

## **81. PROFILE ON CEMENT TILES**

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## **I. SUMMARY**

This profile envisages the establishment of a plant for the production of 200,000 pcs of cement tiles per annum.

The present demand for the proposed product is estimated at 662,000 pcs and it is projected to reach at 5,187,000 pcs by the year 2019.

The plant will create employment opportunities for 11 persons.

The total investment requirement is estimated at Birr 2.43 million, out of which Birr 1.35 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 14% and a net present value (NPV) of Birr 456,930, discounted at 10.5%.

## **II. PRODUCT DESCRIPTION AND APPLICATION**

Cement tiles are wall & floor tiles made of cement together with sand, gravel and optionally adding marble chips to the ingredient. The process of manufacturing is called the "LENOBLE" process, which at present is used in many factories. Cement tiles of various sizes can be produced. The most common ones range from surface sized of 20 cm x 20 cm to 60 x 40 cm having thicknesses in the range of 1 to 3 cm.

The product is applied for floor or wall finishing in building construction and for outdoor pavement work.

### **III. MARKET STUDY AND PLNT CAPACITY**

#### **A. MARKET STUDY**

##### **1. Past Supply And Present Demand**

The demand for cement tile is derived from building construction activities. Since transporting and selling cement tiles over a long distance is not a profitable operation, the relevant market is the local or regional market. Data and information on the amount of public and private sector building construction activity is, thus, critical to determine the present effective demand as well as project future demand.

According to the three year Development Plan of Benishangul Gumuz region, 10 health posts, 6 health centers, 2 hospitals 33 primary village schools (PVS), 15 complete primary schools (cps) and 4 secondary schools are envisaged to be built in different woredas during the planned period. Apart from these public investments, as a consequence of increased economic activity in the region, the private sector is also bound to invest in the construction of low rising (up to ground plus two) commercial, office, and residential buildings.

Table 3.1 details out the anticipated realization of the foregoing building construction activities over a three years period.

In order to establish the floor area of various types of buildings, the Education and Health sub-sector Handbooks of ESRDF (Ethiopian Social Rehabilitation and Development Fund) were referred. For Commercial and Residential Buildings a sample of bill of quantity of various buildings was assessed to establish the average floor area. It is also known that for one-meter square area of floor, 25 tiles having 20x20 cm dimension are required.

The cement tiles requirement calculated by type of building on the basis of the above is provided in Table 3.2.

**Table 3.1**  
**PROJECTED IMPLEMENTATION OF CONSTRUCTION PROJECTS**  
**(NUMBER)**

Sr. No.	Item	YEAR			Total
		2005	2006	2007	
1.	Health Post	2	3	5	10
2.	Health Center	1	2	3	6
3	Hospital	1	1	-	2
4	Primary Village School(PVS)	8	10	15	33
5	Complete Primary School (CPS)	4	5	6	15
6	Secondary School	1	1	2	4
7	Residential House (G+0)	70	80	100	250
8	Commercial & Office Buildings				
	- G+0	30	35	40	105
	- G+1	1	3	5	9
	- G+2	-	1	2	3

**Table 3.2**  
**CEMENT TILES REQUIREMENT IN BENISHANGUL -GUMIZ REGION**

Type of Buildings	Floor Area (m <sup>2</sup> )	Forecasted Number of Buildings			Forecasted Cement Tiles Requirement (pieces of 20X20 cm)		
		2005	2006	2007	2005	2006	2007
Health Post	83.2	2	3	5	4160	6240	10400
Health Center	867.5	1	2	3	21687	43374	650625
Hospital	2400	1	1	-	60000	60000	-
Primary Village School (PVS)	364.6	8	10	15	72920	91150	136725
Complete Primary School(CPS)	904	4	5	6	90400	113000	135600
Secondary School	1270	1	1	2	31750	31750	63500
Residential House	63	70	80	100	110250	126000	157500
Commercial & Office Buildings							
a) G+0	300	30	35	40	225000	262500	300000
b) G+1	600	1	3	5	15000	45000	75000
c) G+2	900	-	1	2	-	22500	4500
<b>Total</b>					<b>631167</b>	<b>801514</b>	<b>1574350</b>

As shown in Table 3.2, the total demand estimated for the year 2005, without considering wastage, is about 631,000 piece of cement tiles. When allowance is made for 5% wastage, the estimate comes to about 662,000 pieces.

## 2. Projected Demand

The Benishangul - Gumuz region's demand for cement tiles in the next three years is forecasted on the basis of projected implementation of building construction projects as depicted in Table 3.1 (with 5% adjustment for wastage).

For the part of the forecasted period extending beyond the coming three years, an annual average growth rate of 10% is used to execute demand projection. The underlying assumption being that as observed in many countries, both developed and developing, the rate of growth of the construction sector had been consistently higher than that of the economy as a whole. Since the Ethiopian economy has been growing at an average rate of 7% in the recent past, a 10% growth rate in the construction sector is not an unlikely scenario in the future. Table 3.3 shows the demand projection made on the basis of these assumption.

**Table 3.3**  
**PROJECTED DEMAND FOR CEMENT TILES**

<b>Year</b>	<b>Projected Demand (pieces)</b>
2005	662,000
2006	842,000
2007	1,653,000
2008	1,818,000
2009	2,000,000
2010	2,200,000
2011	2,420,000
2012	2,662,000
2013	2,928,000
2014	3,221,000
2015	3,543,000
2016	3,897,000
2017	4,287,000
2018	4,716,000
2019	5,187,000

## 3. Pricing And Distribution

The current price of cement tiles ranges between Birr 35 per m<sup>2</sup> to 70 per m<sup>2</sup> depending on composition (marble chips, granite chips, etc.) design and colouring matter. For the

envisaged plant a factory-gate price of Birr 50 per m<sup>2</sup> is recommended. The plant will directly sell its product to the end-users at the premises of the factory.

## **B. PLANT CAPACITY AND PRODUCTION PROGRAMME**

### **1. Plant Capacity**

The envisaged plant has annual production capacity of 200,000 pcs. It is considered that the plant will operate in a single shift of 8 hours a day, six days a week and 300 days a year. Production can be doubled or tripled, if the plant is made to operate in two or three shifts.

### **2. Production Programme**

The plant will be made to start operation at 75% of its rated capacity during the first year. Production will be made to rise to 85% of its rated capacity in the second year and to full capacity (100%) in the third year and thereafter.

## **IV. MATERIALS AND INPUTS**

### **A. RAW AND AUXILIARY MATERIALS**

Raw materials used by the plant are of local and foreign origin. Local raw materials are sand, cement (Grey), gravel and marble chips. Materials of foreign origin include resins and lubricants. The raw materials together with annual requirement and cost are given in Table 4.1.



**Table 4.1****RAW AND AUXILIARY MATERIAL REQUIREMENT AND COST**

Sr. No.	Item	Unit of Measure	Qty.	Cost '000 Birr		
				FC	LC	Total
1	Sand	m <sup>3</sup>	20	-	14,310	14,310
2	Grey cement	kg	700	-	105,651	105,651
3	Aggregate	m <sup>3</sup>	40	-	32,913.2	32,913.2
4	Marble chips	kg	1,750	-	217,350	217,350
5	Pigments	kg	5,000	25,000	-	25,000
6	Resins	kg	2,500	7,500	-	7,500.00
7	Packing materials	lumpsum		-	2,500	2,500
	<b>Grand Total</b>			<b>32,500</b>	<b>372,724.2</b>	<b>405,224.2</b>

**B. UTILITIES**

Utilities required by the plant consist of electricity, water, lubricants and consumables.

Table 4.2 indicates the annual requirement of the various inputs and cost.

**Table 4.2****UTILITIES REQUIREMENT AND COST**

Sr. No.	Description	Cost '000 Birr		
		FC	LC	Total
1	Electricity	-	28,175	28,175
2	Water	-	7,000	7,000
3	Lubricants	1200	-	1,200
4	Others		2,000	2,000
	<b>Grand Total</b>			<b>38,375</b>

## **V. TECHNOLOGY AND ENGINEERING**

### **A. TECHNOLOGY**

#### **1. Production Process**

The production of cement tiles use rubber moulds and vibrating tables. The different materials such as sand, cement, aggregates (gravel) and marble chips are assumed to be ready at the site of the plant.

The ready-made raw materials together with water are mixed in the right proportion by a mixer and measured amounts are poured into the flexible moulds. Mixing and pouring can be done manually or automatically. Each mould containing the measured mix is made to travel the length of the vibrating table for about one minute.

Allowing the concrete mix in the rubber mould to travel along the vibrating table has the advantage of eliminating air bubbles and water veins. In addition to this, the mix is pressed with tiles press. This will create an exceptionally high compactness of the aggregates and the cement in the mix.

After a period varying from one to two hours, a second and thicker layer of concrete is added to the first, and the moulds are vibrated again. The result of vibration is a perfect compaction and firm hold between the two layers. The tile hardens in the mould is then demoulded on the following day without the need of any demoulding products. The concrete then dries in controlled conditions of temperature and humidity. It is to be noted that during preparation of mix, pigments are added to give different colours to the product.

#### **2. Source of Technology**

Machinery and equipment required for the envisaged plant can be obtained from the following company.

Pacific Industrial Co. Ltd.  
9F, No. 42 Tain Shui Road, Taipei  
Taiwan.

URL: www.pacific.co.com.  
Tel. 886-2-25580220.  
Fax 886-2-25580160.

## **B. ENGINEERING**

### **1. Machinery and Equipment**

Machinery and equipment required by cement tile plant consists of mixer, tile press, vibrating tables, rubber moulds and fork-lift trucks. The complete list of machinery and equipment together with cost are shown in Table 5.1.

**Table 5.1**  
**MACHINERY AND EQUIPMENT REQUIREMENT AND COST**

<b>Sr. No.</b>	<b>Item</b>	<b>Qty.</b>	<b>Unit Cost</b>	<b>Cost '000 Birr</b>		
				<b>FC</b>	<b>LC</b>	<b>Total</b>
1.	Vibrating tables	2	100	200	-	200
2.	Rubber moulds	1500	0.35	525	-	525
3.	Mixers	2	90	180	-	180
4.	Tile press	1	320	320	-	320
5.	Pallets	As required	-	-		
	<b>Sub -Total</b>					<b>1225</b>
	Freight, Insurance, Inland Transportation, Bank charges, etc.	-	-	-	122.5	122.5
	<b>Grand Total</b>			<b>1225</b>	<b>122.5</b>	<b>1347.5</b>

### **2. Land, Building and Civil Works**

Land requirement by the envisaged plant is estimated at 800 m<sup>2</sup>. For building, an ordinary shed of corrugated iron sheet wall and ceiling is envisaged. The floor will be reinforced concrete, having a strong foundation. Part of the building will be used to allow storage of the product to dry properly. Open storage is also used for the already dried product and ready for dispatch.

The total building area is estimated to be 450 m<sup>2</sup>. The total cost estimate of building at a unit cost of Birr 1,000 per m<sup>2</sup> will be Birr 450,000.

Land value at the lease rate of Birr 1.2 per m<sup>2</sup> per annum and 70 years of land holding is estimated to Birr 67,200. Thus, the total investment cost for land, building and civil works assuming that the total land lease cost will be paid in advance is estimated at 517,200.

## **VI. MANPOWER AND TRAINING REQUIREMENT**

### **A. MANPOWER REQUIREMENT**

The plant requires both direct and indirect manpower. Direct manpower will be engaged in production activities. This will include technicians and skilled production workers. Indirect manpower undertakes administrative tasks. So, Table 6.1 shows the details of manpower requirement including monthly salary and annual cost.

**Table 6.1**  
**MANPOWER REQUIREMENT AND ANNUAL LABOUR COST**

<b>Sr. No.</b>	<b>Description</b>	<b>Req. No.</b>	<b>Monthly Salary (Birr)</b>	<b>Annual Cost (Birr)</b>
	<b>A. Administrative</b>			
1	Plant Manager	1	1500	18,000
2	Secretary	1	400	4,800
3	Accountant	1	500	6,000
4	Salesperson & clerk	1	500	6,000
5	General Service	1	300	3,600
	<b>B. Production</b>			
1	Technician	1	500	6,000
2	Skilled Workers	2	500	12,000
3	Unskilled Workers	3	250	9,000
	<b>Sub-Total</b>	<b>11</b>		<b>65,400</b>
	Benefits (25%)			16,350
	<b>Grand total</b>	<b>11</b>		<b>81,750</b>

## **B. TRAINING REQUIREMENT**

Due to focus of the government on technical training, skilled workers on construction materials production are available, so no special training is required.

## **VII. FINANCIAL ANALYSIS**

The financial analysis of cement tiles project is based on the data provided in the previous chapters and the following assumptions:-

Construction period	2 years
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	10.5%
Discounted cash flow	10.5%
Repair and maintenance	5 % of plant machinery and equipment
Accounts receivable	30 days
Raw material, local	30 days
Raw materials, import	90 days
Work in progress	2 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days

## **A. TOTAL INITIAL INVESTMENT COST**

The total initial investment cost of the project including working capital is estimated at Birr 2.49 million, out of which about 51% will be required in foreign currency. Details are indicated in Table 7.1.

**Table 7.1**  
**INITIAL INVESTMENT COST ('000 BIRR)**

<b>Sr. No.</b>	<b>Cost Items</b>	<b>Foreign Currency</b>	<b>Local Currency</b>	<b>Total</b>
1	Land	-	67.20	67.20
2.	Building and Civil Work	-	450.00	450.00
3.	Plant Machinery and Equipment	1225.00	122.5	1347.50
4.	Office Furniture and Equipment	-	50.00	50.00
5.	Pre-production Expenditure*	-	411.71	411.71
	<b>Total Investment cost</b>	<b>1225.00</b>	<b>1101.41</b>	<b>2,326.41</b>
6.	Working Capital	12.82	100.00	112.82
	<b>Grand Total</b>	<b>1237.83</b>	<b>1201.41</b>	<b>2439.23</b>

## **B. PRODUCTION COST**

The annual production cost at full operation capacity of the plant is estimated at Birr 678,010 (see Table 7.2). The material and utility cost accounts for 36 per cent while repair and maintenance take 5.9% per cent of the production cost.

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\* *Pre-production expenditure include interest during construction (Birr 311,710) and costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

**Table 7.2**  
**ANNUAL PRODUCTION COST ('000 BIRR)**

Items	Year			
	3	4	7	10
Raw Material and Inputs	153.92	174.44	205.22	205.22
Labour direct	29.43	33.35	39.24	39.24
Utilities	28.78	32.62	38.38	38.38
Maintenance and repair	30.32	34.36	40.43	40.43
Factory overheads	12.26	13.90	16.35	16.35
Administration Overheads	19.62	22.24	26.16	26.16
<b>Total Operating Costs</b>	<b>274.33</b>	<b>310.91</b>	<b>365.77</b>	<b>365.77</b>
Depreciation	183.21	183.21	183.21	163.21
Cost of Finance	180.81	169.73	129.03	74.10
<b>Total Production Cost</b>	<b>638.35</b>	<b>663.85</b>	<b>678.01</b>	<b>603.09</b>

## C. FINANCIAL EVALUATION

### 1. Profitability

According to the projected income statement, the project will start generating profit in the second year of operation. Important ratios such as the profit to total sales, net profit to equity (Return on equity) and net profit plus interest to total investment (return on total investment) will show an increasing trend throughout the production life of the project. The income statement and other profitability indicators show that the project is viable.

### 2. Break-even Analysis

The break-even point of the project is estimated by using income statement projection.

$$\text{BE} = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 38 \%$$

### **3. Pay-Back Period**

The investment cost and income statement projection are used to project the pay-back period, the project will fully recover within 7 years time.

### **4. Internal Rate of Return and Net Present Value**

Based on the cashflow statement, the calculated IRR of the project is 14% and the net present value at 10.5% discount rate is Birr 456,930.

### **D. ECONOMIC BENEFITS**

The project can create employment for 11 persons. In addition to supply of the domestic needs, the project will generate Birr 983,370 in terms of tax revenue. Moreover, the Regional Government can collect employment, income tax and sales tax revenue.