun, the m.c is generally about 12% - 15%. If transport and or storage is more than one month it is advisable to undertake prophylactic treatment. The simplest and significantly effective treatment for mats, provided they are not exposed to drying, is spraying with 1% solution of mixture of boric acid and borax in the ratio of 1:1. Spraying can be done by hand or knapsack sprayer. This will not have any adverse effect on bonding. The mats should be dried after prophylactic treatment.

BMCS have the following distinct properties:

A. Bond Quality

Being a composite material bonded with synthetic resin adhesive, good bond quality is an important property that needs to be ensured. BMCS was subjected to following tests.

(i) Sheets remain without any sign of delamination or weakness even after cyclic boil-dry tests indicating good bonding.

(ii) Immersed in boiling water for 72 hours and dried to 12% moisture content and checked for delamination. Sheets remains intact without any sign of delamination or sign of weakness indicating good bonding.

B. Resistance to Decay and Insects

BMCS samples when subjected to graveyard test (buried in active termite mounds) and borer resistant tests (exposing the test specimens with infected borer samples) remain resistant to termites and to borer infestation. Sheets subjected to high humidity are resistant to mold/fungus.

C. Water Permeability

Standard size BMCS were mounted on a platform over which suitable metal frame to suit the corrugated profile were placed on BMCS and junction sealed with a putty, filled it with water to a height of 75mm above the crown level and observed for water leakage/seepage.

There was no leakage/seepage of water even after three cycles of water permeability tests. Each cycle comprising of water filling up for 24 hours, followed by removal of water and air-drying for 48 hours under the sun.

D. Load Bearing Capacity

Load bearing capacity of BMCS was studied in comparison with some of the existing roofing materials like ACCS, CGI Sheets and Aluminum Corrugated Sheets. Test results indicate that load bearing capacity of BMCS is comparable with those of ACCS and CGI Sheets and much superior to Aluminum Corrugated Sheets. Moreover, BMCS were found to be highly resilient compared to GI Sheets and Aluminum Sheets and ACCS were found to be highly brittle requiring special care during transportation as well as use as roofing sheets.

E. **Thermal Conductivity**

Thermal Conductivity of Bamboo Mat Board (BMB) and Asbestos Cement Sheets were compared with a view to correlate with Bamboo Mat Corrugated Sheets (BMCS) and Asbestos Cement Corrugated Sheets (ACCS). Thermal conductivity of BMCS was determined by measuring the thermal conductivity of flat BMB made by employing the process parameters for making BMCS. Thermal Conductivity was found to be 0.1928 K cals/m^0c and of AC sheets 0.3422 k-cals/m^0c. This is considerably lower compared to ACCS and GI sheets. Thus BMCS roofed houses will provide better thermal comforts compared to houses having ACCS or GI sheet roofs.

CAPITAL INVESTMENT

A BMCS manufacturing unit can be established in the small scale sector and thereby become eligible to all incentives provided by the Government for this sector, in India. In the current context, a small scale industry (SSI) is one in which the investment for plant and machinery is less than 4.5 crores. The estimated capital investment (including land and building) is Rs.4.43 crores as shown in **Annexure I** and total capital investment inclusive of working capital is given in **Annexure III**.

PLANT LAYOUT

Bamboo Mat Corrugated Sheets can be manufactured in plywood factory or in an existing Bamboo Mat Board and Bamboo Veneer Composite with very little additional facility. Additional machinery that is required is a resin applicator, drying chamber and Hot Press having corrugated platens.

The general layout of a manufacturing unit in the small scale sector exclusively for bamboo mat corrugated sheets is given in **Fig 1.**

RECURRING COSTS

The recurring costs are estimated on the assumption that

-the unit will work on two shifts of 8hrs a day.
-number of working days in a year is 300.
-the unit will work to 50% of installed capacity in year1, 75%in year 2 and 100% in year 3 onwards.

Recurring costs involved are for 1) raw material, 2) energy, 3) machinery and equipment maintenance, 4) managerial and labour and 5) post production activities are given in **Annexure II.**

FINANCIAL VIABILITY OF BMCS UNIT

The financial statements are given in **ANNEXURE I to VI**

Capital Investment

Government of India provides many incentives for the industries established under the Small Scale Sector. Investment required for establishing BMCS unit is well within the limits prescribed for the Small Scale Sector. Details are given in **Annexures I & III**.

Production Costs

Production costs are worked with the following assumptions.

a) Unit will work for two shifts of 8hr. each duration in a day.
b) No. of working days in a year are 300.

c) 1st year of establishment is taken as constructional period. Trial and regular production will start from 2nd year and only 50% capacity utilization.
d) 3rd year of establishment 75% capacity utilization.
e) 4th year of establishment and onwards, 100% capacity utilization.
f) Life of Buildings and Machinery are taken as 40 and 15 years for the purposes of depreciation. 5% on the cost of building and 15% on the cost of equipment and machinery are being taken for calculation of depreciation.

Production costs include 1) Raw material, 2) Energy and maintenance, 3) Salaries and Wages, 4) Sales Promotion, 5) Depreciation and 6) Interest on Term Loan and Working Capital Loan. Details are given in **Annexure II**.

Working Capital Requirement

Working capital requirement, for details see **Annexure IV** is estimated for 3 months production. Raw material viz., Bamboo mats, Adhesive and other items are considered for 3 months. In addition to this semi finished goods, finished goods and sundry debtors are included in the calculations. Total quantum of working capital works out to be Rs.431.9 Lakhs, out of which Rs.324 lakhs is the loan and Rs.108 Lakhs is the working capital margin.

Annual Production

The installed capacity is to manufacture 144000 boards of 4 layers with 2.4m x 1.05m as size.

Selling price of BMCS

BMCS is an alternate to other existing roofing materials. Hence the selling price of BMCS is worked out to be Rs.340 per Sq.mtr. (assumed 50% profit).

Income Tax

From the Assessment year 2006-2007, the rate of Income Tax for Companies is 35% with 10% per cent surcharge. Hence the total liability works out to be 38.5%, which has been rounded off to 40% for the purposes of calculations of financial attributes.

Breakeven Analysis

Calculation reveals that the project is viable and the breakeven is achieved at about 44% of Installed Capacity production. Thus the safety margin works out to be 56%. These figures are really attractive and by any Standards, thereby the viability of the project is established. Details are given in **Annex V**.

Sales Promotion and Commission to Dealers.

A nominal sales promotion expenses of Rs.25.00 lakhs per annum has been assumed Whereas a substantial amount has been provided as commission to Dealers since heavy incentives have to be provided to market new product.

Sales, Profit and Return on Investment

By fixing the price of BMCS at Rs.340 per Sq.mtr an amount of Rs.1254.36 lakhs is expected to be realized with 100% capacity utilization in the 4th year. This provides a Net Profit of Rs.249.92 lakhs thereby 32.32% will be the Net Return on Investment. Also the Project yields Rs.261.23 lakhs as the Net Cash Flow i.e., 33.78% as the Total Return on Investment with a pay back period less than 5 years. By any standards this is a viable project. Details are given in **Annex-VI**

Appraisal of the Investment from Financial Attributes.

To appraise the investment made the following financial attributes are evaluated.

Pay Off Period

From Net cash flow table, it can be seen that the entrepreneur gets back his capital investment by the end of Fifth year of production itself.

Net Benefit Investment Ratio

While the B-C ratio serves as the first indicator of the degree of financial viability of the project, the investor or the financing agency would normally look for an indicator which shows the degree of financial return for a given investment. This can be arrived by calculating the Net Benefit-Investment ratio. These are calculated and presented in table. Naturally higher the B-C ratio, better would be the investment choice. As can be seen from table, the B-C ratio is around 1.05 and possess the ability to generate a high degree of financial return for the investment. The B-C ratio indicates that the magnitude of future net benefits is many times larger than the initial investment in the proposed plant, given in **Annexure-VI(a).**

Net Present Value (NPV)

The net present value of the project is equal to the sum of the present values of all the cash flows associated with the project. 12% discount rate employed for evaluating the present value of the expected future cash flow is quite adequate to reflect the risk of the project as the present day inflation rate is only around 5%. Also the net present value represents the net benefit over and above the compensation for time and risk. Since NPV is positive the project is viable, details given in **Annexure Via.**

On perusing the values obtained from the calculations for the financial attributes, it is concluded that the project is viable.

Market Potential

BMCS are versatile roofing material and have enhanced characteristics like toughness, resilience and ductability compared to conventional roofing

sheets an alternate to Asbestos Sheets, Fibre Glass Sheets, PVC Sheets, GI Sheets, Corrugated Polycarbonate Sheets, Aluminimum Sheets, Cloth Embossed Fibre Sheets. Apart from this BMCS are environment friendly, energy efficient and possess good resistance to fire. It has also have tremendous application potential in interior design like walling, sand which constructions prefabricated houses, structural components like stress skin panels, web beams, etc.

Market Size

The current production/consumption of various corrugated roofing materials is estimated to be:

	Production/Annum	**Square meters**
(a) ACC Sheets	1,16,40,000 Tons	138,65,29,412
(b) GP/GI Sheets (Ave. 20 gauge, both interior & exterior)	13,00,000 Tons	31,90,90,909

On a very conservative presumption that BMCS gets 1.0% share in corrugated roofing materials initially during next five years, the market size for BMCS will be about 17 million sq. meters per annum. A BMCS manufacturing plant having a six day-light hot press will have a production capacity of 0.37 million sq. meters per annum working two-shifts-a-day basis. To meet the above market potential, there is scope for at least 30 manufacturing plants in the country. As the awareness of the products and its usage become popular the market potential is bound to increase manifold. Thus, there is a huge market for BMCS sheets in the country itself, not to mention its export potential considering that Asbestos Sheets have been banned in most developed countries around the globe.

Agencies like National Mission for Bamboo Application [NMBA], CPWD, Govt. organizations have already identified as one of the construction materials and included in their list. Hence, the demand for BMCS is very high and in addition the Institute is also getting lot of enquiries both from private entrepreneurs as well as Govt. organization for supply of BMCS and at present only one factory is producing that too on limited scale. Hence the demand for BMCS is likely to be very high and there is good market potential.

IPIRTI has brought BMCS to the notice of policy makers, engineers, architects and common users, industrialists and entrepreneurs and has been receiving continued demand for this material. Enquiry about BMCS is not only received from within the country but from various parts of the world. Market for BMCS has been created, however many industries have not yet been established to produce it.

Annexure – I

LAND, BUILDING & MACHINERY

Sl. No.	Item	Estimated cost (Rs. In lakhs)
I	**Land and Land Development**	
1.	Land cost	45.0
2.	Development cost @ Rs. 80,000/ha.	0.80
	Sub- Total - I	**45.80**
II	**Civil Work**	
1.	Cement compound wall	10.0
2.	Two gates with RCC pillars @ Rs.25,000/- per gate	0.50
3.	Building warehouse of 1250 sq metre @ Rs.5000/sq mtr	62.50
4.	Water storage, distribution/drainage and general piping	5.50
5.	Electrification	5.00
	Sub-Total – II	**83.50**
III	**Plant and Machinery**	
1.	BMCS Press 6 daylight : 1No.	90.00
2.	Band Dryer : 1No.	45.00
3.	Thermic fluid boiler (10 lakh k-cal capacity) inclusive of baby boiler for resin kettle	15.00
4.	Scissor lift - 2 Nos.	1.50
5.	D.D. saw – 1 set.	1.75
6.	Measuring instruments (Auto)	4.00
7.	Storage tank for formalin ,phenol) – 2 Nos.	4.00
8.	Weighing machine (1 tonne capacity)	0.32
9.	Standby generator 100 KVA- 1 No.	8.00
10.	Screw compressor- 1 No.	0.50
11.	Resin kettle – 1 No. 1.5 tonne capacity	5.50
12.	Resin applicator with trolley – 2 Nos.	3.00
13.	Glue spreader 4 ft - 1 No.	3.30
14	Dust Extractor : 1 No.	1.00
15	Pallet Trucks 4 Nos.	0.80
16	Assembly table	2.00
	Sub - Total III	**185.67**

IV	**Miscellaneous**	
1.	Vehicle	9.00
2.	Communication	0.90
3.	Office equipments	1.00
4.	Furniture and Fixture	0.86
	Sub – Total V	**11.76**
V	**Total Capital Cost (I to V)**	**326.73**
VII	Preliminary and preparative expenses	11.34
VIII	Margin money for working capital	105.00
IX	Contingencies	15.00
X	Technology transfer fee	6.00
	(A) Total Capital Cost	**464.07**

Annexure - II

RECURRING COSTS
[for 2 shifts]

(Rs. In lakhs)

Sl. No.	Item	BMCS
I	**Raw Material**	
1.	Bamboo Mats @ Rs.70/- per mat Number of mats required per day 2000 for 300 days BMCS: 2000 x 70 x 300	420.00
2.	PF resin liquid (43% solids) required per Annum BMCS: 2000 kgs x300 x 45 @ Rs.45/- per kg resin	270.00
3.	Cost of preservative chemical @ Rs.150/kg 6000 x 150 (1% on liquid resin)	9.00
4.	Releasing paper @ Rs.175/kg	35.10
5.	Aluminium cauls of 2 mm thick of size 2.5m x 1.25m after accounting for scrap value [one time investment]	3.00
	Total cost of Raw materials	**737.10**
II	**Energy requirement**	
1.	Electricity coverage 800 kwh/day @ 4.5/Unit = 800x 4.5 x 300	10.80
2.	Fuel	8.80
	Total cost of energy	**19.60**
III	**Maintenance**	
	Maintenance cost of machinery & equipment.(4% on Machinery cost)	7.47
IV	**Management and Labour**	
A	**Managerial staff**	
1.	General Manager 1 No.@ Rs.25,000	3.00
2.	Manager Production & Sales Manager – 2 Nos.@ Rs.15000	3.60
3.	Chemist and Quality Controller – 2 Nos.@Rs.10,000/-	2.40
4.	Maintenance Engineer – 1 No. @ Rs.8000 p.m.	0.96
5.	Machine operator– 3 Nos. (3 x Rs.6000/-)	2.16
6.	Boiler operator 3 Nos. (3 x Rs.4000)	1.44
	Sub-Total	**13.56**

B	**Administrative staff**	
1.	Accountant – 1 No.@Rs.5,000	0.6
2.	Clerk/Typist – 2 Nos. (2 x Rs.3000)	0.72
3.	Attendant – 1 No. (1 x Rs.2000)	0.24
4.	Driver – 1 No. (1 x 2500)	0.30
5.	Security guards – 4 Nos. (4 x 2000)	0.96
	TOTAL	**2.82**
C	**Labour**	
	Semi-skilled labours 45 Nos. Rs.100 x 300/day	13.50
D	**Social Overheads**	
	Social overheads like Bonus, P.F., LTC, Medical benefits, Production incentives @ 25% of total management and labour cost	7.47
	Total cost of Management and Labour (A to D)	**37.35**
	Sales promotion and commission	**25.00**
E	**Total Production cost of 144000 BMCS**	**826.52**
F	**Production cost per board in Rupees**	**573.97**
G.	**Add Depreciation** Buildings Machineries	 3.07 10.52
	Total Manufacturing cost	**840.00**
	Production cost per board in Rupees	**583**
	Production cost per square metre in rupees	**227**

Annexure - III

Capital Investment at Glance BMCS Unit

1.	Equipments and Machinery [Refer Appendix 1]	185.67
2.	Land & Building	129.3
3.	Working capital	431.90
4.	Preliminary and pre-operative costs (inclusive of technology transfer fee)	11.34
5.	Contingencies	15
	TOTAL	**773.21**

Annexure IV

WORKING CAPITAL REQUIREMENT: BMCS
(Based on requirement for 3 months production)

	(Rs. In lakhs)
Bamboos Mats	105.00
Resin, Releasing agent & preservative	78.50
Semi processed goods*	41.40
Finished goods**	82.80
Sundry debtors***	124.20
Total	431.90

LOAN FOR WORKING CAPITAL

75% OF THE ABOVE 324

MARGIN MONEY 108

* Based on 15 days production @ Rs. 575Per board

** Based on 1 month production @ Rs. 575Per board

*** Based on 45 days credit @ Rs. 575 Per board

Annexure V

BREAK EVEN ANALYSIS : BMCS UNIT

		Unit	Amount Rs.	Amount Rs.
I	Variable costs			
	1) Bamboo mats (2.44m x 1.22m)	Rs. Per sq. Mtr	94.06	
	2) Adhesive	Rs. Per sq. Mtr	60.46	
	3) Aluminum cauls & releasing agent	Rs. Per sq. Mtr	10.98	
	4) Maintenance costs	Rs. Per sq. Mtr	2.02	
	5) Electricity & Energy	Rs. Per sq. Mtr	5.31	172.83
II	Fixed Costs			
	1) Salaries, Wages & benefits	Rs. Per sq. Mtr	10.12	
	2) Sales promotion & commission to dealers	Rs. Per sq. Mtr	6.77	
	3) Depreciation	Rs. Per sq. Mtr	3.68	
				20.57
	Total manufacturing cost	Rs. Per sq. mtrs		226.85
III	Estimated selling price (50% profit)	Rs. Per sq. mtrs		340.00
IV	Less: Variable costs	Rs. Per sq. mtrs		172.83
V	Unit contribution			167.17
VI	Total Annual Fixed costs	lakhs		75.89
VII	Break even point			45
VII	Installed capacity	Sq. Mtrs.		368928
IX	Break Even Point	% of capacity		167477.55
X	Safety margin	%		54.60

Annexure VI

SALES, PROFIT & RETURN ON INVESTMENT: BMCS

Sl.No	Item	Unit	
1	Sales	Sq.m	3,68,928
2	Value at Rs340per Sq.m (Assuming 50% profit margin)	Lakhs	1254.36
3	Less Production Cost (Excluding Depreciation & Interest)	Lakhs	826.52
4	Gross Profit Before Depreciation & Interest	Lakhs	427.84
5	Total Investment	Lakhs	773.21
6	Gross Return on Investment	%	55.33
7	Less Depreciation	Lakhs	13.59
8	Operating Profit before Taxation	Lakhs	414.25
9	Tax Payable at 40%	Lakhs	165.70
10	Net Profit	Lakhs	248.55
11	Net Return On Investment	%	32.14
12	Add Depreciation	Lakhs	13.59
13	Net Cash Flow	Lakhs	262.14
14	Total Return on Investment	%	33.90
15	Payback Period	Years	2.949639486
			3 years

Annexure VI(a)

CASH FLOW STATEMENT FOR BMCS

	Year 1 constr-uction period Total investment	Year 2 (1st year of production)	Year 3 (2nd year of production)	Year 4 (3rd year of production)	Year 5 (4th year of production)	Year 6 (5th year of production)
INCOME; Sale of Boards		627.18	940.77	1254.36	1254.36	1254.36
Less: Production cost		413.26	619.89	826.52	826.52	826.52
Gross trading profit		213.92	320.88	427.84	427.84	427.84
Less: Interest charges		0.00	0.00	0.00	0.00	0.00
Less: Depreciation		13.59	13.59	13.59	13.59	13.59
Profit before taxation		200.33	307.29	414.25	414.25	414.25
Less: Tax @ 40%		67.31	103.25	139.19	139.19	139.19
Net profit	-773.21	133.02	204.04	275.06	275.06	275.06
Add: Depreciation		13.59	13.59	13.59	13.59	13.59
Positive cash flow		146.61	217.63	288.65	288.65	288.65
Less: Loan repayments:						
Term loan		0.00	0.00	0.00	0.00	0.00
Working capital		0.00	0.00	0.00	0.00	0.00
Net cash flow		146.61	217.63	288.65	288.65	288.65
Cumulative reserves / Surplus	0	146.61	364.24	652.89	941.54	1230.20
IRR	14%					
PV of Net profit (in lakhs)	Rs. 808.10					
NPV of Net Profit (Rs. In lakhs)	Rs. 34.89					
BC ratio (PV of net profits/ investment)	1.05					