84. FABRICATION WORKSHOP

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I. SUMMARY

This profile envisages the establishment of a Fabrication Workshop with a capacity of 2,500 pieces of door and 3,500 pieces of windows per annum.

The present demand for the proposed products is estimated at 1,667 pieces of door and 2,457 pieces of window per annum. The demand is expected to reach at 3,361 pieces and 4,909 pieces, respectively by the year 2010.

The workshop will create employment opportunities for 20 persons.

The total investment requirement is estimated at Birr 1.26 million, out of which Birr 0.24 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 47.6% and a net present value (NPV) of Birr 3.54 million, discounted at 8.5 %.

II. PRODUCT DESCRIPTION AND APPLICATION

Doors, windows and frames are fabricated items, made out of steel work products like angle, channels, flat, plates, etc. Windows and doors are made of flat and/or strip mild steel parts, which are machined at appropriate place as per design and assembled.

Windows, doors, folding gates and other steel-made fabricated items have good mechanical properties like strength, resistance for load etc.

Doors, folding gates, grills, window frames, rails, etc. are widely used for building construction or housing activities. Now-a-days, iron and steel gates (folding or sliding), grills, window frames etc are preferred because of durability and safety.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Fabrication workshop involves fabrication of doors, windows, tables, chairs and filing cabinets. However, engineers involved in the study have opinion that such workshops essentially concentrate on fabricating doors and windows. Accordingly, this study considers only doors and windows.

The demand for doors and windows is derived from building construction. Hence, assuming the regional market constitutes the relevant market, the building construction projects in the region are considered in determining the demand for the products. Table 3.1 depicts the implementation of building construction projects in the region, projected in a recent IPS study.

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

The standard for school buildings is employed in estimating the demand for doors and windows for such buildings. The Ministry of Education standard for school buildings, in terms of room requirements, is given below.

I. Primary school

1. First cycle - grades 1-4
   - 4 class rooms
   - 1 Headmaster office
   - 1 Secretary's office
   - 1 Staff room
   - 1 Janitors' room
   - 1 Student toilet (partitioned for male and female)
   - 1 Staff toilet (partitioned for male and female)
   - 1- room First aid clinic
   - 2- room Production center
   - 2-room Special needs education center
   - 1 Store room
   - 1 Guards house

2. Second cycle - grades 5-8
   - 4 class rooms
   - 1 Headmaster office
   - 1 Secretary's office
   - 1 Staff room
   - 1 Janitors' room
   - 1 Student toilet (partitioned for male and female)
   - 1 Staff toilet (partitioned for male and female)
   - 1- room First aid clinic
   - 2- room Production center
   - 2-room Special needs education center
   - 1 Store room
   - 1 Guards house

II. Secondary school

1. First cycle - grades 9-10
   - On the average 16 class rooms
   - 1 Headmaster office
   - 1 Secretary's office
   - 1 Deputy headmaster office
   - 1 Administration room
   - 1 Accounts room
   - 2 Staff room
   - 2-room Library
   - 3-room Physics laboratory
   - 3-room Chemistry laboratory
   - 3-room Biology laboratory
   - 1 Meeting hall
   - 1 Janitors' room
   - 1 Student toilet (partitioned for male and female)
   - 1 Staff toilet (partitioned for male and female)
   - 2- room Clinic
   - 2- room Production center
   - 1 Store room
   - 1 Guards house

2. Second cycle - grades 11-12
   - Similar to that of the first cycle (grades 9-10)

Based on the above information and assuming the primary village school, complete primary school and secondary school projects projected for the region are upto the standard of primary school (first cycle), primary school (first plus second cycle) and secondary school (either first or second cycle), respectively, the estimated door and window requirement for school buildings is given in Table 3.2.

Table 3.2
DOOR AND WINDOW REQUIREMENT OF SCHOOL BUILDINGS

Schools	Door (No.)	Window (No.
Primary village school	19	52
Complete primary school	25	72
Secondary school	47	161

Reliable information on the standards of health posts, health centers, hospitals and residential as well as commercial and office buildings is not readily available. Accordingly, complete primary school (first plus second cycle) is used as a proxy for health center while secondary school (first plus second cycle) is used as a proxy for hospital. As regards health post and residential as well as commercial and office buildings, estimation of door and window requirements is based on knowledgeable opinion and the impression gained from visits and observations of such buildings.

Table 3.3
DOOR AND WINDOW REQUIRMENT OF HEALTH, RESIDENTIAL, COMMERCIAL & OFFICE BUILDINGS

Buildings	Door (No.)	Window (No.
Health post	5	5
Health center	25	72
Hospital	63	241
Residential house (G+0)	12	10
Commercial & Office Buildings		
- G+0	12	14
- G+ 1	81	21
- G + 2	24	28

By applying the estimates shown in Tables 3.2. and 3.3 on the projected implementation of building projects in the region given in Table 3.1, the demand for doors and windows for the year 2005 is estimated to be 1,667 and 2,457, respectively.

2. Projected Demand

The region's demand for doors and windows for the first three years (2005 - 2007) is projected on the basis of the projected implementation of building construction projects depicted in Table 3.1. Since the demand for the products is associated with construction activities, the 10% average annual growth rate of the construction sector adopted in previous IPS studies is used in projecting the demand for the products for the period extending beyond year 2007. The projected demand for doors & windows is shown in Table 3.4.

Table 3.4

PROJECTED DEMAND FOR OF DOORS AND WINDOWS (NO.)

Year	Projected Demand	
	Door	Window
2005	1667	2457
2006	2013	2982
2007	2525	3688
2008	2778	4057
2009	3055	4462
2010	3361	4909
2011	3697	5400
2012	4067	5940
2013	4473	6534
2014	4921	7817
2015	5413	7906
2016	5954	8696
2017	6549	9566
2081	7204	10522
2019	7925	11575
2020	8717	12732
2021	9589	14005
2022	10548	15406
2023	11602	16946
2024	12763	81641
2025	14039	20505

3. Pricing and Distribution

The current producer price of doors and windows is Birr 440 and 220 per piece, respectively. This price is adopted for financial analysis.

The product can get its market outlet through direct sales to customers that include individuals and contractors.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

The suggested capacity of the plant is 2,500 pieces of doors and 3,500 pieces of windows per 300 days of single shift (8 hours) each. The production can be doubled or tripped by introducing two or three shifts a day. The working days are set by deducting Sundays and public holidays in a year and assuming that maintenance works will be carried out during off-production hours.

2. Production Programme

Considering skill development and marketing factors, the plant will assume 75% and 85% capacity utilization during the first and second year, respectively. On the third year and thenafter, the plant will operate at 100% of the rated capacity.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The major raw materials required for the production of doors, and windows are:-

- Structural round steel, angle, channel of different sizes,
- Mild steel rods, strips, pipes, sheets, plates, etc., of different sizes,
- Fasteners, handles and other handwares, and
- Consumables like welding rod, cotton waste, lubricant, emery paper, etc.

Most of the raw materials will be imported as they are not manufactured locally. Annual estimated cost of materials at full scale production in a single shift and breakdown of the materials' requirement is given in Table 4.1.

B. UTILITIES

Electricity and water are the major required utilities. Total installed electric power is 50 kW. Annual electric energy consumption of the plant under a single shift operation of 300 days & at full scale production is 60,000 kWh. Electricity cost is estimated at Birr 28,417.5. Requirement of water for general use is 600 cubic meters, the cost of which is estimated at Birr 900 per annum.

Table 4.1
RAW MATERIALS REQUIREMENT AND COST

Sr. No.	Description	Qty. (Tonnes)	Cost ('000 Birr)		
			FC	LC	TC
1.	Structural round steel, angle, channel of different size	70	420	105	525
2.	M.S. Roads, strips, pipes, sheets, palates etc. of different size	35	210	52	262
3.	Fasteners, handless and other handwares	As Reqd.	24	6	30
4.	Welding rod, cotton waste, lubricant, emirate paper etc.	As Reqd.	15	5	20
	Grand Total		**669**	**168**	**837**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

Manufacturing process of sliding doors, folding gates, grills, frames, rails, etc. involves the following stages.

- Structural steel angles, channels, sheet/plates, flats, strips, etc. are cut to the required size;
- The component parts are fixed and bent to the desired shape as per the design of gates/grills etc, and machining operations are carried out wherever required;
- Welding and assembly operations are carried out; and
- Finally, painting is done.

2. Source of Technology

The technology required for manufacturing the envisaged products is simple and conventional, and can be procured from countries like India, China, and Western European countries. Metal working machines normally employed by engineering industries can be used to produce doors and windows. Local manufacturers like Mesfin Industrial Engineering, Maru Engineering Industry, GATEPRO and OCFAM can be potential technology suppliers.

External Machinery Suppliers:-
HWACHEON MACHINERY WORKS CO., LTD.
1022-7, Pangbae 3-dong, Socko-gn, Seoul
Tel: 02-523-7766
Fax 02-5232867
www.hwacheon.com,
South Korea

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment required for the envisaged project along with estimated cost is given in Table 5.1.

Table 5.1
MACHINERY AND EQUIPMENT REQUIREMENT AND COST (BIRR)

Sr. No	Description	Qty.	Cost
1	Bench grinder, wheel size: 150X20X15.88	1	12,000
2	Bench drilling machine, diameter 12 mm	1	12,000
3	Hand grinder, disc dia 125 mm	2	5,000
4	Spot welding, 7.5 kv, air cooled	2	6,000
5	Gas welding, complete with accessories	2	6,000
6	Air compressor and paint equipment, working pressure 7 kg/cm^2, 25 litters capacity	1	170,000
7	Shearing machine, 4 ft size	2	4,000
8	Hacksaw machine size 150 mm, blade size 305 mm	1	5,000
9	Riveting press	1	2,500
10	Hand drilling machine	2	5,000
11	Shapper	2	3,000
12	Slotting machine	1	2,000
13	Jigs and fixtures, surface table and measuring instrument, tools, gauges etc.	LS	10,000
	Grand Total		**242,500**

2. Land, Building and Civil Works

The entire space required by the plant is 600 m^2. The value of land, at lease rate of Birr 1.2 per m^2 and for 70 years holdings is Birr 50,400. Out of the total land, built-up area is 300 sq. meters and the estimated cost of building at the rate of Birr 850 per m^2, amounts to Birr 255,000. Thus, total value of land, building & civil works, assuming that the total land lease cost will be paid in advance is Birr 305,400.

3. Proposed Location

It is believed that there is high prospect of market outlets of the products in Asossa town and pawe town. The envisaged plant will, therefore, be located at where better communication and transportation facilities are located.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The plant requires a total of 20 persons. The manpower requirement and estimated annual labour cost including employee's benefit is given in Table 6.1.

Table 6.1
MANPOWER REQUIREMENT AND LABOUR COST

Sr. No.	Description	No Required	Monthly Salary (Birr)	Annual Salary (Birr)
	A. Administration			
1	Plant Manager	1	1,800	21600
2	Finance and Administration Dept. Head	1	1,400	16800
3	Accountant	1	700	8400
4	Secretary	1	500	6000
5	Sales person	1	700	8400
6	Store keeper	1	900	6000
7	Cashier	1	900	6000
8	General Services	1	400	4800
	Sub total	**9**	**-**	**78000**
	B. Technical and Production			
1	Engineer (Technical head)	1	1,400	16800
2	Foreman	1	1,000	12,000
3	Fabrication Technicians	3	800	28,800
4	Unskilled labourers	6	250	81,000
	Sub – total	**11**	**-**	**75600**
	Employees' Benefit (25% of Basic Salary)	-	-	38400
	Grand Total	**20**		**192,000**

B. TRAINING REQUIREMENT

Currently, government's policy gives due attention for Technical (vocational) education. Due to this, technicians on metal works are available on the market. So no special training arrangement is required.

VII. FINANCIAL ANALYSIS

The financial analysis of the Fabrication Workshop project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 years
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	7.5 %
Discounted cashflow	8.5 %
Repair and maintenance	3 % of the total plant and machinery
Accounts receivable	30 days
Raw material, local	30 days
Raw materials, import	90 days
Work in progress	5 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 1.3 million, of which 19.2 per cent will be required in foreign currency.

The major breakdown of the total initial investment cost is shown in Table 7.1

Table 7.1
INITIAL INVESTMENT COST

Sr. No.	Cost Items	Total ('000 BIRR)
1	Land lease value	50.4
2.	Building and Civil Work	255.0
3.	Plant Machinery and Equipment	242.5
4.	Office Furniture and Equipment	50
5.	Vehicle	260
6.	Pre-production Expenditure*	73
7	Working Capital	331
	Total Investment cost	**1,261.9**
	Foreign share	**19.2%**

* *N.B Pre-production expenditure includes interest during construction (Birr 68 thousand) Birr 5 thousand) costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 1.3 million (see Table 7.2). The material and utility cost accounts 67.3 cent while repair and maintenance take 2 per cent of the production cost.

Table 7.2
ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	837	65
Utilities	29.3	2.3
Maintenance and repair	25.7	2.0
Labour direct	153.6	11.9
Factory overheads *	38.4	3.0
Administration Cost **	50.0	3.9
Total Operating Costs	**1,134.1**	**88.0**
Depreciation	97.5	7.6
Cost of Finance	56.5	4.4
Total Production cost	**1.28**	**100**

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the lifetime of the project.

The income statement and the other indicators of profitability show that the project is viable.

2. Break-even Analysis

The break-even point of the project including cost of finance when it starts to operates at full capacity (year 3) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 29.8\ \%$$

**Factory overhead cost includes salaries and wages of supervisors, insurance of factory workers, social costs on salaries of direct labour, etc.*

*** Administrative cost includes salaries and wages, insurance, social costs, materials and services used by administrative staff etc.*

3. Pay-Back Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 3 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 47.6 % and the net present value at 8.5% discount rate is Birr 3.547 million.

D. ECONOMIC BENEFITS

The project can create employment for 20 persons. In addition to supply of the domestic needs, the project will generate Birr 0.2 million per annum in terms of tax revenue when it starts to operate at full capacity. Moreover, the Regional Government can collect employment, income tax and sales tax revenue.