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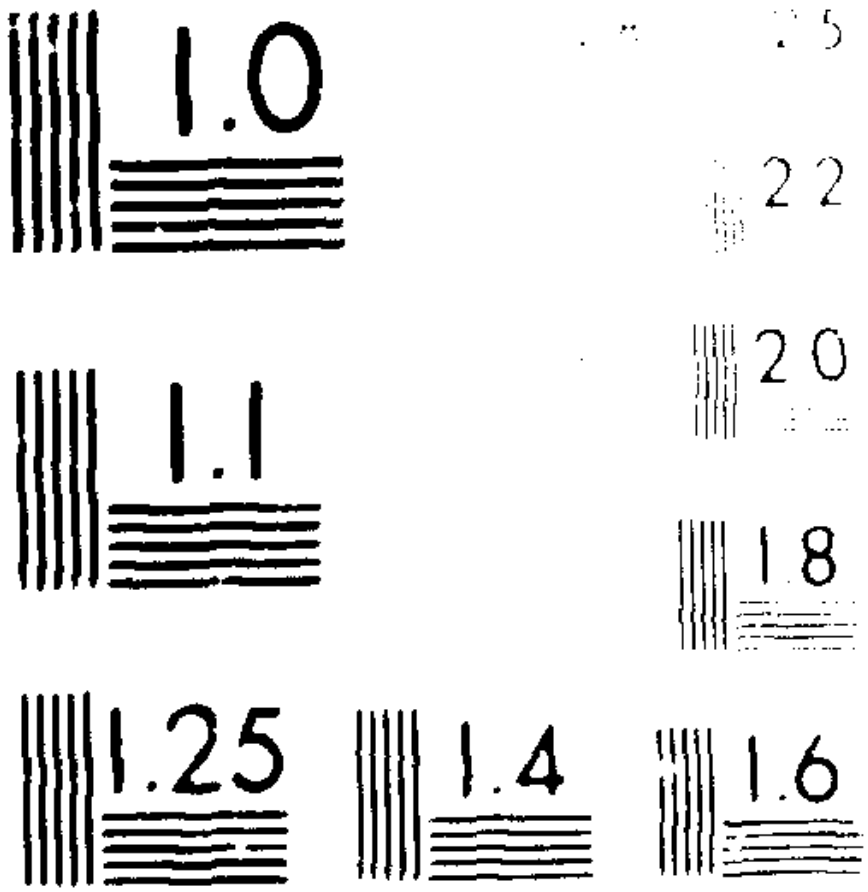
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Feasibility Study for the Expansion of a Door and Furniture Factory for Vintawood Products Incorporated

A study arranged by UNIDO in response to requests from the Government of the Philippines and Vintawood Products Incorporated, and funded by the Government of Finland

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Helsinki 1982-01-25

FEASIBILITY STUDY FOR THE EXPANSION OF A DOOR AND FURNITURE FACTORY FOR VINTAWOOD PRODUCTS INCORPORATED

Preface

This study is based on the contract concluded by the United Nations Industrial Development Organization (UNIDO) and Jaakko Pöyry Consulting Oy (JAAKKO PÖYRY) on 27th October, 1980. According to this UNIDO contract (contract No. 80/115, project No. US/RAS/79/254) JAAKKO PÖYRY was assigned to carry out a feasibility study for the rebuilding of a door and furniture factory for Vintawood Products Incorporated in the Republic of the Philippines.

UNIDO performed a valuable task in organizing the study, responding to the requests from the Government of the Republic of the Philippines and the project promoter Vintawood Products Incorporated, and using funds provided for the purpose by the Government of Finland. This study is a concrete result of the cooperation meeting between the Finnish industry and similar organizations in selected developing countries on the establishment of joint wood processing industries.

Mr. Dan D Tinio of Vintawood Products Incorporated contributed greatly to the performance of the fieldwork in the Philippines by taking care of practical arrangements. We would particularly like to thank the representatives of UNIDO and Vintawood Products Incorporated for their kind cooperation during the course of the study.

Sten von Troil
President

Kari Rinne
Project Manager

Page

ABBREVIATIONS

km	kilometres
m	metres
cm	centimetres
ft	feet (1 foot = 30.48 cm)
m^2	square metres
ha	hectares (1 ha = 10^4 m^2)
m^3	cubic metres (1 m^3 = 424 fbm = 0.424 Mfbm)
m^3s	solid cubic metres of wood
s	seconds
h	hours
d	days
a	year (annum)
kg	kilogrammes
t	metric tons
m^3/a	cubic metres per year
t/a	tons (metric) per year
N	Newtons (1 N = kg m/s^2)
W	Watts
J	Joules (1 J = 1 Nm = 1 Ws)
kWh	kilowatthours (1 kWh = 3.6000 MJ = 3.6 x 10^{-3} GJ)
kV	kilovolts
A	amperes
kVa	kilovolt-ampere
Gcal	giga-calories (1 Gcal = 4.1868 GJ)
kW	kilowatts
hp	horse power (1 metric hp = 0.7355 kW)
GJ/h	giga-joules per hour
Pa	pascals (1 Pa = 1 N/m^2)
MPa	mega pascals (1 MPa = 10 bar = 10.197 kp/cm^2)
bar	bars
kp/cm^2	kilogramme weight (kiloponds) per square centimetres
ROI	return on investment
DCF rate	discounted cash flow
^oC	degrees centigrade
%	percent
o/oo	per thousand, thousandth part
1 USD	(US dollar) = ₱ 7.65 = 3.9 FIM
m.c.	moisture content
r/min	revolution per minute (RPM)
M	100 mm (for door sizes)
M$	Malaysian dollar
S$	Singapore dollar
FIM	Finnish mark
₱	Philippine peso
CAD	Canadian dollar
NLG	Dutch guilder
BEF	Belgian franc
FRF	French franc
DEM	German mark
GBP	Pound sterling
AUD	Australian dollar
JPY	Japanese yen
SAR	Saudi Arabian riyal

1
INTRODUCTION

1.1
Objectives of the Study

The objectives of this study were

- to analyse the relevant markets for doors and possible furniture products, and after that to suggest a realistic product and market programme for a systematic marketing drive

- to prepare conceptual plans for the manufacture of the joinery products selected in the market study

- to calculate the profitability of the proposed factory, carry out financial and economic analyses and to outline policies for training and product development

1.2
Study Methods

Some desk research was first carried out, and it was then followed by a field study programme. This report presents the findings of the studies.

The work was divided into two closely coordinated parts (market study and technoeconomic planning). The field parts for the market study and techno-economic planning were carried out partly simultaneously in the Philippines. The fieldwork was geared to assessing the marketing opportunities, the suitability of the mill site, the availability of raw materials and personnel resources etc. The information was obtained through private interviews. The desk research drew on earlier projects of the same type carried out by the Jaakko Pöyry Group since 1973.

Several preliminary plans were tested in an iterative planning process to find the best technoeconomic concept for the proposed factory. The concept selected represents what appeared to be the optimum solution in view of the production and marketing constraints.

2
SUMMARY

2.1
Conclusions

2.1.1
The Mill

a Mill Concept

The original mill concept of the study included production of both doors and wooden furniture from purchased sawnwood mainly for exports. However, wooden furniture was excluded during the study and a sawing line for sawing of part of the sawnwood required was added to the mill concept. The main reasons for these changes are given below.

Furniture was excluded because

- it is better to concentrate the efforts on one product group only
- marketing channels for doors and furniture are different
- furniture is more difficult to produce because of changes in design and fashion
- the amount of off-cuts for furniture manufacture would decrease, if a sawing line were included in the mill concept (i.e. because sawnwood could be trimmed to the company's own specifications)
- off-cuts could be sold to local furniture plants and thus there would be no need to produce furniture to make use of them

A sawing line was included because

- the availability of sawnwood from local sawmills in Luzon is not fully guaranteed for Vintawood
- the thickness range readily available from local sawmills does not speak for purchasing all sawnwood required
- the thickness tolerance of commercial sawnwood is poor compared with the requirements of door manufacture
- a company-owned sawmill would make required dimensions readily available, ensure good quality of sawnwood and give control over sawnwood production

b Capacity

On the basis of the studies carried out it is concluded that the mill should have an output of 30 000 door sets.

2.1.2
Market Prospects

a General

Vintawood's project is timely. The international trade in wooden panel doors is increasing and the domestic market can absorb 10 percent of the output. The markets are there for the proposed factory.

b Marketing Plan

The key export markets for Vintawood are Western Europe and North America, followed by Australia, the Middle East and Japan.

Vintawood, which was founded in 1964 and has produced doors and furniture until 1979, will have to regain ground in domestic and export markets by using modern marketing ideas and methods differing from those of the present door manufacturers. Guidelines for an efficient marketing plan are presented in the study. It is suggested that Vintawood should make strong efforts to secure good marketing channels for export.

2.1.3
Technical Aspects

a Wood Raw Material

The door factory would require about 6000 m^3 of sawnwood annually of which about 2200 m^3 would be purchased from local sawmills in Luzon and about 3800 m^3 would be sawn by the factory's own sawmill department. The log requirement for sawing would be about 6900 m^3s under bark.

Vintawood does not have its own concession and most probably cannot get one, as the general policy in the Philippines is to reduce the number of concessions and increase their size. This would not prevent Vintawood from obtaining logs, because the planned ban on log exports would make high quality logs available in the Philippines, too.

The doors would mainly be made of lauan, whereas tangile and narra, the traditional species for woodworking, would not be used because these resources are diminishing.

b Personnel

No major difficulties are anticipated in hiring qualified foremen and it is also believed that the top positions of the factory management can be manned with experienced personnel. However, the key personnel should be given additional training.

Unskilled labour is readily available but skilled machine operators etc. should be hired from other companies. Short-term training of labour would also be required.

c Energy

All heat would be generated on the site from the factory's own wood residues.

Electricity would be easily available from the nearby grid. The price of electricity is moderate.

d Production Process

The production process has been designed to allow flexible prosessing, and modifications wuld be easy in line with product development. The low labour cost has affected the process design, i.e. individual machine units have been used instead of processing lines.

e Mill Site

The proposed mill site owned by Vintawood is suitable for the purposes of a door factory. It is also favourably situated in relation to the harbour in Manila.

The mill site is in a rural development area and the factory is registered as an export producer, which would entitle Vintawood to some incentives.

The existing mill building could form a part of the new door factory building.

2.1.4
Profitability and Financing

a Investment

The total investment requirement, including working capital, has been estimated at USD 7 289 000 at 1st quarter 1981 prices.

b Internal Rate of Return

The internal rate of return of the project with an effective operating time of 13 years has been calculated at 19,9 percent which can be regarded fairly good.

c Financing

Key financial ratios show that project financing would be sound with 40 percent equity participation even with commercial credits. If the equity participation were considerably lower than this, economic operations would require softer loans.

2.2
Resumé

2.2.1
Market Survey

Conclusions

The study assessed the business opportunities open to Vintawood in builders' woodwork, wooden panel doors and windows, wooden beadings and mouldings and minor woodworking products. The analysis covered the Philippines and the most attractive overseas market areas (Western Europe, North America, Japan, Australia and the Middle East). The research shows that:

- wooden panel doors would be better suited for Vintawood than other alternative products covered by this study
- Vintawood's plan to build a new panel door factory is timely in view of the domestic and export market potential and the wood supply situation in the Philippines; the Government's policy is to encourage secondary wood processing and to improve the structure of sawmilling and wood-based panel industries; Vintawood's project complies with the former goal
- Vintawood's competitive advantage would be in having a new factory compared with the present less efficient factories in the Philippines. Its competitive disadvantages would be in the dependence on the fluctuating domestic wood market, preoperational training and marketing expenses (as Vintawood restarts its operation after a stoppage of a few years) and the competition from the present door makers.

- Vintawood could sell 10 percent of the target production in the Philippines and export 90 percent predominantly to Western Europe, North America and Japan. Success in marketing would call for efficient marketing channels, types of which are tentatively suggested in the study.

- Building codes and door standards do not set restrictions on wooden panel doors in houses, but specify higher performance standards for doors in non-residional buildings and for entrance doors of flats in high-rise residential buildings. The common door dimensions and general designs are identified in the study, and guidelines are provided for detailed matching of products to the needs of the markets. The product range deserves more attention than given by most present door suppliers.

- Vintawood should aim at the market segment of medium and high priced doors that have a substantial market potential. There would be no point in competing against Taiwanese suppliers in low-priced doors. Buyers would like FOB terms, with payment by letter of credit or cash against documents.

- Most suppliers of panel doors seem to suffer from a weak negotiating position viz-a-viz their marketing channels. Vintawood could contribute to its sales revenues by continuing to develop its product, manufacturing and marketing intelligence, aiming at a good command of the panel door business based on an explicit strategy. There is considerable evidence that a company with a carefully planned strategy can perform relatively better than a company with a general business idea.

Domestic Supply and Demand

The Philippine woodworking industry comprises altogether some 310 factories, with only 10-15 companies making joinery and cabinets. The factories use labour-intensive production methods, and most of them suffer from several of the production and marketing bottlenecks identified in the study (section 3.2). During the strong domestic and international building boom in the early 1970s, there were 32 joinery factories, so their number has decreased by half during the subsequent building recession.

Most of the consumption and production of joinery in the Philippines is confined to Metro Manila and a few other major cities. The building activities have not met the needs primarily because of the considerable building backlog, the escalation of building costs, the great public investments in energy production, and the weak average national economic development. The estimates of future building activity

suggest the demand for doors would rise from 140 000 - 150 000 doors at present to a maximum of 340 000 and a likely 250 000 doors by 1990, consisting of 20 percent external and 80 percent internal doors. Special doors still command little demand in the Philippines (section 3.3).

Market Outlook for Panel Doors Overseas

Panel doors offer the best business opportunities to Vintawood; other builders' woodwork (windows, beadings and mouldings, staircases) are not well suited for Vintawood. The positive and negative aspects of alternative product lines from Vintawood's point of view are listed in section 3.6.1 of the study.

The current main importers and exporters of panel doors are (ranking by volume):

Importers

- Western Europe
- North America
- Australia
- Middle East
- Japan

Exporters

- Regional trade in Western Europe
- Taiwan
- Southeast Asia
- North America
- South America

The study lists the general competitive advantages and disadvantages of tropical countries in the woodworking industry (section 3.5.1), suggesting that the advantages outweigh the disadvantages. The Philippines still plays a minor role in the international panel door trade, so Vintawood should be able to more than double the country's export potential. Singapore and Peninsular Malaysia are growing exporters of panel doors.

Vintawood's Market Position

The domestic market could absorb 10 percent of the proposed production (30 000 doors). Major builders in Metro Manila and a few other major cities would be the main customers, but sales should also be promoted to the authorities administring and financing the housing programmes. Vintawood would be a major panel door producer in the Philippines but a medium size company in an international comparison. Vintawood would benefit from the competitive strength of having a modern factory, but it would need considerable thrust to overcome the competition from major domestic door makers and overseas competitors in other ASEAN countries. Vintawood would be much better off if its project had financing and marketing partner(s).

Marketing Plan for Vintawood

Vintawood should concentrate on the markets where the highest FOB prices can be fetched (section 3.7.1). On the other hand, as differences in price levels are small, and fluctuating exchange rates may change the relative profitabilities, Vintawood should also export some to the currently less attractive markets to monitor the market situation and to acquire market intelligence. This policy would improve the company's long-term performance.

The study suggests types of efficient marketing channel in the Philippines, Western Europe, North America. Japan, Australia and the Middle East (sections 3.7.2 to 3.7.7). These guidelines can be used when selecting marketing partners for the project. It should be noted that the production of wooden panel doors does not present any challenges, so the performance depends on marketing and procurement of wood raw material. Most of present panel door makers - as Vintawood did in the past suffer from their predominantly production-concentrated operations.

Product, Pricing and Sales Promotion Policy for Vintawood

The study suggests Vintawood should aim at a cost-efficient and desired product range (section 3.8). Realistic ways of adding value to standard panel doors are identified. The fragmented unprofitable product range was a major reason for Vintawood's insuperable operating problems before it had to cease production in the late 1970s. Several other companies have suffered from the same problems.

The panel door markets are segmented by price in the study (section 3.9). Vintawood should concentrate on medium priced doors - sufficient market volume and reasonable price - and aim at high-priced doors in the medium to long-term as demand for these products is gradually rising. Further processing and additional sizes and designs should provide full compensation for the production costs.

The actual sales prices will depend on Vintawood's negotiating power vizaviz its marketing partners. Vintawood will need to monitor the business cycles and market prices of panel doors in its target markets e.g. through the trade commissioners of the Philippines. Guidelines for other sales promotion activities are given in the study (section 3.10).

2.2.2 Capacity

The planned production of the door factory would include

- doors	30 000/a
- frames	30 000/a
- sills	20 000/a

2.2.3 Products

a Red and white lauan would be the main species for the doors but some other species with appropriate quality and properties would also be used.

b In general the moisture content of wood for doors should be 10±2 percent, or the average equilibrium moisture content that the doors are expected to attain in service. This means that the sawnwood would have to be kiln-dried.

c Each country has its own standards and requirements for the sizes of doors, functional requirements, classification methods, workmanship and methods for determining various defects. In many cases the national standards largely follow the ISO standards.

Annex I lists the most important standards, and sections 4.1 and 4.2 describe the standards used in the study.

d All doors, frames and sills would be made of solid wood. The design of a door leaf may vary, but in this study the door types have been divided into nine groups.

The thickness of door leaves and frame profile sizes vary depending on the market area. In this study door leaf thicknesses of 35, 40 and 44 mm have been used, as these are the most commonly traded thicknesses.

The doors would be finished according to the customer's specifications. The rebates and holes for hardware would be machined, but hardware would not be delivered by Vintawood.

2.2.4 Raw Materials

a The wood raw material requirement of the factory would be the following:

- logs	m^3s/a	6870
- sawnwood, green	m^3s/a	2170

The wood raw material would be classified into two main groups: light and dark-coloured species (e.g. White lauan and Red lauan).

b Other raw materials include about 10 t/a of glue - consisting of urea-formaldehyde (UF), urea-melamine (MUF) and polyvinyl acetate (PVA) resins - 28 t/a of finishing materials such as putty, wax, sauding sealer, stains and laquer, and plastic wrapping and corrugated board for packaging.

2.2.5 Mill Description

a The operating time of the factory would be 300 d/a and 1 shift/d with the exception of drying which would require 330 d/a with 3 shifts/d.

b The process design of the door factory is characterized by the following features:

- simple straight forward process flow
- sufficient intermediate stores between each stage
- individually operated machines to avoid difficulties in production programming and to make it possible to change the process lines, if the product mix or design is changed
- machines of good reliable quality allowing high efficiency
- effective removal of dust and shavings from each machine
- work pieces either piled on pallets or in small size containers would be transported with simple manually operated trucks

c Capacity calculations for main machines have been carried out taking into account the number of components to be machined, the available working time and the operating time factors in each stage of the process. The number of machines have been selected on the basis of the capacity calculations.

i The sawmill process has been designed for breaking up logs and cants into the special dimensions required by the factory and for resawing purchased sawnwood. All sawnwood would be kiln-dried.

2.2.6
Mill Site

a The door factory would be built at the existing mill site with an area of about 26 900 m^2. The existing buildings which are in fairly good condition would be used. But the existing roofed sawmill shelter and old kiln chambers would have to be demolished.

b The following new buildings would have to be built:

- sawmill building	m^2	865
- green sorting shed	m^2	400
- prefabricated kiln dryer	m^2	470
- shed between kilns and factory	m^2	530
- new factory department	m^2	1750
- storage for chemicals	m^3	25

The offices, and the maintenance and material stores would be located in the existing buildings.

c The mill site would have to be improved by paving the feeder road and gravelling the mill roads and log yeard.

d Heat energy would be generated using wood waste as fuel. The heating medium in the boiler would be water. Wood waste available for heat generation would be about 5200 m^3s/a with a corresponding heat content of about 32 600 GJ/a.

The heat requirement would be about 11 000 GJ/a depending on the boiler efficiency. Thus about half of the wood waste would be sold.

e Power would be supplied through a 36 kV overhead transmission line to the factory. One 800 kVA, 36/0.44 kV transformer and small enclosed dry-type transformers would be needel.

f The power demand would be about 1440 MWh/a and the total installed motor power about 1000 kW.

g Water would be taken from the existing deep well.

2.2.7
Organization

The organization would consist of marketing, production and administration departments. The total personnel would be about 155 persons. (See section 8.1.3.) Section 8.2 describes the suggested training policy.

2.2.8
Repair and Maintenance

Maintenance would be coordinated by the production department. Only daily repair and maintenance would be carried out by the factory's own workshop with equipment for minor repairs. All major repairs would be carried out by an outside engineering workshop in the Manila area.

2.2.9
Implementation Programme

The total construction period from the go-ahead decision to start-up would be 16 months. A possible know-how partner, consultants and civil engineering contractors would have to be selected before the implementation stage.

2.2.10
Investment Requirements

a The total investment, including erection, interest during construction and working capital has been estimated at USD 7 289 000.

b About USD 2 273 000 of the fixed investment of USD 5 993 000 would be local currency, and the rest, USD 3 720 000 would, be foreign currency mainly for machinery and equipment.

c The working capital of about USD 1 036 000 includes accounts receivable, accounts payable and inventories.

2.2.11
Profitability of the Project

a The total variable costs would be USD 2 363 000 a year and the total fixed cost excluding capital charges, USD 359 000 a year.

b The sales revenue would be USD 4 327 000 a year.

c Return on Investment (ROI) of the factory would be 22,0 % when running at full capacity.

d The Internal Rate of Return would be 19,9 % with an operating lifetime of 13 years.

e Sensitivity analyses show that a change in sales revenue would have the strongest effect on the profitability, A change in fixed costs would have the smalles effect.

2.2.12
Project Financing

The total financial requirement of the project, including working capital and a 12 percent annual escalation, would be USD 8.0-8.1 million, depending on the interest rate. Equity amounting to USD 3.2 million, which corresponds to 40 % of the fixed investment, has been used in the financial evaluation.

The project would be financially viable even with commercial credits. The liquidity of the project would, however, be on a more satisfactory level, if softer loans were available.

3
DOMESTIC AND EXPORT MARKET PROSPECTS

3.1
Introduction

This market survey is intended to provide the market information needed for preparing a comprehensive feasibility study for Vintawood. The survey seeks to show the marketing opportunities open to Vintawood, the specific needs of promising market areas and guidelines for tapping the marketing opportunities. This information should answer the following key questions:

1 What products should Vintawood make and what are their general specifications?

2 What are the marketable production capacities? How much can be sold in the Philippines and how much should be exported? Where are the best export markets?

3 Which marketing channels provide access to the target markets? How could Vintawood organize its marketing drive?

4 What are the average sales prices attainable and what kind of a pricing policy should Vintawood follow?

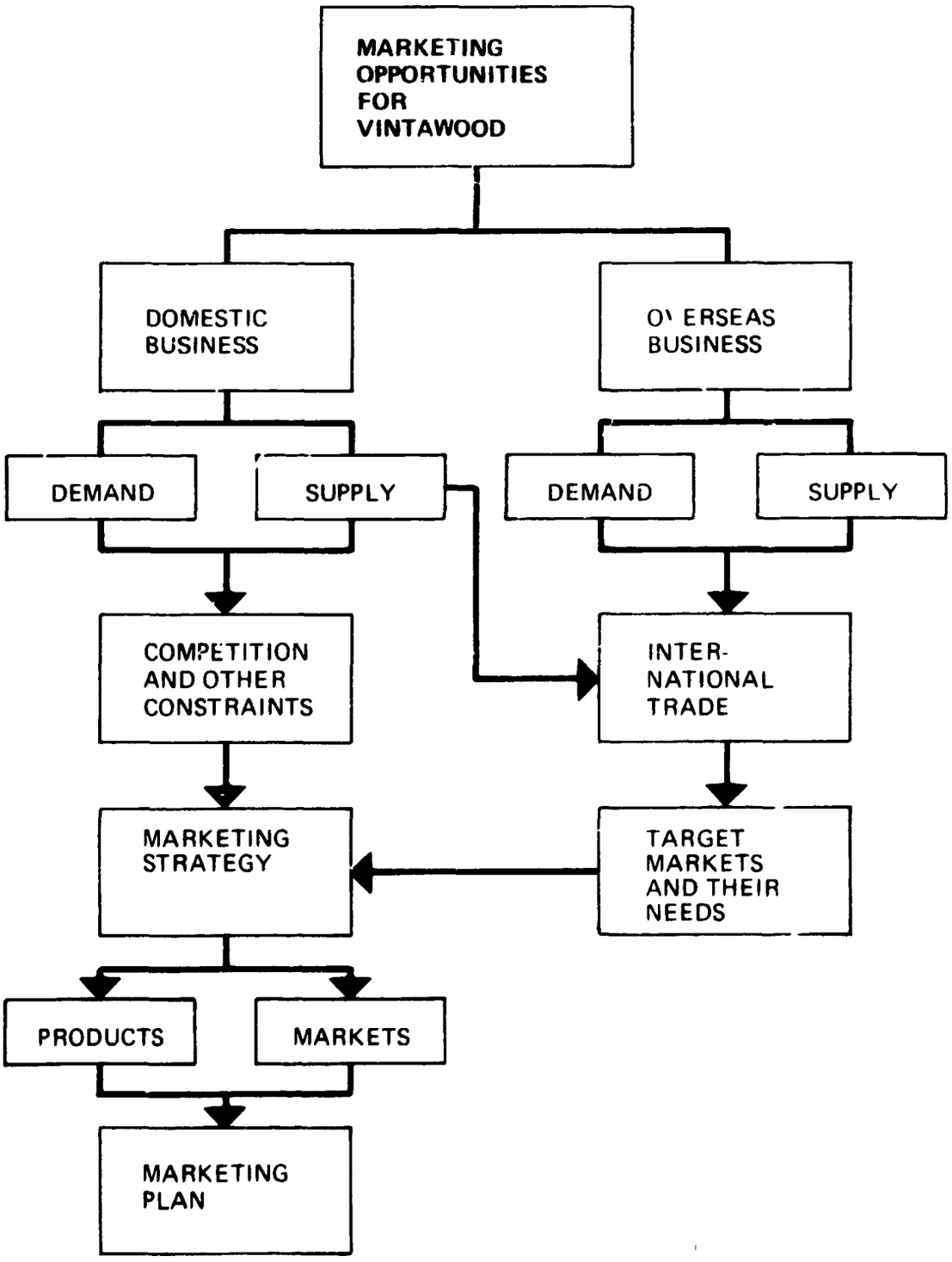
5 What kind of SP and PR activities are needed to support the marketing drive?

The export markets have been emphasized in the survey, because the export performance will determine the success of the project.

The survey is based on a work plan that reflects the goals of the study (Fig. 3/1). The object has been to work out a realistic marketing plan for Vintawood.

The overall business opportunities open to Vintawood have been assessed based on a wealth of published information. To define the specific needs of target markets, prices attainable and marketing activities, limited fieldwork was carried out in the Philippines and in selected importing and competing countries. Altogether some 40 private interviews were carried out.

Fig. 3/1 FLOW CHART OF THE MARKET SURVEY



3.2
Domestic Supply

Woodworking is a traditional industry in the Philippines. The sector comprises[1]:

- 60 - 65 significant furniture factories, and about 230 medium to small establishments plus a great number of small workshops all over the country
- 20 significant rattan furniture manufacturers and some 50 small workshops
- 10 - 15 companies making cabinetry and joinery
- a number of companies making woodcrafts

In the last few years the woodworking industry has attracted some new investments in line with the Government's policy to encourage secondary processing of wood products. The few major companies are in Metro Manila and Cebu, which are commercial centres for overseas transport, export trade and domestic trading of sawnwood and other raw materials. The major companies employ 100 to 500 workers. In lesser cities and the countryside the companies are considerably smaller.

The woodworking industry makes all kinds of furniture, joinery and built-in fitments. The factories represent labour-intensive technologies, with machines having small capacities and being best suited to individual job orders rather than serial production. The furniture tends to be of classic European or early American designs which call for elegant lines, delicate features, attention to detail and a fine finish. The average quality leaves a lot to be desired since the woodworking industry reportedly suffers from a number of constraints:

- over-dependence on a few markets. Most exports have gone to the USA, followed by Australia and Japan. Several otherwise major importing countries import little from the Philippines.[1]
- poor product design and quality control because of the present semicraftsmanlike production methods. It is difficult to reproduce products of the same design and quality and to ensure interchangeable parts. (Pieces of some product model sometimes slighly different in details.)
- small domestic contract market and very few distributors. Factories depend on varying individual order. Major companies sell directly through their showrooms, even offering a design service.

1) According to the Chamber of the Furniture Industries in the Philippines (CFIP) and the Philippine Furniture Manufacturers and Dealers Association (PFMDA)

- high costs of developing new markets and products. This is aggravated by the shortage of working capital and the small average profit margin.

- inadequate and obsolete production facilities, machinery and equipment. Few major companies have most appropriate technologies.

- low capacity utilization resulting in high unit costs. Companies cannot undertake big orders due to short finance.

- inadequate know-how of technologies and overseas markets, lack of trade contacts. Companies should monitor marketing opportunities and new production technologies.

- limited availability of high quality sawnwood in suitable dimensions. No particleboard is made. The woodworking industries feel that wood industries export their best qualities.

- Wood raw materials are the main cost item of production. Lumber of Narra, which is a prime species for woodworking, is no longer available because of the logging ban. Wood supply situation has in general deteriorated due to excessive logging in the past.

- poor availability of skilled labour leads to low productivity. Companies use a lot of contractual and temporary labour to meet temporary suxeges in demand. It often takes some time for the contractual/temporary labour to reach the some productivity as the permanent labour.

- in the present buyers' market the Phillipino companies have to accept competitive prices and high quality requirements

- manufacturers of rattan furniture face uncertain supply of rattan in the medium term

- limited training and other supporting services. There is a plan to establish a woodworking industrial estate where suitable companies could be integrated to enjoy the supporting services. Vintawood has been invited to join the woodworking industrial estate.

- considerable domestic competition due to a great number of small workshops and limited investment requirements

The woodworking industry underwent a significant expansion 10 to 15 years ago when new high-rise buildings were constructed in Metro Manila. The sector fared reasonably well during the international boom in the early 1970s. At that time there were e.g. 32 makers of wooden doors compared with 10 factories at present, which cater for selected medium to high quality building markets abroad and in the home market. In addition there are numerous small workshops with very simple machinery and negligible overhead costs making doors on order. The workshops situated on the outskirts of cities, cater for local and lowerquality markets. The principal factories have found it difficult to compete in the latter market segments.

3.3 Domestic Demand

The domestic building market was buoyant in the early 1970s, but then suffered from the worldwide recession from 1975 to 1978. A recovery began in 1979 and in 1980 it levelled off because of rising costs. The building costs have more than trebled since 1972.

The demand for furniture and joinery depends essentially on the construction of new housing. The housing industry has not yet met its production targets because of limited financing, small profit margins and considerable governmental investments in infrastructure and energy production (Table 3-1) which have reduced the resources available for the housing industry. It should be noted that most of the new housing is either administered or financed by the Government, so its policies affect the building market. The targets for new housing in the 1980s are ambitious. The Government's planned increasing involvement in the new housing activities may strengthen the sector, leading to a greater output. The normative[1] housing demand is very great since:

- There are 45.9 million people, the per capita gross domestic product (GDP) being P 3745 (USD 459) at current, and P 1785 at constant 1972 prices. The population is forecast to rise to 78.3 million by 1995 and the total GDP at 5 percent per annum.

- There is a housing backlog of about 2 million dwelling units. The authorities have estimated the 1980 - 2000 new housing needs at 3.3 million units in urban and 7.4 million units in rural areas, if sufficient housing stock were to be built[2].

1) UN terminology
2) Philippino Development, Vol. VI, No. 23, April 30, 1979

Table 3-1
National Housing Targets in the Philippines

Type of housing	1979 Target	1979 Output	1977 Output
		- units -	
New units	24 113	16 300	12 721
Sites and services programme	1 500	3 627	3 487
Upgrading of marginal areas	5 787	5 499	3 364
TOTAL	31 400	25 460	19 572

B Goals[2)]

Type of housing	1978-82	1983-87
	- units -	
Government administration	72 137	128 899
Government financed	76 373	27 670
Other	68 614	99 500
Sites and services programme	37 403	50 989
TOTAL	254 527	307 058

In recent years the Philippines have suffered from an increasing oil bill and high inflation in the same ways as other tropical countries and this has retarded the development of construction activity. On the other hand, the Government aims at expanding new industries and exports, exploiting the indigenous energy potential of the country (coal, petroleum, biomass, geothermal) and at restructuring the industries to more competitive larger units. This would improve national economic performance and diversification resulting in lesser dependence on agriculture and then more finance could be channelled into the construction industry, raising the demand for building materials.

The Metro Manila and its surroundings account for about 2/3 of the building market. In residential building there is a maximum of 5 storeys. Residential houses are primarily built by medium to small contractors, with the greater companies concentrating on civil engineering, high-rise non-residential buildings etc. Advanced building technologies are not yet used in residential building projects. The contractors undertake either a turnkey project or alternatively erect the building from the owner's materials.

1) Philippino Development, Vol. VI, No. 23, April 30, 1979
2) Office of the President, National Home Mortage Finance Corporation

The number and design of doors, windows and built-in fitments are influenced by interior decorators/architects, contractors and building owners. In turnkey projects the contractors buy building materials directly from producers. The woodworking industry offers joinery according to the buyer's design as contract work. The contractors often make door frames on site since the building dimensions are somewhat inaccurate. The input of doors per housing unit is roughly:

	Internal	External	Louvred sliding
	-	units	-
Medium cost houses	5	1	few
High cost houses	8-10	1-3	several

The present domestic consumption of doors is roughly estimated at 140 000 to 150 000 pieces[1], comprising 20 percent external and 80 percent internal doors. If the housing programme (Table 3-1) could be implemented, the demand would rise to 330 000 to 350 000 pieces in the late 1980s. If the housing industry had the same priority as in the last few years, the door demand would amount to some 270 000 pieces.

The demand is confined to common interior and exterior doors, with fire and other special doors accounting for a negligible portion of the market. Such special doors are more extensively used in developed countries, and they also call for other raw materials than wood, from which Vintawood plans to make doors.

3.4 Philippino Foreign Trade

The Philippines are a minor exporter of woodworking products. Furniture accounts for only 1.2 percent of the total exports of the country. The trade balance for furniture is, however, very positive (1979):

- import	USD million	1.2
- export	USD million	54.9
NET TRADE TOTAL	USD million	53.7

The exports of furniture have been sensitive to international business cycles, which reflects the buyer's market, but the interest in importing furniture from the Philippines appears to be increasing. In 1975 the total furniture exports were only USD 5.2 million and in 1978 USD 26.6 million. The exports comprise mostly rattan furniture, followed by wooden chairs, seats and their parts. The main markets are North America (USA) and the EEC, with Japan, Australia and Singapore forming secondary markets. The furniture imports comprise special furniture in small quantities.

1) no comprehensive statistics available

The Philippino exports of joinery and minor woodworking products are smaller (USD 43.9 million in 1979) than those of wooden furniture (Annex 3.1). The exports comprise several types of product. The main commodities by trade value (1979) are as follows:

	USD million
Wooden beadings and moldings	1.5
Wooden doors	2.7
Other builders woodwork	16.5
Household utensils of wood	10.0
Carved articles	4.4
Other commodities	8.8
TOTAL	43.9

The product group other builders woodwork includes all kinds of wooden building components and elements for building that are not mentioned separately. Its magnitude is partly explained by the significant overseas jobs of Philippino contractors, but most of it is independent trade.

The exports of joinery and minor woodworking products amounted to USD 28.1 million in 1978, which means considerably slower growth from 1978 to 1979 than for furniture. Exports grew most in household utensils and the product group other builders woodwork. The imports of joinery and related products are negligible.

The exports go to a great number of markets, although a few countries absorb most of the exports. The primary markets for all product groups are the USA, the United Kingdom and Japan, followed by Australia and Canada. The value of the business by country is limited, and the Philippines command small import market shares.

3.5 Market Outlook for Woodworking Products Overseas

3.5.1 Builders' Woodwork

General

The building industry accounts for most of the wood products consumption. Sawnwoods and wood-based panels are used in many ways by the building industry, with builders' woodwork forming part of the finished building, and concrete formwork, scaffolding etc. being only temporary auxiliary uses.

The quantities of wood products consumed per unit of building volume vary from country to country, depending on the building practices, so any estimate of the distribution of wood consumption is only indicative, and refers to one country and a particular time. However, to illustrate the order of magnitude, some guidelines are given below (early 1970s, points from 1 to 3):

1 Average distribution of sawnwood consumption in the building sector [1)]

Residential building	40 %
Non-residential building	45 %
Maintenance building	15 %
Total	100 %

2 Average distribution of consumption by type of sawnwood in the building sector [1)]

Carcassing	30 %
Joinery	40 %
Low grade	30 %
Total	100 %

3 Mean sawnwood content of an average individual house in the Netherlands

Use	m^3
Facades	1.46
Roof	2.32
Flooring	5.00
Ceiling	1.00
Doors	0.10
Staircases	1.85
Shed	0.60
Total	12.33

Builders' woodwork comprises a number of different products. They are smaller than wood-based building systems [2)] (precut, small units, large units, box units) and are incorporated into the building. A possible classification of builder' woodwork, including wood-based building components is:

A Load-bearing structures (stressed skin units or load-bearing frames)
- walls
- floor joists
- roofs

1) average situation in Western Europe
2) terminology according to the Swedish Centre of Technical Terminology

B Nonloadbearing elements
- partitions and other walls
- cladding of walls, floors and ceilings

C Fittings
- doors
- windows
- mouldings
- ladders and staircases

There is some international trade in all these products. From Vintawood's point of view, it is wooden fittings (C) that are the realistic target product. Product groups A and B call for more capital and human resources, different manufacturing techniques and marketing organization, and specific know-how.

The international trade in fittings grew during the early 1970s with the international economic boom, and then again during the late 1970s with an increasing interest and need to make basic wood industries in developing and newly industrialized countries. They enjoy some general competitive advantages, but are adversely affected by other factors. The competitive situation can be qualitatively evaluated as follows:

Competitive advantages

- Increasing freight costs are an incentive to export secondary wood products, rather than primary materials. In log transport freight has to be paid for the processing waste too (about 40-50 percent of solid wood volume). Recent feasibility studies suggest that the freight incidence can be 5 to 10 percent higher, if primary materials are transported instead of secondary wood products.

- Production costs are less in the developing countries than developed countries. This and indigeneous hardwood resources give a competitive advantage to developing countries. The main cost items are raw materials and wages.

- Some production facilities in developed countries have poor productivities. This is reflected in the considerable variation in productivity, and it means that some companies have poor competitiveness and profitability. Recent studies suggest that the productivity of work in competitive companies is double that in weak companies. Modernization investments have not been made owing to low profitabilities.

- Improved transport and communication systems have opened up international markets to new producing countries. These have become easier to exploit as some progress has been made in product standardization to meet the acute need to economize.

Competitive disadvantages

- Importers are concerned about the reliability of deliveries and the meeting of specifications. The potential losses resulting from these difficulties have increased.

- Only North America is a homogeneous volume market. Other markets are more difficult to tap because of their heterogeneity.

- Declines in business activity hit new and remote suppliers first. The average economic growth has declined.

- When interest rates are high, importers like suppliers that can provide short delivery times.

The demand for fittings depend on the building activity. Residential buildings absorb 70 to 80 percent of all wooden fittings, since first they represent a larger share of the market, and second building codes allow more extensive use of wood products in residential than nonresidential buildings, and dwellings have a higher standard of finishing than most public, commercial and industrial buildings. The primary dwelling markets are:

Region	Average completions of new dwellings[1)] - million -
Western Europe	2.10 - 2.50
North America	1.70 - 2.30
Japan	1.20 - 1.60
Australia	0.12 - 0.14

1) typical level of building activity in the last few years and likely situation in the 1980s

Western Europe includes several differing markets, with the United Kingdom, Spain, Italy, France and the Fed. Rep. of Germany, followed by the somewhat smaller Netherlands and Greece, being the principal countries (Annex 4.1). The heterogeneity of the Western European market enhances the importance of North America as a target market especially as the demand for new dwellings is increasing there.

In central and northern parts of Western Europe the dwelling stock is already rather high in relation to the population, so an increasing proportion of building investments will go into renovating existing buildings. To tap the renovation market calls for building fittings of the special sizes and designs. Presumably an average of 20 to 30 percent of building fitments currently go to renovation applications.

The Middle East, particularly the OPEC countries there, is a new building market area. The most attractive target markets are Saudi Arabia and Iraq. Iran and Egypt will have considerable demand for building materials in the longer term. The other countries have smaller absorption capacities because of their limited populations. but anyway they will have to import wood products, too, as they have only negligible domestic forest resources:

Country	Estimated construction expenditure[1]		Population
	1977	1978	1978
	- USD million -		- million -
Bahrain	320	259	0.3
Egypt	1 713	1 182	38.0
Iran	5 305	3 873	34.0
Iraq	2 750	3 355	12.2
Jordan	320	422	2.8
Kuwait	1 020	1 071	1.0
Libya	1 433	1 247	2.5
Oman	483	382	1.5
Qatar	461	309	0.2
Saudi Arabia	10 390	11 845	8.0
Syria	630	523	8.0
United Arab Emirates	1 960	1 235	0.9
Total	26 785	25 703	109.4

1) including all building expenditure. The level of building activity depends on (a) the financing possibilities (e.g. Saudi Arabia) and (b) the population. Due to her great population, Egypt will have substantial building needs. Statistics do not allow a seaprate analysis of housing activities.

3.5.2
Doors

The door business can be divided according to basic material, type and application (Table 3-2). The structure of the business differs from country to country, depending on building habits, standard of buildings and proportion of low-rise and high-rise housing. Metal doors are primarily used in public, commercial and industrial buildings because of their durability and ease of maintenance and fire rating according to the building code; wooden doors dominate the housing market. Table 3-2 suggests, wooden doors may be used predominantly in internal uses and as external entrance doors of low-rise residential buildings. Low-rise non-residential buildings often call for doors with a higher fire rating that also wooden door with special fire-retardant construction can meet.

The proportions of internal and external doors differ from country to country, depending on the shares of low-rise and high-rise residential buildings, with internal doors accounting for 70 to 80 percent of the door market (number of doors) on average. In some countries sliding and swinging doors, often with metal frames are part of contemporary architecture and interior design. For instance, in Australia they are reasonably common.

Table 3-2
Major Divisions of Door Markets

Material or type	Application[1]		Special design features
	Internal	External	
Metal		x	glass panel possible
Wooden			
Flush	x	(x)	
Panel/solid	(x)	x	glass panel possible
Bifold	x		
Louvred	x		
Sliding	x		
Swing		x	

The average number of doors per dwelling declined in the developed countries somewhat during the 1970s as people favoured more open dwellings. This trend is levelling off, but there is no indication of an increase in the number of doors per dwelling.. The turnover of the door industry was not reduced by the decline in door usage since suitable countermeasures have been exploited:

- better technical standards
- selection of economic raw materials
- better finishing
- prehanging
- higher unit value

1) x = main usage area
(x) = occasional usage area

Flush doors have gained ground in internal usage because they are economical. They have a honeycomb core and mostly hardboard faces, though some producers use plywood for decorative and more expensive flush doors. There is a small market for internal panel doors in high class dwellings.

Panel doors are used primarily as entrance doors. Plywood flush doors are also used in exterior situations, but they are not too common. There is a tendency to have glass panels in entrance doors.

Door markets are heterogeneous in that there are a number of designs and sizes available. There is more variation in door design than in size, the most common sizes being 526/626/726/826 x 2040 mm. Most of the developed countries have their own door standards, which differ in depth but tend to state sizes, some performance requirements, strength, sound and heat insulation, straightness and tests for evaluating a door. Building codes include some specifications for doors. Regional harmonization of door specifications has progressed more than international harmonization.

The competitive structure of the door industry is undergoing noticeable changes. The manufacture of flush doors is being concentrated in major factories with efficient production lines, so real prices of flush doors have declined. In Western Europe a major company can sell some 2 million flush doors per annum. Manufacture of panel doors is less industrialized.

The international trade in doors shows a fairly clear pattern (Table 3-3). The primary emerging trends are increasing international trade and prospective additional supplies from Southeast Asia. In Singapore ten new door factories making panel doors have recently been built. The new factories are on the wood industries estates, and they are designed to make 20 000 to 30 000 doors each. There are some door making projects in Peninsular Malaysia where the about 80 moulding factories could easily enter the door business, with the present exports still being rather limited. In 1978 the total exports of builders' carpentry and joinery amounted to only M$ 0.6 million[1], going mainly to East Malaysia (Sabah) and Singapore. The new investments in the door industry reflect the favourable market outlook and the strive to add value to sawnwood. China's province of Taiwan[2], by far the dominant present exporter, may loose some ground in the long term as the logs available for import from Southeast Asia declines and their prices rise. Indonesia, with its great tropical hardwood forests, may become a new exporter in the long term.

1) equivalent to about USD 240 000
2) hereafter referred to as Taiwan

Table 3-3
Major Trade Flows in Wooden Doors (Ranking of Importers and Suppliers in 1977 - 1980

Major importers	Major sources				
	1	2	3	4	5
1 Western Europe[1]	EEC	Taiwan	Rest of Europe	Southeast Asia[3]	North America
2 North America	Taiwan	Mexico	Canada	"	Brazil
3 Australia	Taiwan	Southeast Asia	Oceania	Others	
4 Middle East[2]	Western Europe	Taiwan	Jordan	Others	
5 Japan	Taiwan	Thailand	Southeast Asia[3]	Others	

1) mainly EEC countries
2) mainly OPEC countries
3) ASEAN countries

Intraregional trade has accounted for the bulk of the international door trade but the structure is changing towards a larger interregional trade. This augurs well for new suppliers in developing countries. New door suppliers can get little guidance for their product planning from the standards of the International Standards Organization. The relevant standards are listed in Annex I for the main export markets. It should be noted, however, that most doors are traded by company standards very loosely complying with the international standards.

3.5.3
Windows

The international window trade has developed more slowly than the trade in doors.[1] Windows are like architectural elements of a building, so window designs, sizes, structures and performances differ greatly from region to region. There are national standards and a few international ones to guide the trade.

Windows have been a reasonably good business, particularly since the mid 1970s. Increasing energy costs have made it essential to improve the heat insulation properties of windows and also better sound insulation is appreciated increasingly. Improved standards and better finishing have raised the unit value of windows. The manufacture of windows is less concentrated and industrialized than that of door making, though investments are being made to raise productivity.

1) Doors are also architectural elements but to a somewhat lesser extent than windows.

Residential buildings appear to account for 75 to 80 percent of window usage, with increasing modernization absorbing more and more in the developed countries. Heat insulation requirements have become so much stricter that making better windows pays off.

Wooden windows are the principal type, particularly for new buildings, while windows with plastic and aluminium frames are used to some extent for renovation. Windows with plastic and aluminium frames made inroads in some countries during the 1970s, but increased raw material prices are eroding their competitive advantages (durability and ease of maintenance), and wooden frames provide better insulation. Wooden windows may regain some ground during the 1980s because of their insulation, improved finishings and competitive prices.

Most of the international trade in windows is between the neighbouring countries, which is why the international window trade is concentrated on Western Europe.

3.5.4 Wooden Beadings and Mouldings

This group comprises several types of product machined from sawnwood. To add value to basic sawnwood, sawmills and independent processors have increased their capacities, and they have been able to win business in selected standard products. The main international trade flows are (1977-1980):

Major importers	Major suppliers 1	2	3	4
1 Western Europe[1]	EEC	Rest of Europe[2]	Southeast Asia[3]	South America
2 North America	Malaysia	Other Southeast Asia[4]	South America	
3 Australia	Malaysia	Other Southeast Asia		
4 Japan	Taiwan	Western Europe	North America	Southeast Asia

1) mainly EEC countries
2) mainly Eastern Europe
3) mainly ASEAN countries
4) mainly Taiwan

The principal exporters in Southeast Asia are Malaysia and Singapore (Tables 3-5 and 3-6), which can still increase their moulding output, even though the availability of sawlogs may decline in the medium term. Both of them are geared to the North American markets, followed by Western Europe and Australia. This orientation is due to the fact that the relatively homogeneous market of North America can absorb more standard products than the differing markets in Western Europe. These major importing regions have accepted the Philippino hardwoods.

Table 3-4
Exports of Builders' Carpentry and Joinery from Singapore in January-June 1980

	Value - 1000 S$ -
Wooden windows	
Fed. Rep. of Germany	2 919
Other	217
Total	3 136
Wooden panel doors	
United Kingdom	2 219
Netherlands	1 438
Fed. Rep. of Germany	644
Denmark	594
Other	249
Total	6 144
Other products	
Hong Kong	734
Iraq	403
Kuwait	260
Other	489
Total	1 886

The profitability of the mouldings business depends on the product range. It appears that mouldings can fetch 2.25 to 2.50 times the average sawnwood price. If a moulding manufacturer can concentrate on some five products, then production runs can be efficient.

Table 3-5
Exports of Mouldings from Peninsular Malaysia in 1979

Region	Volume - m³ -	Average value - M$/m³ -
North America	51 148	880
Oceania	50 887	741
EEC	23 004	1 126
Far East and Southeast Asia	24 164	813
Rest of Western Europe	1 455	783
Middle East	76	1 445
Africa	6	1 194
Total	150 740	859

Table 3-6
Exports of Mouldings from Singapore January-July 1980

Region	Volume - m^3 -	Average value - S$/$m^3$ -
North America	13 852	984
EEC	6 714	1 205
Australia	5 049	802
Japan	4 973	1 119
Others	3 294	1 135
Total	33 882	1 035

3.5.5
Minor Woodworking Products

There are a number of minor woodworking products in whose international trade developing countries have gained considerable ground because of their decorative and strong hardwoods. The main groups of such products are:

- tool and brush handles
- household utensils
- ornamental boxes and cases
- picture and mirror frames
- carvings

The minor woodworking products have put different requirements on the wood. Tool and brush handles call for woods that are resistant to splitting, warping and chemical substances while the other products require attractive, uniform and finishable woods. The value of the latter is in their appearance whereas the former offer mechanical strength. Naturally "appearance" products must meet the basic requirements for strength and rigidity.

Wooden household utensils appear to represent a relatively large business among these minor woodworking products. The demand open to developing countries is increasing due to escalating plastic prices, decorative appearance of wooden products, import tariff concessions under the GSP[1] system and declining production in developed countries where the present producers can import components for finishing.

Wooden household articles represent either functional or decorative designs. Both types call for good finishing and accessories and uniform and consistent pieces of wood. The finishing can be carried out by waxing, polishing or oiling, if high quality paints or varnishes are not available.

1) Generalized system of preferences

The international trade in wooden household utensils has changed during the 1970s. The Southeast Asian countries have gained ground as export suppliers because of their woodworking knowledge and availability of wood residues from sawmills and plywood mills. It should be noted that due to the different woodworking operations the total recovery of wood utilization is high in an international comparison. Japan was earlier a major exporter of wooden household utensils, has lost ground in internatioanl markets, because of rising labour and wood costs and changes in exchange rates.

3.6 Marketing Strategy for Vintawood

3.6.1 Possible Products

In view of the tightening wood supply situation in the Philippines, it is reasonable to develop woodworking industries rather than sawmilling and woodbased panel industries. Vintawood's project idea is timely also in that there are new domestic marketing opportunities [1] and increasing interest overseas in importing woodworking products [2]. The rising import demand is due to the improved competitiveness of the tropical producing countries compared with the major developed countries.

Vintawood would have a few reasonable options for product orientation (Table 3-7). The factors that can lead to success are different for the potential product lines. All too often woodworking companies try to do business in a few weakly related product lines. This generally leads to average or poor results, because the company is not really good in any particular sector. It might be a good idea for Vintawood to concentrate on gaining a strong foothold in the wooden door business, aiming at good profitability through efficiency in all operations of the company. There is no idea in making flush doors, which call for an efficient and high production capacity. Ones panel door production and marketing is running well Vintawood could make some louvered doors as an additional product. The wooden door business is preferred for Vintawood since:

- it already has some experience, though production was discontinued a few years ago because of production and marketing bottlenecks
- panel door trade offers favourable prospects and relativeiy little barriers of entry, (production and marketing) as compared to other possible products [3]
- there is a limited domestic market potential for panel doors

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1) section 3.3
2) section 3.5.1 to 3.5.2
3) windows, mouldings, building elements, minor woodworking products

Table 3-7
Evaluation of Possible Product Lines for Vintawood

1 Wooden Panel Doors

Positive	Negative
Growing international trade. Taiwan may loose ground.	New supply coming from Singapore, Malaysia, Thailand and Indonesia
Unit value can be increased by some finishing.	Domestic housing programmes have not achieved their targets, so the market potential has not materialized.
A manageable variety of door designs can be produced with a reasonable investment.	Domestic housing programmes have not achieved their targets, so the market potential has not materialized.
In the domestic market it is possible to gain ground from small workshops through better guality and prompt supply of larger orders.	Product planning and marketing call for contacts with building contractors and designers.
Domestic market potential is confined to a few major cities. That can be served efficiently.	

2 Wooden Windows

Positive	Negative
Increasing insulation needs have given a new thrust to window industry, increasing the replacement demand in developed countries.	Too great a number of specifications (design, size, structure, material).
	Product planning and marketing call for contacts with building contractors and designers.
	Technical properties of windows (insulation performance) are becoming main sales arguments, reducing the marketing possibilities of tropical suppliers since they should import first the insulation glass, fitments and windows should be tested in target markets.
	Limited domestic market potential.

3 Wooden Beadings and Mouldings

Positive	Negative
Value added product from sawnwood.	Malaysia and Singapore are present main exporters in South-east Asia.
Importers can be persuaded to buy a few basic types of moldings. The trade has expanded in the 1970s.	Only strong importers can buy a few basic types in sufficient quantities. There is a limited number of potential distributions.
Progressive wood industry countries have developed increasing tade.	Vintawood should have its own sawnwood production.
	Limited domestic market potential.

4 Minor Woodworking Products

Positive	Negative
Tropical countries (Shoutheast Asia) already major suppliers.	Production would be based on handicraft.
Limited investments needed.	Business would split into small products.
Can be made from wood offcuts. Wooden products gaining ground from plastics.	Too little domestic market potential.

5 Wooden Furniture

Positive	Negative
Increasing demand for wooden outdoor furniture in Western Europe, North America and Oceania. Unit value has increased.	In outdoor furniture major distributors need great quantities for the season (seasonal business with a need of working capital).
Tropical countries are gaining ground in international furniture trade. Components and basic models can be made economically in tropical countries.	Market have different design tastes. A good market intelligence and access to efficient distribution channels are essential.
	A limited number of major importing countries.
	Domestic furniture industry is more crowded than joinery industry.

3.6.2
Target Markets

The present industrial makers of wooden doors tend to neglect the domestic market, because an average buyer can take only a few doors, whereas small workshops make doors to order with very low overhead costs. There are on the other hand some major builders that could be persuaded to buy doors from an industrial maker. Vintawood will naturally have to win the contracts from the major builders in a competitive environment, because builders are used to their present suppliers. Vintawood should concentrate on builders with affiliated joinery makers. As wooden doors sell at prices comparable with average export prices, and domestic sales can be managed more easily than exports, Vintawood should tap the profitable segments of the domestic door market in the Manila region and other major cities. This can be done by marketing a few standard designs to major builders with competitive pricing policies and by promoting the products through architetcts, interior decorators and authoirities that are in charge of the national housing programmes, Ministry of Human Settlements and its related agencies, i.a.:

- National Mortgage Home Finance Corporation
- Home Financing Corporation
- Human Settlements Development Corporation
- Human Settlements Regulatory Commission
- National Housing Authority
- National Housing Corporation
- authorities in charge of regional development programmes
- building contractos and their association

While the domestic market cannot absorb the target output of Vintawood's proposed panel door factors, about 90 percent of the output will have to be exported. There is a sufficient market potential for the factory, provided the products will be of reasonable quality and the sales price requirement (based on production and transport costs) is competitive. The study shows that Vintawood could compete in the markets for medium to high-priced panel doors, not in the markets for cheap panel doors. Vintawood would be a significant expansion of the Philippino panel door production and exports, since the present exports are limited, ranging in 1978-1979 from USD 2.2 to 2.7 million. Vintawood's planned export capacity would raise the exports 2.3-fold (Annex 2.1). Vintawood's project idea is timely in that it seeks to exploit the domestic and export market potential by establishing a technically viable panel door factory.

The best export market for Vintawood is Western Europe (the EEC countries). There the quality requirements are high and prices reasonable. The second export area is North America with somewhat less exacting quality requirement, but considerable cyclical fluctuations in the housing market. The Australian and Middle Eastern markets are both quality and price-conscious. Japan calls for high quality, with the profit in the finishing of doors in Japan. There are relatively many designs and sizes available (Annex 2.2 to 2.11).

3.6.3 Competitive Position

Domestic Market

The Philippino panel door producers sell most of their output in local markets. The imports do not disturb the business and the exports absorb a minor portion of the output. A few major companies dominate the competition in the primary domestic market (Metro Manila), whereas in lesser areas the local workshops dominate. The smaller companies have fared reasonably well since furniture and joinery designed according to a client's wishes fetch attractive prices and a client needs only a few pieces at a time.

The present companies make a range of products (entrance doors, furniture, louvred doors, room dividers etc.) to have a reasonable load of work. Doors are in general supplied without finishing and hardware. While the present companies carry out general marketing, a new factory (e.g. Vintawood) should seek to capture a market share by a goal-oriented marketing.[1)]

The forest resources of the Philippines have been heavily exploited, and the removals of tropical hardwood logs are projected to decline somewhat. The Government seeks to stop log exports by 1983, hoping for an increase in domestic processing. The wood industry has been advised to concentrate into viable companies. Mergers are likely to take place between logging enterprises, sawnwood and plywood companies and woodworking firms. Some woodworking firms already have their own forest concessions and production of sawnwood and plywood. While a woodworking factory does not call for great quantities of wood products and the supplies can be bought, it would be an advantage for the company to have its own forest concession and wood industry.

1) Section 3.6.2, 3.7.2

Vintawood is duly registered at the Philippine Securities and Exchange Commission (since 1964) and the Board of Investment (since 1974). Currently it holds - like other woodworking firms - the status of a non-pioneering export producer. It is entitled to limited incentives (Annex III) either under the investment incentives ACT RA 5186, the export incentives ACT RA 6135 and the annual export priorities plan[1]. If Vintawood's project presented clearly new features, somewhat better incentives might become available[2], and if a foreign company had more than 30 percent of the equity, the new company would become subject to the Foreign Business Regulation ACT RA 5455. The other domestic panel door factories do not enjoy better incentives than Vintawood, but some of them have considerable more resources (financial, personal, captive wood raw material supply) which will place the present Vintawood at a disadvantage unless the project can contract a strong partner. It should be noted that Vintawood ceased making panel doors about 3 years ago because of production and marketing bottlenecks during the recession of the building material markets in 1975 to 1978.

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1) The present 13th Investment Priorities Plan lists preferred areas of activity in the manufacturing sector where investments are being encouraged. Panel door industry is not there separately, but it goes under lumber products and such a project must export at least 70 percent of the production in order to enjoy investment incentives.

   The present 11th Export Priorities Plan lists products currently being developed and promoted because of their market potential. Wooden doors and builders woodwork are listed as non-pioneering export products.

   The Export Incentives ACT and the Export Priorities Plan are directly interrelated, and they also comply with the Investment Priorities Plan, so that a company can enjoy the incentives only once. The different laws are, however, needed since there are companies at different stages of development, and schemes are required to provide each company suitable promotion.

2) direct communication from BOI

Table 3-8
Evaluation of Vintawood's Competitive Position in the Philippines

Positive	Negative
Can establish a new efficient factory using modern machine and product developments.	Some door makers are integrated with sawmilling (assured and more economic access to wood).
Can introduce new administration production management and marketing systems.	Vintawood will have to gain ground frompresent producers.
Can make high-quality panel doors with new machinery.	Pre-operational training of personnel may be needed when introducing new systems.

The Philippino panel door industry cannot be regarded overcrowded in view of the domestic and overseas market potential and the techno-economic weaknesses of the present producers (section 3.1). However, to be able to penetrate the domestic panel door market, Vintawood should plan its marketing activities carefully and start the sales drive early enough before the start-up of the factory, so that sales contracts can be secured in time. This is essential since most of the large construction groups have their own woodworking plants, and since Vintawood has not been in the door business for some time, this is an added disadvantage.

Export Markets

The major overseas competitors are Taiwan, Singapore, Malaysia and to some extent Mexico for the USA. The competitive pressure from Taiwan is decreasing gradually in the long term, and Taiwanese companies are seeking partnerships in the Philippines, as the log producing countries are reducing log exports to Taiwan, the Republic of Korea and Japan. Singapore and Malaysia have a competitive edge in shipping costs and sales contacts to Europe and the Middle East, while Vintawood could seek to exploit the present repuration of the Philippino wood quality and the traditional US-Philippino trade contacts.

Table 3-9
Evaluation of Vintawood's Competitive Position for Overseas Markets

Positive	Negative
Can seek to export panel doors via new and to lesser extent present Philippino building contractors working overses. Vintawood should try to gain ground by exploiting its competitiva strengths (Table 3-8)	Small ocean freight disadvantage for European, Middle Eastern and Australian markets.
	Lack of Vintawood's own forest concession may cause problems for the procurement of wood. Because of tightening wood supply situation in Luzon, wood industries have been urged to concentrate on viable larger units and to integrate into secondary wood processing.
New complete factory can make high quality panel doors, to be promoted by product branding.	
Philippino woods are appreciated for their quality.	
Can seek to tap the increasing foreign trade in panel doors, and to gain ground from Taiwan that has imported wood from the Philippines.	
Vintawood's timely project idea can attract joint-venture partners that could provide finance, detailed product designs and marketing outlets.	Company and marketing organizations will have to be rebuilt which will take some time. It should be noted that Vintawood's prospective performance will largely depend on the marketing organization.
	New Singaporean and Malaysian panel door producers have better export facilities (harbour, shipping space, telecommunication).
	Local producers in importing countries can make the more profitable panel door types unless Vintawood's marketing organization can fetch the necessary product know-how for door designing and convince distributors about the merits of importing surface finished doors.
	As Vintawood will have to restart its operations, some extra working capital will be needed for the training period.

For genuine panel doors Taiwan is a lesser competitor than what the trade statistics suggest. The foreign trade statistics of Taiwan include several kinds of doors (louvre, panel, flush, cupboard, etc.) with panel doors being only one product among them and the panel doors are cheaper type with a bockboard are. The good export performance of Taiwan is based on economical labour, availability of wood offcuts in suitable species and efficient production techniques.

Vintawood has to find marketing channels that make it possible to place the target output in the key markets. It is essential to choose the right marketing strategy, since the channels largely determine the market position in each country. There are few options:

a) to design, make and market doors independently

b) to make doors for manufacturers in importing countries according to their specifications, and for sale by them

c) to make doors to be sold through importers, agents or other middlemen

The proposed production volume of 30 000 doors is all too small to warrant independent manufacturing and marketing to end users in overseas markets[1]. The marketing has to be arranged through middlemen, aiming at short networks, to fetch maximum prices.

If Vintawood exported doors through door manufacturers in importing countries, the cooperation contract should provide it with a constant work load, balanced capacity utilization and a product range that sells well and is not too complicated to make. At worst Vintawood might end up as a subcontractor making uneconomical products. If Vintawood sold through importers, it would have more freedome to manoevre but a bigger risk.

1) to establish Vintawood's own sales offices profitably would call for a capacity several times the proposed one

3.7 Marketing Plan for Vintawood

3.7.1 Sales Plan

To improve its profitability, Vintawood should concentrate on the markets where the highest FOB prices can be fetched. The most profitable markets identified in this study are the Philippines, followed by Western Europe, the Middle East and Japan, North America and Australia in descending order of the attainable FOB prices. On the other hand, as the differences in the attainable FOB prices are small, and fluctuating exchange rates may alter the relative profitability of the potential markets, it is suggested that Vintawood should export limited quantities to the currently (4th quarter 1980) less attractive markets to monitor the market development and to accumulate market intelligence. This would allow Vintawood to perform better in the medium to long term, and it would help in the competition against other panel door producers, of which several still concentrate on short-term operations.

Table 3-10
Sales Plan for Vintawood [1)]

Market area	Target of doors [2)]	Average [3)] FOB prices (USD)
Philippines	3 000	140
Western Europe [1)]	13 000	130
Fed. Rep. of Germany	4 600	
France	3 200	
United Kingdom	3 200	
Benelux	2 000	
North America	10 000	120
USA	9 000	
Canada	1 000	
Australia	1 500	115
Middle East Asia	1 500	125
Japan	1 000	125
Total	30 000	127

1) Based on the market situation in 1981. Changes in the market situation require changes in the sales plan. For the rest of Europe, Vintawood could monitor Italy and Scandinavia as potential future markets.
2) door designs are presented in section 4.4.2
3) prices attainable from different markets for each product design are presented in section 12.2.2. The above average price represents an average door size and design.

The sales plan (Table 3-10) is based on the assumption that Vintawood would operate as an independent company. However, as the original project idea, which subsequently has failed, was to have a joint-venture with a marketing and financing partner and the project apparently needs one, the sales plan can change because of the specific needs and marketing capabilities of a new possible partner.

3.7.2 The Philippines

Vintawood should concentrate on the Luzon Island and there particularly in the Metro Manila market that accounts for most of the domestic sales potential. It would be highly uneconomic to ship panel doors to other islands where panel doors can be made on the spot. The sales drive should be directed at architects/interior decorators, contractors, building owners and housing authorities identified in this study (section 3.5) that all influence the choice of panel doors in their own housing projects. Direct personal selling will be essential when trying to win orders, so Vintawood will need 2 sales representatives to carry out the sales campaign and to seek new building projects. There are also building material merchants that could distribute panel doors, but as the builders' policy is to buy materials directly from the producers and deliveries can take place directly from the factory, direct sales should be used. Then builders would also collect the consignments from the factory by their own lorries.

Panel doors are subject to a domestic sales tax of 10 percent. Apparently, several small workshops making panel doors to order often neglect paying the sales tax, which accordingly weakens Vintawood's price competitiveness. Vintawood should recognize this and argue for its products to enhance quality and supply capabilities rather than the price.

There are no national standards for panel doors, so companies present their own specifications with limited guarantees.

3.7.3 Western Europe

The main external supplier of wooden doors is Taiwan. The target markets of Vintawood imported some 2.2 million doors from Taiwan in 1979. They trade several types of door (louvre, kitchen, cabinet, panel), so their market for panel doors is considerably smaller than the trade statistics imply. The foreign trade statistics do not allow a detailed breakdown of door imports by product type.

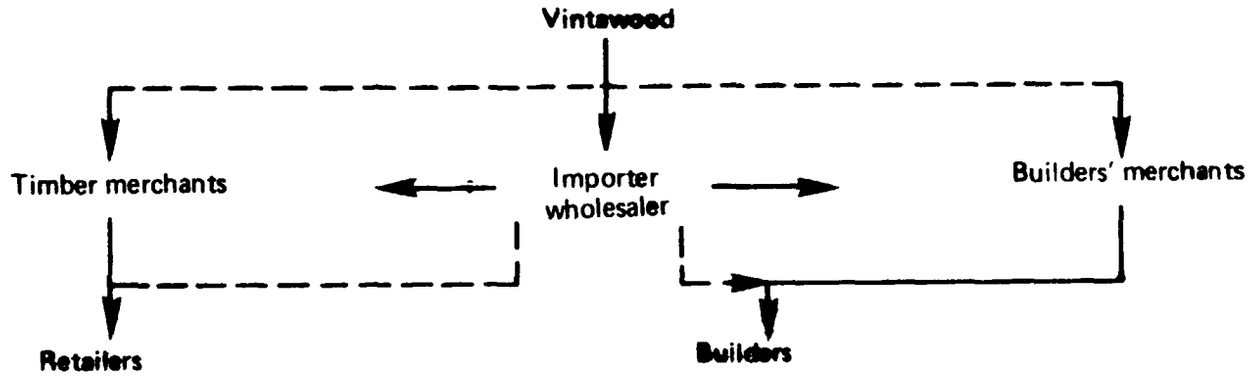
The housing industry in Western Europe was unstable in the 1970s (Annex 4.1). The number of dwelling completions has fluctuated considerably and the average level of activity has declined. This is due to the limited increases in populations, and the prospects are that the recent trend will continue. On the other hand, an increasing number of dwellings are renovated which absorbs new doors, windows, kitchen cabinets, flooring and similar wood products, which is why the joinery industry has enjoyed reasonable markets in the past few years.

Wooden panel doors are subject to the general EEC import duty of 13 percent ad valorem. A number of countries, including the Philippines, however, enjoy duty-free access to the EEC countries, and Spain has a reduced import duty of 2.7 percent. If the imports of panel doors from the tropical countries rose too high, then the EEC countries could introduce the general import duty after a duty-free import quota is full. As to the competitiveness of Vintawood, the import duties do not affect its position as compared to other overseas exporters.

Wooden panel doors are traded through a few channels in Western Europe. From Vintawood's point of view the alternatives are presented in Figure 3/2. The continuous line shows the marketing channels recommended for Vintawood.

Fig. 3/2
Suggested Marketing Channels
for Vintawood in Western Europe

(Annex 4.2)



The national and EEC standards for wooden panel doors state the recommended dimensions and test methods, leaving room to companies' own product development. The building codes call for panel doors to be of recognized quality. The codes do not present more stringent import obstacles. However, it would be a good idea to have panel doors tested by a building material research institute in each country, and subsequently use a quality certificate as a means of publicity. More and more building materials are commercialized based on this system. General approval or type approval is obligatory only for non-traditional building materials, prefabricated structures and load-bearing construction used in public places.

3.7.4
North America

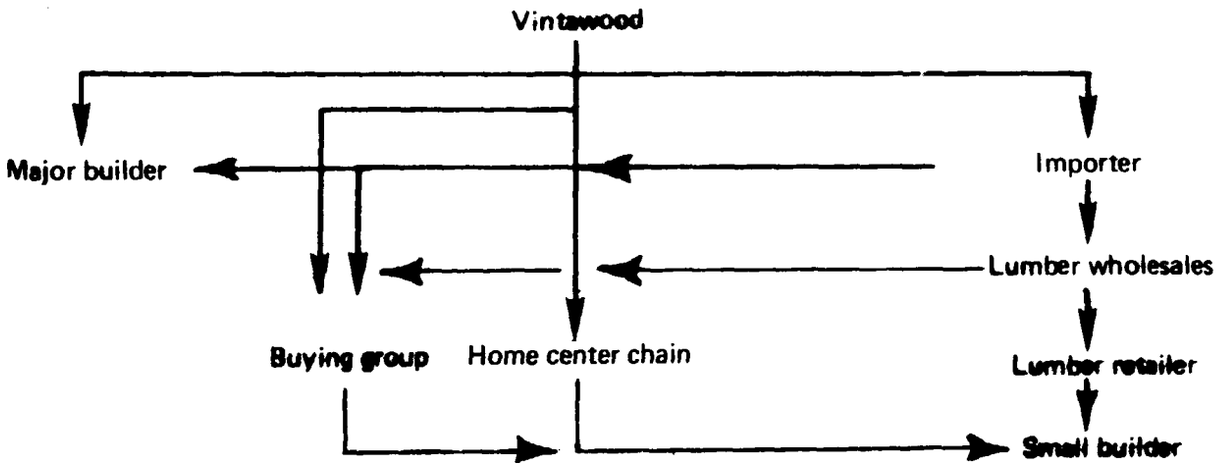
The USA is currently one of the main markets for the Philippino door manufacturers. The USA absorbs standard sizes and designs. Vintawood should cover both East and West Coast markets.

The US housing industry shows considerable cyclical fluctuations, since the prime interest rate and the economic expectations affect the housing starts (Annex 4.3). New houses are built by a great number of builders while in Western Europe the number of entrepreneurs is relatively smaller and the companies greater.

The potential housing demand in North America is greater than in Western Europe since population grows more rapidly in the former [1].

1) Western Europe 0.3 percent p.a. in 1980-1990
North America 0.6 " " "

Fig. 3/3
Suggested Marketing Channels for Vintawood in North America (Annex 4.4)



The possible marketing channels in North America present more alternatives than those in Western Europe. This is due to the fact that North America forms a great market, whereas in Western Europe there are different country markets of smaller size.

North American importers and major builders are inclined to cooperate with overseas wood product producers, so Vintawood could perhaps find a partner among them. Yet, it is not necessary to start a joint-venture with North American buyers. The trade channel via importer to small builder is a lengthy one, reducing the FOB price to Vintawood, so it would be a good policy to export directly to major builders and buying groups of builders and Home Centre chains although a big importer could provide a wider coverage of the markets.

Panel door imports to the USA are subject to an import duty of 7.5 percent ad valorem, and those to Canada to an import duty of 25 percent ad valorem. The imports from developing countries enjoy duty free preferences. The duty is the same for unfinished and finished doors. Canada provides easier access to imports from the United Kingdom (4.2 percent duty), to favoured nations (14.7 percent duty) and to developing countries entitled to preferences (free of duty). Imports from the Philippines would have dutyfree access to the Canadian market.

In North America building control is delegated to State Governments (USA) and provinces (Canada), but in practice it is carried out at municipal level; each municipality can in principle have its own building code and inspection procedures. In fact, many municipal codes are based on national models drafted by associations of building officials and the American Insurance Association. The trend is, however, towards state-wide/provincial codes.

There are no obligatory standards for panel doors (Annex I), but they are controlled by industry standards and architects guidelines. In view of the product liability laws, it is advisable to comply with the voluntary standards and present the compliance certificate on doors. It would imply that Vintawood's panel doors are in line with the recognized door quality. There is a proposal for Model Manufactured Building ACT that would strengthen the control system towards the Western European practice.

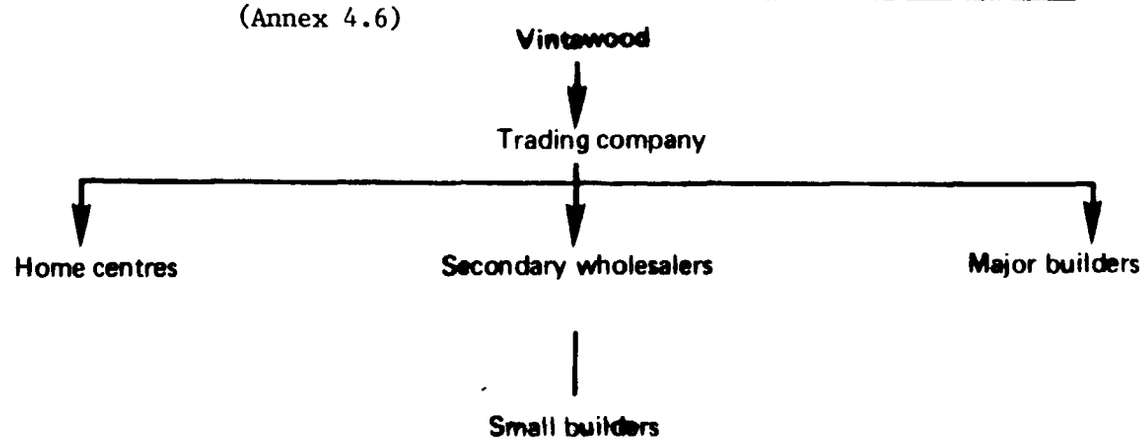
3.7.5 Japan

In Japan doors are an even more an essential part of house design than elsewhere, so the door assortment is large. Taiwan and Thailand supply most of the door imports through cooperation with Japanese companies. One reason why Vintawood ran into difficulties in 1975 is that as the Japanese building market softened, so Vintawood ended up making too many different panel doors in short series without finishing. This left Vintawood with production problems and limited value added. The standard (Annex I) suggests the dimensions and measuring methods for doors, leaving other features at the industries' discretion. Panel doors have dutyfree access to the Japanese market.

The Japanese housing industry is undergoing changes that affect door suppliers. The population is rising at 0.7 percent a year creating new demand, but the housing stock is also relatively great which, together with rising building costs, has reduced the level of new house completions (Annex 4.5). The North American wood industries are trying to introduce the platform building system with some success which leads to increased standardization of housing and furthemore, part of the population is adopting western ways of life changing the type of house furnishing and design. These tendencies may bring out possibilities of reducing the panel door designs and dimensions, facilitating industrial door manufacturing.

The Japanese building market can best be reached through trading companies that subsequently sell to home centres, secondary wholesalers and main builders. The secondary wholesalers sell to medium builders and retailers. An importer-primary wholesaler can carry out the same function as a trading company.

Fig. 3/4
Suggested Distribution Channels for Vintawood in Japan
(Annex 4.6)

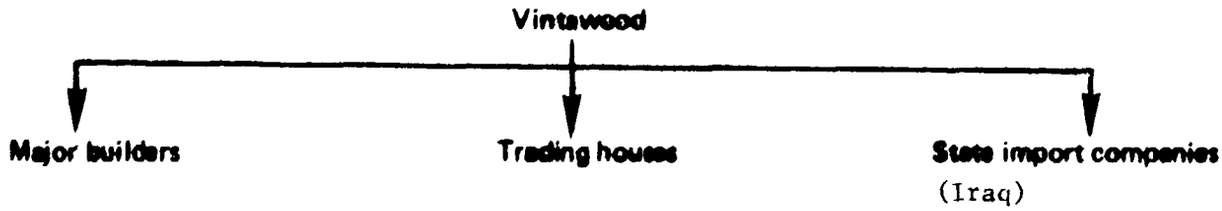


The trading companies are a typical feature of the Japanese distributive trade. They can buy large volumes if the quality is good, and they like production cooperation with South-east Asian suppliers. A trading house may act on its own behalf, or serve as an importer, wholesaler, manufacturer, major builder or major home centre. It may also be associated with the building materials industry and contractors.

3.7.6
Middle East Asia

The main market is Saudi Arabia. The imports of builders' joinery have increased since 1974. In general they like medium quality at economic prices. There are some plans to establish more woodworking factories, and at least one Philippino door maker has tentatively discussed the possibilities of setting up a door factory in Saudi Arabia as a joint venture. While Saudi Arabia is a market economy, some Middle Eastern countries import building materials based on the tenders of state controlled companies (Iraq).

Fig. 3/5
Suggested Distribution Channels
for Vintawood in the Middle East
(Annex 4.7)



In Saudi Arabia business can be fetched by selling direct to major builders, or by selling through the trading houses. From Vintawood's point of view the best policy would probably be to sell direct to the Philippino builders that operate there. In late 1980 their contracts amounted to USD 1.4 billion (65 percent in Saudi Arabia, considerable work in Iraq). The trading houses are very price and quality-conscious, and they call for exact shipments. The Philippino contractors could provide access also to the other countries of the region so that Vintawood would not need go through the bargaining trading houses and state import companies.

The panel doors are used in the higher-class housing projects. The low to medium class houses have aluminium doors with glass. The quality is generally appraised according to the European recognized level, and there are no local standards. In high-class housing projects the quality of materials matters, but in general the importers prefer price to quality. The imports are subject to an import duty of 3 percent, irrespective of the source of supply.

3.7.7 Australia

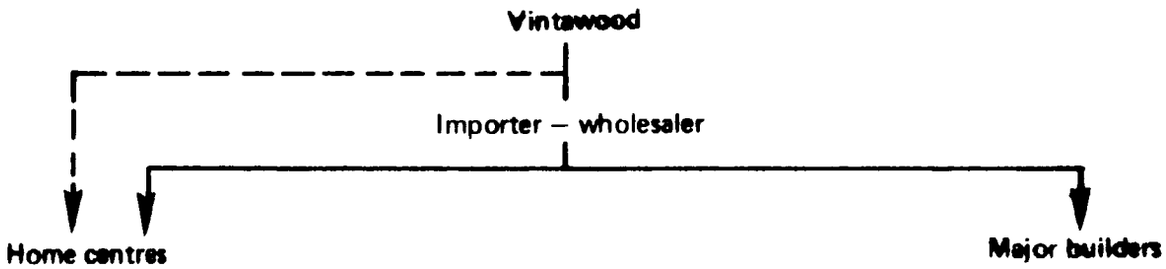
The main market areas are New South Wales, Victoria and Queensland. Renovations of present buildings absorb 10-15 percent of building materials (less than in Western Europe). The non-residential building market is relatively large. Garage, louvre and sliding doors are sold extensively. The population is rising at 0.6 percent a year, sustaining the demand for new housing. The completions fluctuate relatively less than in Western Europe, North America and Japan (Annex 4.8).

Houses and low-rise residential buildings incorporate up to 3 entrances and at least 6 internal doors. The door industry in Australia is rather concentrated. There are few big producers that also import door components and doors from their own affiliated companies in the Philippines and Malaysia. The main companies are:

- Corinthian Industries Pty Ltd
- John V. Perry Pty Ltd
- Plycore and Door Pty Ltd
- APM Wood Products Pty Ltd
- Stegbar Fold Door Pty Ltd
- Tilling Timber Pty Ltd
- Trimview Timber and Hardware Pty Ltd
- Hume Doors Pty Ltd

Vintawood would be able to cover the main sales areas of the continent through an importer-wholesaler. An importer-wholesaler could sell to major users through its depots and through associated home centres to small builders and private people. There are also chains of home centres that import doors direct, but they cater for regional markets.

Fig. 3/6
Suggested Distribution Channels for Vintawood in Australia



The Australian import regulations vary depending on the source of imports. The general import duty for builders' carpentry and joinery is 22.5 percent ad valorem. Papua New Guinea allows duty-free access and Canada reduced rates (15 percent ad valorem). The rate for developing countries is also 15 percent. The import duties constitute a greater trade barrier than in the other target markets of Vintawood.

The standards specify the panel doors in more detail than those in the other target markets. This is why the trade takes place in a standard size of 2040 x 820 x 40 mm or in few special sizes, improving overseas suppliers' technical possibilities of catering for the Australian market. On the other hand, the local manufacturers state in detail their product guarantees, and the buyers appreciate them, which gives local suppliers a competitive edge unless an overseas supplier can offer similar guarantees through its distributors.

3.8 Product Policy

Vintawood can influence its performance by adopting a new product policy which is different from those of other door makers.

Taking into account that most of the present Philippino door manufacturers pay little attention to their product range, it is suggested that Vintawood should aim at a competitive edge by working out a product plan as described in the following.

Types of Panel Door

External panel doors offer the best business for Vintawood. The demand for internal panel doors is limited because of the popularity, low cost, ready availability and several types of flush doors. Internal panel doors are in demand for dwellings with a high standard of finishing only. The suggested types of door are described in detail in sections 4.3.2 and 4.4.2 of this study. The markets for these doors are presented in section 3.6.1.

Vintawood could initially concentrate on panel doors. When the basic business runs properly, the company could consider making louvre, bifold and cupboard doors and room dividers. Presumably they could be traded together with panel doors through the same marketing channels. The other types of door mentioned would reduce the dependency on one product line and would lead to benefits in production and marketing in that wood could be used efficiently and buyers could obtain all door types from one supplier.

Single doors account for most of the market potential. A limited market exists for double and arch doors. The appearance of a door must match the prevailing tastes in each importing country (Table 3-10). There appears little if any advantage in providing excessively hand-carved doors. The carvings could be confined to a few door designs. The new competitors in Singapore and Malaysia make only doors with machined panel faces. Vintawood should aim at productivity in the same way.

Dimensions

The ISO standard 2776-1974 aims at coordinating the heights and widths of wooden doors. Though some major countries are signatories to the mentioned ISO standard, there still exist several sizes in the markets. Yet, a comparatively limited number of sizes accounts for the bulk of the door trade. Vintawood should limit the amount of odd sizes and concentrate on the common ones:

Widths	Heights	Thicknesses
	mm	
520 (internal)	2000	35 (internal)
620 (")		
720 (")	2040	40 (external)
770 (")		
820 (external)	2100	44 (external)
870 (")		

It would be essential to drop any uneconomic odd sizes. The demand can be directed to standard sizes by charging higher prices for odd sizes. It should be noted that Vintawood should be particularly careful in accepting orders for odd dimensions from Japan. A reason for Vintawood's past collapse was that they ended up making to many design for the Japanese market.

The common widths for bifold and louvre doors that Vintawood may make in the medium term are similar to those of internal panel doors. The additional heights are 2300 and 2400 mm. The common thicknesses are 25, 29 and 33 mm.

Casing

The current practice is to export doors without the casing (sill, jambs and head). The door exporters could make casings, but normally they are supplied separately from local sources in the importing country. Vintawood could seek to add value to its products by offering also the casings. The advantage of this policy would be that as the casing would be of the same wood species as the door, the appearance and possibly the price would improve slightly. Labour is good also for the mills.

Finishing

Most of the present exporters sell doors in which the main quality considerations are careful sanding and using colour-matched components in the assembly phase. Some companies offer waxing or oiling, whereas others provide a polyurethane coating with ultraviolet inhibitor. As the quality of the Philippino woods is greatly appreciated in most markets, any finishing should maintain or enhance the attractiveness of a door. The reputation of Philippino wood is a clear competitive advantage to be exploited by Vintawood.

The importers stress the importance of colour matching between wood species, but their attitudes to prefinished doors from overseas are ambiguous. They are worried about damage that can take place in transit, during distribution or on the building site, where some trimming of sides may have to be done. On the other hand, local companies also offer pre-finished doors. The importers' slight reluctance to import prefinished doors can perhaps be changed by persuasive sales efforts and with favourable experience, particularly as the trend is towards better doors.

The door exporters do not fix the hardware (lock, handle, hinges), since the opening side of a door is not known before the retail sale and the buyer often likes to select the hardware. Each importing market has its own designs and types, which are not available in the Philippines. Fixing of the Philippino type of hardware would limit the sales possibilities. Instead it might be possible to provide a small part of doors with hardware from the buyers' specifications, especially if the consignment were sold direct to a major builder or manufacturer of prefabricated houses. This would require either (a) imports of hardware to the Philippines o· (b) fixing of hardware by Vintawood's representative in the importing country. Vintawood could also offer doors with hardware for the domestic market.

Packing

The present practice of shipping doors in containers is efficient and protective. Each door is normally put into a polyethylene bag, with corners protected and 10 to 40 doors are packed into corrugated boxes. From the importer's point of view it is essential that the type, size and quality of the doors are properly marked on each box.

Product Development

In the long term Vintawood can influence its performance most by selecting efficient distribution channels as described in this study and by active product development. The competitors can easily act on Vintawood's efforts to gain a greater market share by lower prices and increased product promotion, but it will take more time to develop new door designs and structures and to introduce them. This activity could be organized through the marketing department, collaborating closely with the production side. The initiative of the marketing department is needed, since the products have to be adapted to the target markets. The following aspects call for action:

- glass panel doors should be designed (glass e.g. 3-5 mm thick and several types of glass). Glass to be fitted in importing country.
- finishings should be introduced. Possible ways of finishing were given earlier in this section.
- doors should be made to comply with the recognized quality level and marketable dimensions of target markets. The common sizes were presented earlier in this section.

Several species of the same wood group can be used in panel doors provided they meet the strength requirements, are uniform in colour and behave in the same way. To ensure free use of wood, the wood species should not be emphasized in the marketing. This is essential also because of the fact that as the wood supply situation tightens on the Luzon Island (location of Vintawood), the present commercial woods may become expensive.

Door suppliers in developing countries have a slight disadvantage in that they cannot provide as good product guarantees as the local door manufacturers in the importing countries. This prejudice can be overcome by supplying consistently high quality doors and by presenting the product guarantee via the distributor. Transport distance and time are not specific trade barriers since the importers will carry some stocks and sell sufficient consignments to distributors. It should be noted that panel door production is being transferred to tropical countries, so overseas transport will be an inherent feature of the trade.

3.9 Pricing Policy

The present (late 1980) prices of the Philippino exporters and their overseas competitors differ somewhat, while the domestic prices in the Philippines are rather consistent. Panel doors sell at about P 900-950 (USD 120-127) per door without the casing.

The overseas market prices are dragged downwards by the cheap supplies from Taiwan. They offer standard panel doors at USD 45-50 per door FOB, which is about 50 percent of the lowest prices of competitive suppliers. The Taiwanese doors have a blockboard-type solid core with veneered faces. Technically, they are not genuine solid panel doors.

The present Philippino producers offer basic doors at USD 80 to 150 per door FOB for export. The doors made from narra cost about 80 percent more. The casings are quoted at USD 16 to 50 per door. The new Singapore companies aim at FOB prices ranging from USD 80 to USD 110 plus USD 35 for casings. The corresponding prices in the Philippines would be a little lower, since Singapore enjoys an advantage in freight costs over Western Europe and the Middle East. The overseas door markets can be divided into three segments (Table 3-11).

Table 3-11
Segments of Panel Door Markets for Vintawood

Segment by price	Competitive supplier
USD 45 - 65	Taiwan
USD 70 - 120	other ASEAN countries
USD 125 - 200	other ASEAN countries

To achieve long production runs, Vintawood should charge a premium for odd sizes. The pricing policies of competitive suppliers and distributors suggest that the premium could be in the order of 10 to 20 percent of the basic price. The glazing could add up to 60 percent, depending on its type. The possible price premium attainable by 3 polyurethane [1] coatings is similar to the glazing price premium. These examples show that the profit is in the finishing of the panel doors, so Vintawood should aim at developing trade in finished doors in cooperation with efficient importers.

The prices for door types differ considerably (Table 3-12). In the product range of major manufacturers the expensive designs fetch up to 3 times the prices of cheaper designs. The price differences are much larger than the differences in their manufacturing costs. As Vintawood will contemplate its initial product assortment, it would be a good idea to select a limited number of product designs that could fetch mostly medium prices, with a few designs for expensive doors that are more difficult to sell.

The terms of sales depend on Vintawood's marketing arrangements. The object should be to fetch maximum prices for Vintawood. While it would be possible to sell on CIF or C&F terms to the all key markets, major importers might be able to negotiate lower charter freights and insurances than Vintawood based on their combined shipments with other cargo (Table 3-12). The present common method for payments is L/S (Letter of Credit) or CAD (cash against documents).

1) already used in the Philippines

Table 3-12
Current Conference Freight Rates
for Panel Doors from the Philippines (late 1980)

Cost items	Central Europe	Australia	Japan	US West Coast
	-	USD/m^3		-
Basic rate	67.90	67.70	38.00	62.50
Currency adjustment	24.50	18.80	9.50	7.00
Bunker surcharge	32.25	13.30	7.20	10.00
Total	124.65	99.80	54.70	79.50
Containerization	-2.60	-2.60	-2.75	-2.75
Freight	122.05	97.20	51.95	76.75
Freight incidence per door	17.09	13.61	7.27	10.75

The prices that Vintawood could fetch are presented by market area and door type in sections 12.2.2 and 12.2.3 of this study. It should be noted that the prices attainable depend on the marketing performance. Currently, most tropical door exporters suffer from weak negotiating power when dealing with importers, because they have not tried to find out the most profitable outlets. This is why Vintawood should select the types of distribution channel presented in this study and deal with companies that can serve Vintawood.

3.10
Sales Promotion Policy

Vintawood will have to re-establish itself as a new company in the markets aiming at a stronger marketing organization and more effective cost control than in the past. There is a certain loyalty between present importers and their suppliers. It can, however, be overcome by efficient sales promotion by Vintawood's distributors:

- attractive product presentation using representative brochures
- persuasive sales arguments for Vintawood's products[1)]
- appealing brand names that are easy to remember
- quality control and after sales service
- competitive product guarantees and quality certificates
- information about Vintawood's new factory
- good packing

1) statements of product performance from users' point of view, durability, differences compared with competing doors etc.

- installation instructions and installation service if a client wishes to pay for it. Best chances in project deals to the Middle East.
- monitoring the markets through building magazines and early action on new opportunities/threats
- immediate settlement of claims

In the Philippines Vintawood can reach potential customers, architects, interior decorators and authorities managing the building programmes by personal selling, which is more effective than other sales promotion efforts. In exports personal selling must be carried out by the importers' representatives.

4
PRODUCTS

4.1
Quality Requirements and Moisture Content of Joinery

4.1.1
General

General quality requirements for joinery products vary greatly from country to country and the final detailed quality requirements are determined by the customers. In this context realistic quality requirements are briefly described. International standards (ISO) and the British Standards (BS) have been used as basis.

The Philippines have no own national standards, so ISO standards can be used. This makes it also possible to sell export rejects in the Philippines.

4.1.2
Quality of Timber

In general the timber for joinery shall be of a species suitable for the purpose for which it is to be used. For example, according to the BS standard 1186, light red and dark red meranti are suitable for all external and internal joinery. The wood species not suitable for joinery may only be used if agreed between the supplier and purchaser.

Care shall also be taken that mixing of two or more species in a unit does not lead to distortion or dissimilar reaction to painting or other finish.

It is very common to grade timber into classes. The quality of timber in the finished joinery product shall comply with one of these classes.

Vintawood has to establish its own quality classes so that the product meets the end-users' requirements.

BS1186 can be mentioned as an example. According to it there shall be four classes for exposed surfaces of timber. These are:

- Class 1S
- Class 1
- Class 2
- Class 3

The requirements of each class are summarized in the following:

SUMMARY OF REQUIREMENTS

Feature	Class 1S	Class 1	Class 2	Class 3	Concealed or semi-concealed surfaces
Knots	As Class 1 unless larger knots are required as a feature	Pin knots, up to 6 mm, only	(Up to 25) One half (Over 25 up to 50) 13 (Over 50 up to 100) One quarter (Over 100) 25	(Up to 40) One half (Over 40 up to 60) 20 (Over 60 up to 150) One third (Over 150) 50	(Up to 45) Two thirds (Over 45 up to 60) 30 (Over 60 up to 100) One half (Over 100) 50
Checks and shakes *Width*	0.3	As Class 1S	1.5 (filled if over 0.5)	As Class 2	Any width
Length	300	As Class 1S	300	As Class 2	Not continuous for whole length
Depth	One quarter	As Class 1S	One quarter	As Class 2	One half
Pitch pockets	Not permitted unless agreed by purchaser to be cut out and filled	Not permitted unless cut out and filled	As Class 1	As Class 1	Permitted
Plugs and inserts	Not permitted unless agreed by purchaser	Width not to be more than 6 mm greater than maximum limit of permitted knot size			
Sapwood	1. Not permitted on hardwood surfaces exposed to the weather 2. Discoloured sapwood not permitted in Class 1S unless required as a feature 3. Sapwood, including discoloured, permitted in other classes specified for painting				
Joints and lamination glue lines	None if so stated, otherwise as Class 1	Not unduly conspicuous	As Class 1	As Class 1	No requirement specified
Rate of growth	Not fewer than 8 growth rings per 25 mm at any point on any cross section				
Slope of grain	Not greater than 1 in 10 in softwoods and 1 in 8 in hardwoods				
Species and character of grain	Same on all surfaces and matched as far as possible	No requirements specified			
Boxed heart	Permitted in softwoods only, if there is no shake on exposed surfaces				
Pith	Not permitted	Permitted if hard	As Class 1	As Class 1	Permitted
Pinholes	Not permitted	Permitted if filled	As Class 1	As Class 1	Permitted

NOTE 1. This table only provides a convenient summary. It does not state the requirements fully. Timber in joinery shall comply fully with the requirements given in the various clauses of this British Standard and not only with the particulars quoted in this table.
NOTE 2. Sizes quoted are maximum permitted limits in millimetres.
NOTE 3. In the requirements for knots the particulars in brackets are the limits of the corresponding dimension of the piece within which the requirement applies.
NOTE 4. Where a fraction is stated in words it means that the size of the feature shall not be more than that fraction of the corresponding dimension of the piece.
NOTE 5. Class 1S refers to joinery which is specified at the time of enquiry and order to be selected for clear finishing

Moisture Content of Timber

Climatic conditions viz: temperature and relative humidity of the air, influence the equilibrium moisture content of wood.

These factors naturally vary in different regions and countries. For this reason the stipulations regarding the regulated moisture content of woodcan differ, too.

The following norms of the BS1186: Part 1 can be presented as a guideline and/or an example:

The moisture content of the timber during manufacture and when the joinery is handed over to the purchaser shall be within ±2 % of the average equilibrium moisture content that it is expected to attain in service, as specified by the purchaser:

External joinery	
- external joinery for heated or unheated buildings	17 %
Internal joinery	
- buildings with intermittent heating	15 %
- buildings with continuous heating providing room temperatures in the range 12°C to 18°C	12 %
- buildings with continuous heating providing room temperatures in the range 20°C to 24°C	10 %
- close proximity to sources of heat	8 %

It is also important that precautions be taken to ensure that

- joinery is adequately protected during transport, especially against changes in moisture content
- it is stored at all times under conditions that will maintain the desired moisture content
- it is protected and maintained at suitable conditions during and after installation. This applies especially to items with a moisture content of 14 % or lower.

4.1.3
Workmanship in Joinery

The quality of workmanship must follow the specific standards of each country. These are specified for example in the BS Standard 1186, part 2.

Summarized requirements for doors are as follows:

a) The faces of members joined shall be flush with one another.

b) The haunch in a tenon joint or the tongue in a dowel joint shall be a push fit. Its groove, and the gap between the end of the haunch or tongue and the bottom of the groove shall not at any point exceed 1.5 mm.

c) Dowels in dowelling joints shall be grooved to allow glue to be driven into the dowel holes, and shall fill the holes to within 6 mm at each end when the joint is assembled.

d) In mortise and tenon joints the tenon and mortise shall be in parallel. The tenon shall be a push fit in the mortise.

e) In edge-to-edge joints the faces of the pieces joined shall be flush with one another. The edges of a joint showing both faces of the work shall be in close contact throughout their length.

f) When solid panels are fitted into grooves, the grooves shall be of a depth, not less than 9 mm, appropriate to the amount of moisture movement which may be anticipated on the basis of the properties of the timber and the dimensions of the parts. The panel shall be 3 mm shorter than the distance between the bottoms of the grooves. The panel shall not be fixed in any way which will prevent its free expansion and contraction.

g) The adhesive used shall comply with the requirements of British Standard BS 1202, Synthetic resin adhesives (phenolic and aminoplastic) for wood.

The adhesive shall be applied in such a way that all necessary surfaces receive an adequate coating.

As a further example standards in Nordic countries stipulate the dimensional accuracy of door leaves and frames as follows:

h) The manufacturing dimensions of a door frame shall be 10^{+2}_{-} mm smaller than the joining dimensions (modular size) of the door in question (Finnish Standard 4434).

i) The clearance between the door leaf and frame (on all sides) shall be 2^{+1}_{-} mm for interios door and 3^{+1}_{-} mm for exterior doors (SFS 4434).

j) The distortion of squareness of the door leaf when delivered and at the guarantee inspection shall not exceed 1.0 mm (SFS 4434) when measured according to EN 25 (European standard). According to this standard the squareness distortion of adjacent edges of a door leaf is determined at all four corners of the door leaf with a square having 500 mm long arms.

k) The distortion of general flatness of a door leaf when delivered, shall not be more than 4 mm, and at the guarantee inspection not more than 5 mm (SFS 4434) when measured according to EN 24. According to this standard the twist and longitudinal and transverse bending close to the edges are measured for one face of the door leaf.

4.1.4
Functional Requirements of Doors

In Nordic countries the suitability and durability of doors for different end uses are determined for example in SFS standard 4487, which is based on corresponding foreign norms and testing methods[1)] and covers the following items:

a) Durability of hinges

b) Rigidity of door leaf

c) Door leaf durability against clash

d) Door leaf durability against shock

e) Sound insulation[2)]

f) Dimensional stability of nonsymmetrical door leaf

g) Dimensional stability of door leaf when temperature and air humidity vary

h) Resistance to burglary

In addition there are special requirements on heat insulation and fire resistance for doors. These are specified in the building codes of each country.

Vintawood should have its doors tested in an appropriate laboratory in each country to obtain a quality label proving that its doors have passed the required tests.

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1) EN (European Standard) 24, EN 25, EN 79, EN 43, ISO 140
SS (Svensk Standard, Swedish Standard) 817316, SS 817319, SS 817320, SS 817317, SS 817318, SS 817314

2) Class 1 average insulation of airborne sound $\geq$ 40 dB
Class 2 " " " $\geq$ 34
Class 3 " " " " $\geq$ 28

4.2
The Size Requirements of Doors

4.2.1
General

The ISO standard 2776, approved by the Memeber Bodies in 26 countries in Asia, Africa, Europe and Oceania, gives only a range of door sizes which has been accepted by the Member Bodies. National standards in each country may include additional sizes.

The ISO standard does not specify width and height combinations. Each country has its own most common modular doos sizes which have to be followed.

4.2.2
Specified Co-ordinating Sizes of Door Sets (ISO)

External door sets

Width	Height
9 M	21 M
10 "	24 "
12 "	27 "
15 "	30 "
18 "	
21 "	
24 "	

Internal door sets

Width	Height
7 M	21 M
8 "	24 "
9 "	27 "
10 "	30 "
12 "	
15 "	
18 "	
21 "	

The sizes are so called joining dimensions of doors where M is the symbol for the basic module corresponding to 100 mm.

For example the most common modular door sizes in Europe are:

Internal doors

8 M x 21 M
9 M x 21 M
10 M x 21 M
12 M x 21 M

External doors

9 M x 21 M
10 M x 21 M
12 M x 21 M
24 M x 21 M

Other door sizes commonly used are:

Internal doors

7 M x 21 M
15 M x 21 M
18 M x 21 M
24 M x 21 M

External doors

15 M x 21 M
18 M x 21 M

The height of a door with an over part above the door leaf is commonly n x M, but the size of the door leaf itself is the same as mentioned above.

4.2.3
Size of Door Leaf

The thickness of door leaves varies depending on the country and use.

A common thickness for internal doors is 35 mm, but some other measures are used as well. The thickness of external doors may also vary. For capacity calculations in this study 40 mm and 44 mm have been used based on information received during the field trip and market survey.

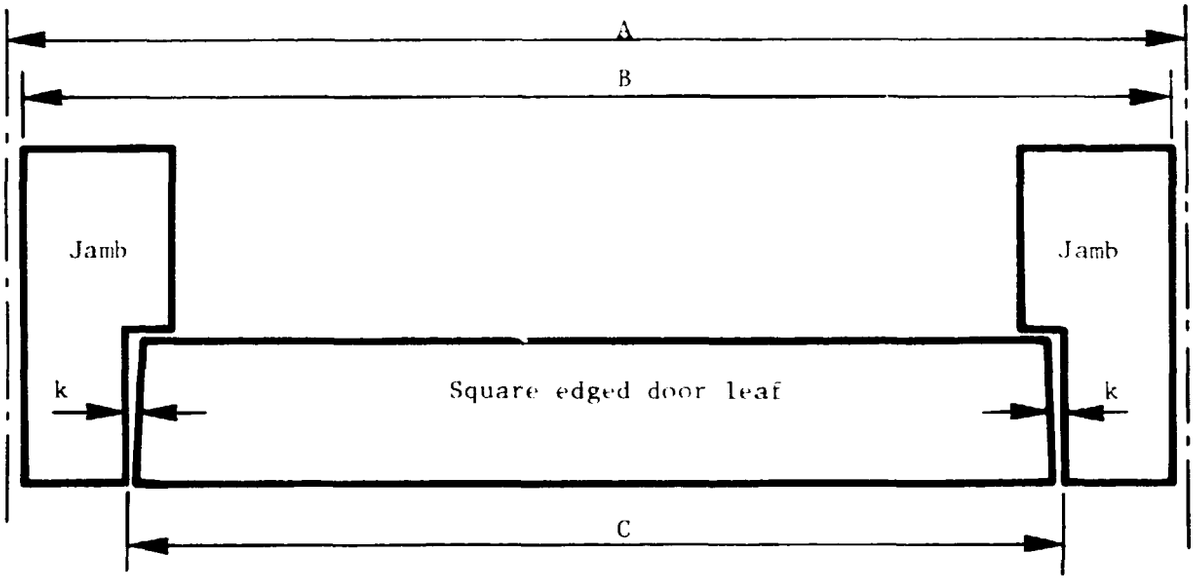
In addition, the profile of the door leaf edge may be either rebated or non-rebated, i.e. square-edged. In panel doors rebated door leaves are not very common, but a possibility to produce this type would be reserved in the process design.

Fig. 4/1 and 4/2 show how to determine heights and widths, for example according to SFS standards 4081 and 4434. A door 9 M x 21 M in size has been used as an example.

The symbolic letter in Figs. 4/1 and 4/2 are as follows:

A Modular width of door 9 M
B Width of door frame or door set 890 mm $\pm$ 2 mm
C Door frame reveal width 830 mm $\pm$ 1 mm
D Modular height of door 21 M
E Height of door frame or door set 2090 mm $\pm$ 2 mm
F Door frame reveal height 2045 mm $\pm$ 1 mm
k Clearance between door frame and door leaf
- in interior doors 2 mm $\pm$ 1 mm
- in exterior doors 3 mm $\pm$ 1 mm

Fig. 4/1
Horizontal Section of Doors



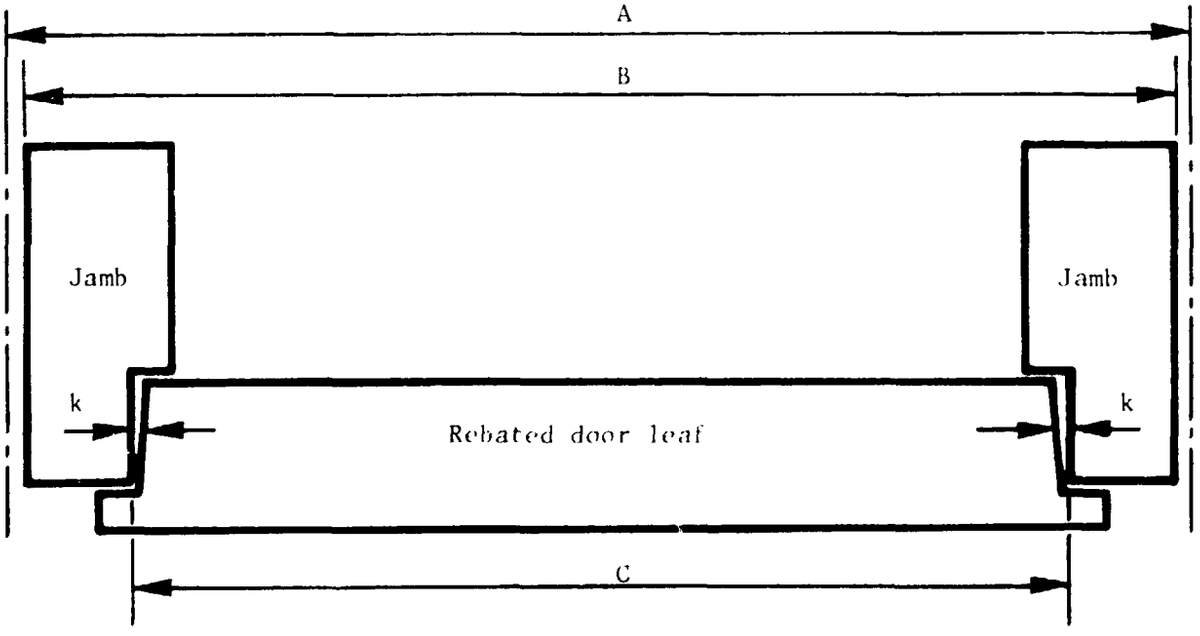
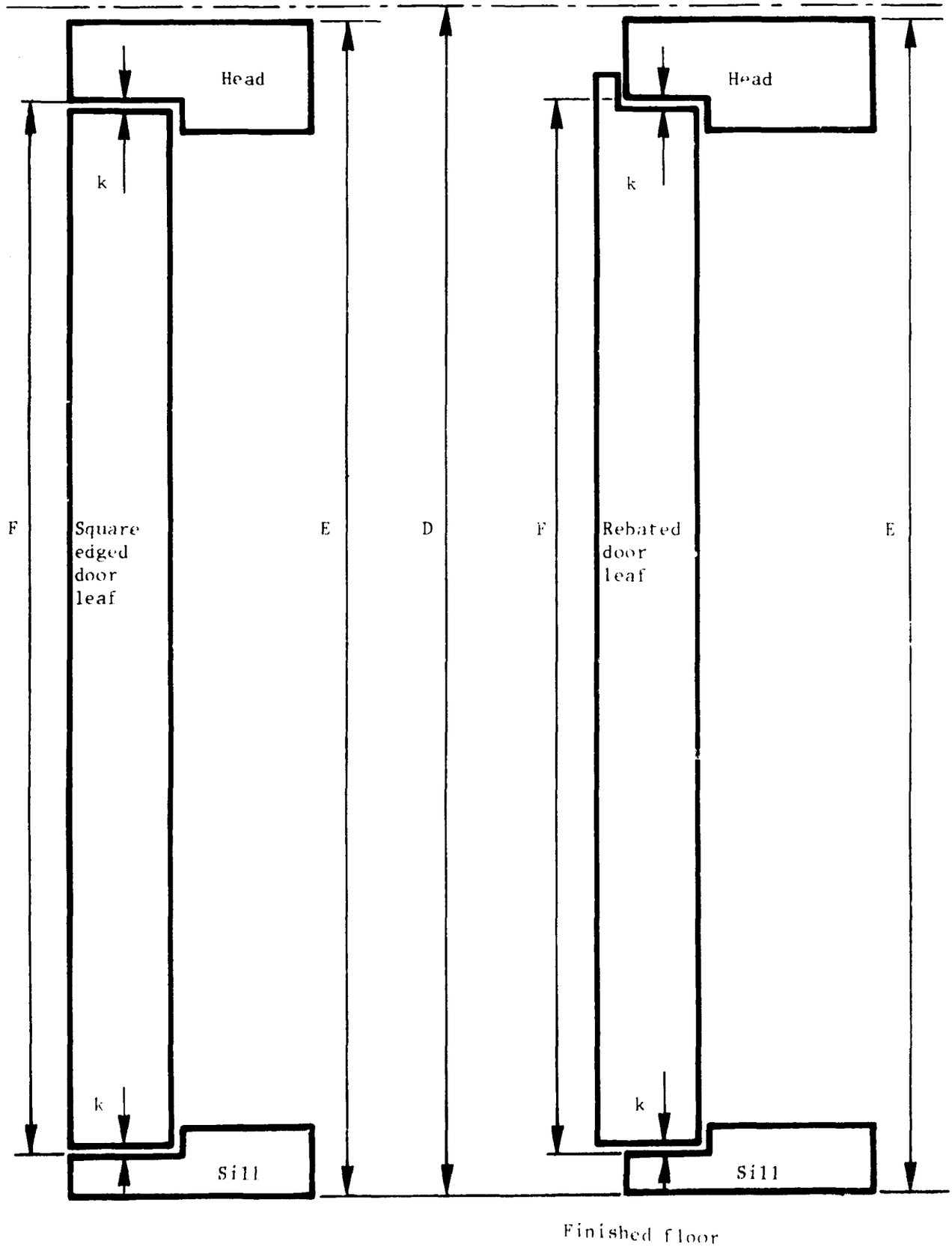


Fig. 4/2
Vertical Sections of Doors



4.2.4
Door Frames and Sills

According to ISO Standard 1804 for Door Terminology, the door frame is a unit in which the door leaf is hung and it consists of the following parts:

- one head piece
- two jambs
- one transom (if required)
- one sill (if required)

The door frame reveal may be either rebated or non-rebated. Usually the door frame is rebated when its depth and width is determined according to the door leaf edge profile.

Commonly used frame and sill depths are as follows:

- 68 mm
- 92 "
- 131 "
- 142 "

Thickness of head and jambs 42 mm
Thicknesses of sills 22 mm and 42 mm

4.3
Product Description

4.3.1
General

The planned mill would produce high quality doors, frames and sills only.

The design and construction of the products have not been specified in too much detail, because of possible variations in customer specifications.

4.3.2
Door Leaf

The door leaves consist of panels, horizontal and vertical frames, stiles and top and bottom rails. In some cases panels could be replaced by glass, if required.

All components would be made of solid wood. Both dark and light coloured wood species would be used.

The following main thicknesses, indicated by the market investigation, have been used for the calculations in this study:

- door leaf	35 mm
- panel	32 mm
- door leaf	40 mm and 44 mm
- panel	37 mm and 41 mm

The door sizes correspond to the ISO standard described in section 4.2.

The panels could be furnished with carvings. They would be fastened by mouldings in interior doors and by groove joints in exterior doors. Glass panels would be fastened to the doors by mouldings only.

Stiles, rails and frames would be assembled using glued mortise and tenon joints. The length of tenons would vary in vertical joints between 25 and 50 mm and in horizontal joints between 60 and 70 mm.

The edges of door leaves would mainly be non-rebated. All rebates and holes for hardware would be machined before finishing if required.

Most of the doors would be delivered without any hardware such as hinges or locks, because design and safety regulations vary from country to country, and most of the hardware would therefore have to be imported from the respective country anyway.

Doors would be finished in the door factory.

The following types of finishing would be used:

- staining, if colour tone of wood needs to be changed
- treatment with sealer, if pores of wood need to be filled before final laquering
- laquering or wax finishing including polishing or dimming, if required

The design of the door leaves varies widely and it is not practical in this context to describe quite many door types. In this study the doors have been divided into 9 types as follows:

Type A	equipped with 21 panels
Type B	same as type A, but panels replaced by glass
Type C	equipped with 4 panels
Type D	equipped with 8 panels
Type E	equipped with 8 carved panels
Type F	two door leaves of which one is equipped with 8 panels and another with 4 panels
Type G	two door leaves of which one is equipped with 21 panels and the other with 7 panels
Type H	two door leaves as type G, but panels replaced by glass
Type I	two door leaves of which one is equipped with 8 panels and the other with 4 panels

The door types are illustrated in Annex 5. The carvings and patterns on the panels are indicative only and would in practice be selected according to fashions in each country.

4.3.3
Frames and Sills

The frame would consist of four pieces: head piece, two jambs and sill. Sills would be delivered as separate units. They are fastened to the floor with screws.

Frame pieces would be glued with longitudinal joints. In this way, defects such as bow, cup, spring and twist could be prevented and correct clearance between door leaf and frame would be better guaranteed.

Frames and sills would be made of solid wood, and the wood quality would correspond to that of the wood species used for door leaves. However, all sills would be made of red lauan or some other harder wood. Tenon joints are used for frame pieces. Frames are delivered unassembled. Final assembly is performed using glue and nails.

The frames would be finished in the same way as described for door leaves.

4.3.4
Mouldings

All mouldings would be made of solid wood, finished in the same way as door leaves and fastened with glue and nails.

4.4
Production Programme

4.4.1
General

The Vintawood mills would produce panel doors only. The production programme corresponds to the factual market prospects.

4.4.2
Planned Production

Volume of production:

- doors 30 000 a year
- frames 30 000 "
- sills 20 000 "

A production mix of 20 000 internal doors (35 mm) and 10 000 external doors (40 mm and 44 mm) has been used in the technical and economic calculations. The mix can be varied widely, because it affects only the raw material consumption and kiln drying capacity.

Product Specification used in Feasibility Calculation

	Thickness mm	Size MxM	Products Share %	Doors/a	Total doors/a
Internal door leaves with 35 mm thickness					
- type A	35	8 x 21	3.4	680	
	35	9 x 21	20.4	4 080	
	35	10 x 21	10.2	2 040	6 800
- type B	35	8 x 21	0.4	85	
	35	9 x 21	2.6	510	
	35	10 x 21	1.3	255	850
- type C	35	8 x 21	0.9	170	
	35	9 x 21	5.1	1 020	
	35	10 x 21	2.6	510	1 700
- type D	35	8 x 21	1.3	255	
	35	9 x 21	7.6	1 530	
	35	10 x 21	3.8	765	2 550
- type E	35	8 x 21	2.6	510	
	35	9 x 21	15.3	3 060	
	35	10 x 21	7.6	1 530	5 100
- type F	35	15 x 21	2.5	502	502
- type G	35	12 x 21	6.6	1 333	1 333
- type H	35	12 x 21	0.8	165	165
- type I	35	15 x 21	5.0	1 000	1 000
			100.0		20 000
External door leaves with 40 mm thickness					
- type A	40	9 x 21	2.4	122	
	40	10 x 21	5.7	284	
	40	9 x 24	0.3	14	
	40	10 x 24	0.6	32	452
- type C	40	9 x 21	4.9	243	
	40	10 x 21	11.3	567	
	40	9 x 24	0.5	27	
	40	10 x 24	1.3	63	900

	Thickness mm	Size MxM	Share %	Doors/a	Total doors/a
- type D	40	9 x 21	9.7	486	
	40	10 x 21	22.7	1 134	
	40	9 x 24	1.1	54	
	40	10 x 24	2.5	126	1 800
- type E	40	9 x 21	7.3	365	
	40	10 x 21	17.0	851	
	40	9 x 24	0.8	41	
	40	10 x 24	1.9	95	1 352
- type F	40	15 x 21	5.0	250	250
- type G	40	12 x 21	1.3	65	65
- type I	40	15 x 21	3.7	187	187
			100.0		5 006
External door leaves with 44 mm thickness					
- type A	44	9 x 21	2.4	121	
	44	10 x 21	5.7	283	
	44	9 x 24	0.3	13	
	44	10 x 24	0.6	31	448
- type C	44	9 x 21	4.9	243	
	44	10 x 21	11.4	567	
	44	9 x 24	0.5	27	
	44	10 x 24	1.3	63	900
- type D	44	9 x 21	9.7	486	
	44	10 x 21	22.7	1 134	
	44	9 x 24	1.1	54	
	44	10 x 24	2.5	126	1 800
- type E	44	9 x 21	7.3	364	
	44	10 x 21	17.0	850	
	44	9 x 24	0.8	40	
	44	10 x 24	1.9	94	1 348
- type F	44	15 x 21	5.0	250	250
- type G	44	12 x 21	1.2	60	60
- type I	44	15 x 21	3.7	188	188
			100.0		4 994

	Thickness and width mm x mm	Size MxM	Share %	Sets/a	Total sets/a
Door frames					
	42 x 92	8 x 21	4.0	1 190	
		9 x 21	21.1	6 315	
		10 x 21	14.4	4 308	11 813
	42 x 131	8 x 21	1.4	425	
		9 x 21	14.7	4 420	
		10 x 21	16.2	4 846	
		9 x 24	0.5	162	
		10 x 24	1.0	315	10 168
	42 x 160	8 x 21	0.3	85	
		9 x 21	6.3	1 895	
		10 x 21	5.4	1 616	
		9 x 24	0.4	108	
		10 x 24	1.1	315	4 019
		15 x 21	7.9	2 377	
		12 x 21	5.3	1 623	4 000
Door frames total			100.0		30 000
Sills	22 x 92	8	4.0	794	
		9	21.0	4 213	
		10	14.4	2 873	7 880
	22 x 131	8	1.4	283	
		9	15.3	3 055	
		10	17.2	3 442	6 780
	22 x 160	8	0.3	57	
		9	6.7	1 333	
		10	6.4	1 286	
		12	5.4	1 081	
		15	7.9	1 583	5 340
Sills total			100.0		20 000

5
RAW MATERIALS

5.1
Wood Raw Material and its Supply

The doors would mainly be made of lauan, which is a compound name for a group of light-weight timber used in the Philippines. Also some other lesser in appearance similar species would be used, but only on a minor scale.

Wood species such as Shorea polysperma (TANGILE) and Pterocarpus indicus Willd (narra) would not be used due to declining resources.

5.1.1
General Features of Wood Species and their Classification

The lauan belongs to the Dipterocarpaceae family consisting of various species of Shorea, Parashorea and Pentacome. Lauan in the Philippines corresponds roughly to meranti in Malaya and seraya in North Borneo.

The Dipterocarpaceae is the most important botanical family in the Philippines. About 90 percent of the standing timber belongs to it.

There is a wide range of weight, hardness, colour and mechanical properties, depending on the species, but certain structural features are fairly uniform for the whole family.

Annual rings are rare, except in the first years of growth. Ripple marks are also rare and when present, rather indistinct. Resin ducts are partly scattered but more often arranged in conspicuous narrow concentric lines giving the appearance of growth rings.

It is common practice in the Philippines to classify the timber into two main groups on the basis of colour. The darker timbers are known as red and dark red lauan. The whitish or pale-coloured timbers are known as light red or white lauan.

The principal species are:

Red lauan or dark red lauan
- S. negrosensies Foxw.
- S. polysperma Merr (Tangile)
- S. squamata Dyer syn.
  S. palosapis Merr (in part)
- S. agsaboensis Stern
- selected materials of S. squamata

White lauan or light red lauan
- Parashorea malaanonan (Blco) Merr. Syn P. Plicata Brandis
- Shorea almon Foxw.
- selected material of S. squamata
- Pentacme of which P. contorta Merr provides white lauan proper
- P. mindanensis Foxw. produced Mindana white lauan

Some of the species are described in more detail in Annex 6.

5.1.2
Sawnwood Supply

There are four alternative ways of getting the sawnwood for door production. They are described below:

Alternative 1

The logs would be purchased by Vintawood according to the custom of trade and then sawn by a sawmill according to contract to dimensions specified by Vintawood. Green sawnwood would also be kiln dried by contract in the same sawmill.

Alternative 2

All sawnwood would be purchased green and edged according to the needs of joinery products. Vintawood itself would kiln dry the sawnwood.

Alternative 3

Part of the wood raw material would be purchased as green sawnwood and part as logs. The logs would be sawn by Vintawood according to desired specifications. All sawnwood would be kiln dried by Vintawood itself.

Alternative 4

Vintawood would purchase logs, and contract a sawmill to cut the logs into sawnwood according to specifications. Kiln drying would be done by Vintawood.

Discussion

The decision which alternative to select depends on the three main subjects, which are discussed in the following:

- Availability and quality of sawnwood
- Capability of the existing sawmills
- Availability of logs

On the basis of the interviews during the field work, the availability of sawnwood from local sawmills in Luzon is not fully guaranteed for Vintawood. Most of the sawnwood available has a nominal thickness of 41 mm or 50 mm when green, and about 39 mm or 48 mm when dry while the most important dry thicknesses required in door manufacture are 35, 40, 43, 45, 48 and 50 mm. So the thickness range available from the sawmills does not speak for purchasing all the sawnwood required. Another obstacle is the poor thickness tolerance of the commercial sawnwood compared with the requirements of door manufacture. This would increase the wastage in door production.

If an existing sawmill were contracted to cut according to Vintawood's specifications, it should adopt a completely new sawing pattern to obtain the dimensions required and also concentrate on quality sawing. It is doubtful whether a commercial sawmill supplying only part of its production to Vintawood could adopt the dual role of sawing for export and domestic market in the traditional way on one hand, and special dimensions and quality for Vintawood on the other.

Contracting a sawmill to cut all the needs of Vintawood would make Vintawood completely dependent on this sawmill and yet it would not have full possibilities of controlling the quality of sawnwood. This could easily lead to a situation in which Vintawood would have to accept lower quality sawnwood or cease production due to the lack of suitable raw material.

The drying facilities of the existing mills are not fully modern, and the moisture content of dried sawnwood would probably vary more than when done by Vintawood. If drying were done by Vintawood, it could develop individual drying schedules for each species. This would minimize drying defects and ensure uniform moisture content and quality of dried sawnwood, which is essential for a high quality export product.

Vintawood cannot get a concession of its own for log supply, as the general policy is to reduce the number of concessions and increase their size. A few years ago there were about 400 concessions in the Philippines, in 1980 their number had reduced to about 250 and there are plans to reduce the number down to 60 by 1985.

The lack of a concession would not prevent Vintawood from obtaining logs, as a ban on log exports is scheduled in 1982-1983. This would make high quality export logs available also in the Philippines especially in Mindanao, where most of the wood resources are.

Conclusion

On the basis of the above discussion, Alternative 3 would seem most attractive. It means that Vintawood would have to invest in a small sawmill, too, which was not foreseen at the beginning of the study. The advantages of this solution would be:

- required dimensions would become available, which would reduce wastage
- good quality sawnwood
- full control of sawnwood production
- uniform moisture content of sawnwood

Vintawood should aim at purchasing sawlog 1 grade logs corresponding to second in the Malayan Grading Rule.

Sawnwood is graded in the Philippines according to the American NHLA standard which has the following grades: 1st, 2nd, Select, No. 1 Common, No. 2 Common, No. 3A, No. 3B and Below Grade. Vintawood should concentrate on the three best grades, which are the common export grades, in its sawnwood purchases.

5.2 Wood Raw Material Needed in Production

5.2.1 General

On the basis of the sawnwood dimensions available in the market and the required dimensions, the door factory would need 2170 m^3/a of green sawnwood and 6870 m^3/a of logs. The raw material balance is given in section 5.2.3.

In the following technical descriptions all wood to be used has been divided into two groups according to their properties and use. The groups are the following:

Group 1

Red or dark red lauan and other dark coloured species. Average volume shrinkage 12 percent and density about 630 kg/m^3 at a moisture content of 15 percent.

Group 2

White or light red lauan and other light coloured species. Average volume shrinkage 10 percent and density about 530 kg/m^3 at a moisture content of 15 percent.

The moisture content of purchased sawnwood would be 40-60 percent according to information received from Vintawood. The moisture content of logs would vary from 40 percent to 80 percent. All design calculations are based on a moisture content of 80 percent.

The present rules in the Philippines prevent cutting of trees with a DBH of less than 60 cm (24"). To get a safety margin calculations have been based on an average log diameter of 54 cm (21") and a minimum diameter of 45 cm (18").

5.2.2
Sawnwood Dimensions

The most suitable thicknesses after drying for door production would be:

35 mm
40 "
43 "
45 "
48 "
50 "

The width of sawnwood would be determined according to door specifications with widths of stiles, rails, frames and panels.

The most suitable lengths of sawnwood are determined by the modular heights and widths of doors or their multiples such as:

1.7 m
1.8 "
2.0 "
2.1 "
2.8 "
3.0 "
4.0 "
4.2 "
4.5 "
5.1 "
5.4 "
6.0 "

However, it is impossible to make cross-cutting plans for purchased sawnwood, as each piece of sawnwood must be cut individually to maximize the grade and avoid defects such as knots, splits, resin pockets, wane, discoloration etc. On the other hand, each component of the door, i.e. stiles, rails, frames panels, panel frames, mouldings and sills, require individual length.

5.2.3
Wood Raw Material Balance

	m^3s/a
Logs	6 870
Sawnwood as green	2 170
Total	9 040
Sawdust from sawmill	- 830
Other residues	-2 096
Total wood raw material to be dried	6 114
- shrinkage	- 430
Total dried sawnwood	5 684
Crosscutting waste	- 569 (1
Shavings, sawdust and other waste during machining	-1 705 (2
Total net wood content of doors	3 410

5.2.4
Distribution of Wood Raw Material

Logs (without bark)

Red lauan	%	m^3s/a
- dried sawnwood including cross cutting waste	55.0	1 480
- shrinkage in drying from m.c. 30 % to m.c. 10 %	4.8	130
- strips and other waste wood	28.3	760
- sawdust	11.9	320
Total	100.0	2 690

White lauan		
- dried sawnwood including cross cutting waste	55.0	2 300
- shrinkage in drying from m.c. 30 % to m c 10 %	3.8	160
- strips and other waste wood	29.0	1 210
- sawdust	12.2	510
Total	100.0	4 180

1) About 10 % of dried sawnwood
2) About 30 % of dried sawnwood

Sawnwood

Red lauan

- dried sawnwood including cross cutting waste	87.1	740
- shrinkage in drying from m.c. 30 % to m.c. 10 %	7.1	60
- wood waste in sawing	5.8	50
Total	100.0	850

White lauan

- dried sawnwood including cross cutting waste	88.2	1 164
- shrinkage in drying from m.c. 30 % to m.c. 10 %	6.1	80
- wood waste in sawing	5.7	76
Total	100.0	1 320

5.2.5
Summary of Dried Sawnwood Consumption Including Cross Cutting Waste

Door leaves	Sawnwood			
	Dark coloured wood species	Light coloured wood species	m^3 s/a	Mfbm/a
- type A		889		
- type B		84		
- type C		185		
- type D		320		
- type E		640		
- type F		103		
- type G		239		
- type H		23		
- type I		206	2 689	1 141
- type A	150			
- type C	249			
- type D	567			
- type E	426			
- type F	122			
- type G	27			
- type I	92		1 633	692
Frames	500	774	1 274	540
Sills	88		88	37
Sawnwood total	2 220	3 464	5 684	2 410
	39 %	61 %		

5.2.6
Consumption of Dried Sawnwood

Products	Type	Size MxM	Thickness mm
Door leaves	A	8 x 21	35
	»	9 x 21	»
	»	10 x 21	»
	B	8 x 21	35
	»	9 x 21	»
	»	10 x 21	»
	C	8 x 21	35
	»	9 x 21	»
	»	10 x 21	»
	D	8 x 21	35
	»	9 x 21	»
	»	10 x 21	»
	E	8 x 21	35
	»	9 x 21	»
	»	10 x 21	»
	F	15 x 21	35
	G	12 x 21	35
	H	12 x 21	35
	I	15 x 21	35

	Sawnwood		
Unit/a	m^3/unit	m^3/a	m^3/a
680	0.125	85.0	
4 080	0.128	522.2	
2 040	0.138	281.5	888.7
85	0.094	8.0	
510	0.098	50.0	
255	0.103	26.3	84.3
170	0.097	16.5	
1 020	0.107	109.1	
510	0.117	59.7	185.3
255	0.111	28.3	
1 530	0.123	188.2	
765	0.135	103.3	319.8
510	0.111	56.6	
3 060	0.123	376.4	
1 530	0.135	206.6	639.6
502	0.206	103.4	103.4
1 333	0.179	238.6	238.6
165	0.139	22.9	22.9
1 000	0.206	206.0	206.0

5.2.6 (cont.)

Products		
Type	Size MxM	Thickness mm
A	9 x 21	40
»	10 x 21	»
»	9 x 24	»
»	10 x 24	»
»	9 x 21	44
»	10 x 21	»
»	9 x 24	»
»	10 x 24	»
C	9 x 21	40
»	10 x 21	»
»	9 x 24	»
»	10 x 24	»
»	9 x 21	44
»	10 x 21	»
»	9 x 24	»
»	10 x 24	»
D	9 x 21	40
»	10 x 21	»
»	9 x 24	»
»	10 x 24	»
»	9 x 21	44
»	10 x 21	»
»	9 x 24	»
»	10 x 24	»

Unit/a	Sawnwood m^3/unit	Sawnwood m^3/a	m^3/a
122	0.148	18.1	
284	0.162	46.0	
14	0.168	2.4	
32	0.185	5.9	
121	0.160	19.4	
283	0.176	49.8	
13	0.181	2.4	
31	0.200	6.2	150.2
243	0.123	29.9	
567	0.134	76.0	
27	0.140	3.8	
63	0.154	9.7	
243	0.134	32.6	
567	0.146	82.8	
27	0.153	4.1	
63	0.167	10.5	249.4
486	0.140	68.0	
1 134	0.154	174.6	
54	0.158	8.5	
126	0.173	21.8	
486	0.151	73.4	
1 134	0.166	188.2	
54	0.171	9.2	
126	0.187	23.6	567.3

5.2.6 (cont.)

Products		
Type	Size MxM	Thickness mm
E	9 x 21	40
»	10 x 21	»
»	9 x 24	»
»	10 x 24	»
»	9 x 21	44
»	10 x 21	»
»	9 x 24	»
»	10 x 24	»
F	15 x 21	40
»	15 x 21	44
G	12 x 21	40
»	12 x 21	44
I	15 x 21	40
»	15 x 21	44

Door leaves total

	Sawnwood		
Unit/a	m^3/unit	m^3/a	m^3/a
365	0.140	51.1	
851	0.154	131.1	
41	0.158	6.5	
95	0.173	16.4	
364	0.151	55.0	
850	0.166	141.1	
40	0.171	6.8	
94	0.187	17.6	425.6
250	0.235	58.8	
250	0.254	63.5	122.3
65	0.207	13.5	
60	0.225	13.5	27.0
187	0.235	43.9	
188	0.254	47.8	91.7
			4 322.1

5.2.6 (cont.)

Products	Size M :M
Frames	
42 x 92	8 x 21
—»—	9 x 21
—»—	10 x 21
42 x 131	8 x 21
—»—	9 x 21
—»—	10 x 21
—»—	9 x 24
—»—	10 x 24
42 x 160	8 x 21
—»—	9 x 21
—»—	10 x 21
—»—	9 x 24
—»—	10 x 24
—»—	15 x 21
—»—	12 x 21
Frames total	

	Sawnwood	
Unit/a	m^3/unit	m^3/a
1 190	0,0301	35,8
6 315	0,0307	193,9
4 308	0,0313	134,8
425	0,0437	18,6
4 420	0,0446	197,1
4 846	0,0455	220,5
162	0,0499	8,1
315	0,0508	16,0
85	0,0519	4,4
1 895	0,0530	100,0
1 616	0,0540	87,3
108	0,0593	6,4
315	0,0603	19,0
2 377	0,0593	141,0
1 623	0,0561	91,1
		1 274,0

5.2.6 (cont.)

Products			
	Length M	Thickness mm	Width mm
Sills			
	8	22	92
	9	»	»
	10	»	»
	8	»	131
	9	»	»
	10	»	»
	8	»	160
	9	»	»
	10	»	»
	12	»	»
	15	»	»
Sills total			

	Sawnwood	
Unit/a	m^3/unit	m^3/a
794	0,0026	2.1
4 213	0,0030	12.6
2 873	0,0033	9.5
283	0,0037	1.1
3 055	0,0041	12.5
3 442	0,0046	15.8
57	0,0044	0.3
1 333	0,0050	6.7
1 286	0,0055	7.1
1 081	0,0067	7.2
1 583	0,0083	13.1
		88.0

5.3 Glues

5.3.1 General

Glues would be used for jointing frame pieces and in door assembly.

The glue type would be determined by client or by regulations prevailing in domestic and/or export markets.

The most common glue for interior joinery is ureaformaldehyde glue. Polyvinyl acetate glues are also used particularly in assembly.

Very high durability can be achieved using a balanced mixture of melamineformaldehyde and ureaformaldehyde glue.

5.3.2 Glue Consumption

Glue for jointing of frame pieces		
- pieces before gluing	m/a_2	406 300
- specific glue consumption	g/m^2	200
- glue waste	%	15
- annual glue consumption is		
1.15 x 406 300 m x 0.045 m x 0.2 =	kg/a	4200
of which urea glue	kg/a	840
urea-melamine glue	kg/a	3360
Glue for door assembly		
- specific consumption including waste	kg/door	0.2
- annual glue consumption would be		
30 000 x 0.2 =	kg/a	6000
of which urea glue	kg/a	1200
urea-melamine glue	kg/a	3800
PVA glue	kg/a	1000

5.4 Finishing Materials

5.4.1 General

The finishing materials to be used in door production would be divided into the following groups:

- putty
- wax
- sanding sealer
- brown and red powder
- wood stain
- lacquer and lacquer thinner

The consumption figures have been estimated on the basis of the following data:

Average finished are of	
- doors	4 m^2
- frames	1 "
Total finished area	5 m^2

5.4.2
Consumption of Finishing Materials

Putty
- specific consumption 0.0016 kg/m^2
- annual consumption 30 000 x 0.0016 x 5 = 240 kg/a

Wax
- 10 percent of doors and frames would be treated with wax
- specific consumption 0.1 kg/m^2
- annual consumption 0.1 x 30 000 x 0.1 x 5 = 1500 kg/a

Sanding sealer
- 20 percent of doors would be treated with sanding sealer
- specific consumption 0.024 kg/m^2
- annual consumption 0.2 x 30 000 x 0.024 x 5 = 720 kg/a

Brown and red powder
- 80 percent of doors would be treated with powder solution
- specific consumption 0.005 kg/m^2
- annual consumption 0.8 x 30 000 x 0.005 x 5 = 600 kg/a

Wood stain
- 20 percent of doors would be treated with wood stain
- specific consumption 0.02 kg/m^2
- annual consumption 0.2 x 30 000 x 0.02 x 5 = 600 kg/a

Lacquer and lacquer thinner
- 50 percent of doors would be treated with lacquer
- specific consumption 2 x 0.125 kg/m^2
- waste about 30 %
- annual consumption
  1.3 x 0.5 x 30 000 x 2 x 0.125 x 5 = 24 000 kg/a

Other finishing materials for 30 000 door sets.

5.5
Packaging Materials

5.5.1
General

All door leaves and door frames would be packed individually into plastic bags to minimize damage during transport and handling. Individual packaging is seen necessary for easy collection of different door types for a shipment. Market size and especially the large number of small end users also favour individual packaging, which would protect the doors on their way from the mill store to the final user.

To obtain additional protection during transport, the bags would be wrapped into corrugated board before loading into containers.

5.5.2
Consumption of Packaging Materials

Plastic bags for door leaves
- weight of plastic 0.092 kg/m^2 (polyethene)
- specific consumption 0.46 kg/door
- annual consumption 34 000 x 0.46 = 15 640 kg/a

Corrugated board for door leaves
- specific consumption 5 m^2/door
- annual consumption 34 000 x 5 = 170 000 m^2/a

Consumption of other packaging materials
- tapes, cords etc. for 30 000 door sets

5.6
Hardware and Other Materials

Nails, screws etc. for 30 000 door sets.

Glass for 20 % of glass doors, equal to about 7 % of doors for domestic market.

6
MILL DESCRIPTION

6.1
Process Calculations for Main Machines

6.1.1
Basic Design Data

Production of the mill

	units/a
- door leaves	30 000
- frames	30 000
- sills	20 000

Operating schedule

Kiln drying

- days/a	330
- shifts/d	3
- available production time	
- min/shift	480
- min/a	475 200

Other production departments

- days/a	300
- shifts/d	1
- available production time	
- min/shift	420
- min/a	126 000

Operating time factors

Breaks and unproductive operating time have been taken into account in the operating time factors to be applied to the available time.

The following time factors have been used in these calculations:

Kiln drying	0.90	
Sawing	0.60	
Milling operations	0.60	(planer/moulder 0.4)
Assembly	0.80	
Finishing	0.80	

6.1.2
Summary of Pieces to be Machined

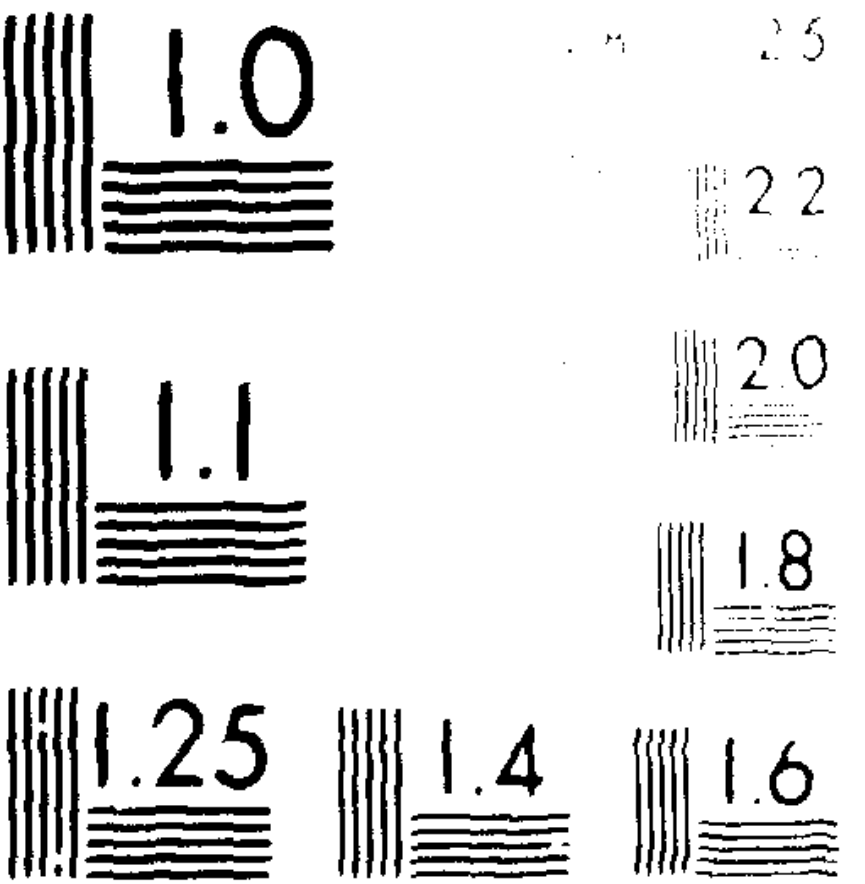
	m/a	Pieces/a
Stiles and rails	187 170	136 000
Panels	152 340	356 650
Frames of door leaves	107 650	345 120
Sills	19 720	20 000
Total	466 880	857 770
Mouldings	777 100	3 032 940
Frames	155 500	90 010
Frame pieces before gluing	406 300	234 590

6.1.3
Number of Components to be Machined

Doors

	pcs/a
Type of door leaves	
- type A	7 700
- type B	850
- type C	3 500
- type D	6 150
- type E	7 800
- type F	1 002
- type G	1 458
- type H	165
- type I	1 375
TOTAL	30 000

Components/a			
Stiles and rails	Panels	Frames of door leaves	Mouldings
30 800	161 700	154 000	1 293 600
3 400	-	17 000	142 800
14 000	14 000	10 500	112 000
24 600	49 200	43 050	393 600
31 200	62 400	54 600	499 200
8 016	12 024	10 020	96 190
11 664	40 826	37 910	326 590
1 320	-	4 290	36 960
11 000	16 500	13 750	132 000
136 000	356 650	345 120	3 032 940


1.0
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

	Products/a	Components/a	
		Head and jamb pieces	Pieces before gluing
Frames			
- size 42 mm x 92 mm	11 813	35 440	70 880
- size 42 mm x 131 mm	10 168	30 510	91 530
- size 42 mm x 160 mm	8 019	24 060	72 180
Total	30 000	90 010	234 590
Sills			
- size 22 mm x 92 mm	7 880	7 880	
- size 22 mm x 131 mm	6 780	6 780	
- size 22 mm x 160 mm	5 340	5 340	
Total	20 000	20 000	

6.1.4
Lenght of Components to be Machined

Products	Stiles and rails
Door leaves	
- type A	42 740
- type B	4 700
- type C	19 600
- type D	34 850
- type E	43 900
- type F	10 640
- type G	14 500
- type H	1 640
- type I	14 600
TOTAL	187 170

1) without cutting waste

Components m/a[1)]		
Panels	Frames of door leaves	Mouldings
55 660	32 400	238 300
6 100	-	26 200
7 660	11 830	63 400
26 000	19 500	135 000
32 700	24 600	169 700
5 600	4 700	33 100
9 850	8 170	58 640
1 120	-	7 330
7 650	6 450	45 430
152 340	107 650	777 100

	Products/a	Components m/a: Head and jamb pieces	Components m/a: Pieces before gluing
Frames			
- size 42 mm x 92 mm	11 813	60 200	120 400
- size 42 mm x 131 mm	10 168	52 300	156 900
- size 42 mm x 160 mm	8 019	43 000	129 000
Total	30 000	155 500	406 300
Sills			
- size 22 mm x 92 mm	7 880	7 220	
- size 22 mm x 131 mm	6 780	6 350	
- size 22 mm x 160 mm	5 340	6 150	
Total	20 000	19 720	

6.1.5
Sawing of Logs

Technical data

- log input	m^3s/a	6 870
- average size of logs		
- length, average	m	4.00 [1]
- average log diameter	m	0.54
- number of logs	logs/a	7 500
- average cuts in band headrig	cuts/log	14 [2]
- average cuts in resaw	cuts/log	33
- sawing in band headrig	cuts/a	105 000
- sawing in resaw	cuts/a	247 500

Required capacity of band headrig:

$$\frac{105\ 000}{126\ 000 \times 0.60} = 1.39 \text{ cuts/min}$$

Required capacity of resaw:

$$\frac{247\ 500}{126\ 000 \times 0.60} = 3.27 \text{ cuts/min}$$

Band headrig capacity

- loading of logs on the carriage, turning and removing to last flitches	min/log	2.0
- sawing and return time	min/cut	0.4
- sawing time total (14 x 0.4 + 2)	min/log	7.6
- capacity of band headrig $\left(\frac{14}{7.6}\right)$	cuts/min	1.84

One band headrig with carriage would be sufficient.

1) See section 5.2.1
2) Cutting patterns cannot be given as each log would have a different one, depending on log size, dimensions in demand, species and defects in the log

Resaw capacity

- sawing time $\frac{30 \text{ m/min}}{(4+1) \text{ m/cut}}$	cuts/min	6

One resaw would be needed.

6.1.6
Kiln Drying

Design data

- green sawnwood to be dried	m^3	
- dark coloured wood		2 410
- light coloured wood		3 704
Total		6 114
- initial moisture content of wood, average	%	80[1]
- final moisture content of wood after drying	%	10 ± 2
- average thickness of sawnwood	mm	40
- average length of sawnwood	m	4.0
- estimated drying time		
- dark coloured sawnwood	d	14[2]
- light coloured sawnwood	d	12

Size of kiln load (geometrical)

- length	m	6
- width	m	1.3
- height	m	3.2
Thickness of sticks	mm	25
Layor capacity factor		0.94
Number of kiln loads per chamber		4

Average wood volume per kiln load

$$\left(\frac{3.2}{0.04 + 0.025}\right) 1.3 \times 0.04 \times 4.0 \times 0.94 = 9.6 \text{ m}^3$$

1) For calculation purposes only
2) Calculated on the basis of Kiln Drying of Sawn Timber, Robert Hildebrand Maschinenbau GmbH, 1970, and allowing for a safety factor of 1.3

Number of kiln chambers:

- for dark coloured wood species

$$\frac{2\ 410 \times 14}{330 \times 9.6 \times 4 \times 0.90} = 2.96$$

- for white coloured wood species

$$\frac{3\ 704 \times 12}{330 \times 9.6 \times 4 \times 0.90} = 3.90$$

A total of 6.86 kiln chambers would be needed, so 7 chambers would be suitable.

The calculation was based on the assumption that the utilization factor in kiln drying would be 90 percent. In factory-made steel construction drying chambers it normally lies between 90 and 95 percent because of simple machine design and control systems.

The drying chamber is reloaded immediately after removing dried loads, because stickered loads are ready. Thus 7 chambers would be adequate.

The drying time varies depending on wood species, thickness and moisture content. In this calculation the rated usage of wood raw material to be dried has been calculated to be 6114 m^3/a of which dark coloured wood species would account for about 40 percent and light coloured for about 60 percent. Corresponding drying times are 14 days and 12 days. Other factors are: average thickness of sawnwood 40 mm, average initial moisture content 80 percent and final moisture content 10 percent.

The highest initial temperature in drying would be 40-45°C and highest temperature below 25 percent average wood moisture content, 60-70°C.

The drying schedule would be selected individually for each drying charge, but the following schedule could be given as a guideline for a drying gradient[1] between 2.3 and 3.4.

1) instantaneous wood moisture content per average wood equilibrium moisture content

Wood moisture content %	Average wood equilibrium moisture content %
initial - 60	13 - 16
60 - 50	12 - 15
50 - 40	11 - 13
40 - 28	10 - 11.5
28 - 25	8.5 - 10
25 - 23	8 - 9
23 - 21	7 - 8.5
21 - 19	6.5 - 7.5
19 - 17	6 - 7
17 - 15	5.5 - 6
15 - 13	4.5 - 5.5
13 - 11	4 - 4.5
11 - 10	3 - 4

The drying times described in these calculations are average values for dark and light coloured wood species with average thickness, initial moisture content and weight. This is because the values and the factors affecting them are not known in detail.

In general, the drying time is dependent on wood thickness, density, initial moisture content, drying temperature and air velocity.

Drying time (t) can be described mathematically as follows:

a) Wood thickness d

$$\frac{t_1}{t_2} = \left(\frac{d_1}{d_2}\right)^n \qquad n = 1.1 - 2$$

b) Wood density s

$$\frac{t_1}{t_2} = \left(\frac{s_1}{s_2}\right)^n \qquad n = 1.5 - 2.4$$

c) Wood moisture content
u_i = initial m.c.
u_f^i = final m.c.

$$\frac{t_1}{t_2} = \ln \frac{u_i}{u_f}$$

d) Drying temperature T

$$\frac{t_1}{t_2} = \left(\frac{T_1}{T_2}\right)^{-n} \qquad n = 1 - 3.4$$

e) Air velocity v

$$\frac{t_1}{t_2} = \left(\frac{v_1}{v_2}\right)^{-n} \qquad n = 0.5 - 0.6$$

6.1.7
Cross-cutting

The amount of sawnwood to be machined would be as follows:

	pcs/a	m/a	m^3/a
- sawnwood for mouldings	600 000 (1	155 400	
- frames	90 010	155 500	
- others	857 770	466 900	
Total net	1 547 780	777 800	5 684

Required cross cutting capacity with 10 % cutting waste would be

$\frac{777\ 800 \times 1.1}{126\ 000 \times 0.6}$ = 11.3 m/min; $\frac{5684\ m^3/a}{300\ d/a}$ = 19 m^3/d; 23 pcs/min

Three cut-off saws would be needed, of which one would be radial type and two air operated.

6.1.8
Rip Sawing

The amount of sawnwood to be machined would be:

- mouldings $(\frac{777\ 100}{5})$	m/a	155 400
- frames	m/a	155 500
- other components	m/a	466 880
Total	m/a	777 780

Required capacity of machine

$\frac{777\ 780 \times 1.1}{126\ 000 \times 0.6}$ = 11.3 m/min

One multi-rip saw for general cutting and one power rip saw with one saw blade for quality cutting would be needed.

1) With multiple length of small mouldings

6.1.9
Planing and Moulding

The length of components to be machined would be:

- frames	m/a	155 500
- frame pieces before gluing	m/a	406 300
- other components	m/a	466 880
- mouldings	m/a	777 100
Total	m/a	1 805 780

Required capacity of planing and moulding machines

$$\frac{1\ 805\ 780}{126\ 000 \times 0.4} = 35.8 \text{ m/min}$$

With three machines the average speed would be 11.9 m/min.

Two planing and moulding machines with straightening units and one molding machine would be needed for machining door components.

6.1.10
Profile Sanding

The length of components to be machined would be:

- mouldings	m/a	777 100
- frames	m/a	155 500
- other components	m/a	100 000 [1]
Total	m/a	1 032 600

Required capacity of machines

$$\frac{1\ 032\ 600}{126\ 000 \times 0.6} = 13.7 \text{ m/min}$$

One profile sanding machine would be needed.

1) estimate

6.1.11
Tenoning and Precision Cross-cutting

The amount of components to be machined would be:

- frames	pieces/a	90 010
- sills	"	20 000
- frames of door leafs	"	345 12^
- stiles and rails	"	136 000
	pieces/a	591 130

$$\frac{591\ 130}{126\ 000 \times 0.6} = 7.8 \text{ pieces/min}$$

Distance between work pieces would be 0.3 m with a feed speed of 0.3 x 7.8 = 2.3 m/min.

End profiling of door leaf
- 10 % of door leaves would be rebated

Machine capacity for end profiling

- height of door leaf	m	2
- width of door leaf	m	0.9

Total length	m/a
3000 x 2	6 000
3000 x 0.9	2 700
Total	8 700

Distance between doors in feeding would be about 0.3 m.

Machine capacity

$$\frac{3\ 000 \times 0.3 + 8\ 700}{126\ 000 \times 0.6} = 0.13 \text{ m/min}$$

One double end dimensioning and profiling machine would be needed.

6.1.12
Mortising

Components to be machined:

- stiles and rails	pieces/a	128 000
- frames of doors	"	72 800
Total	pieces/a	200 800
Holes to be mortised	holes/a	777 000

Capacity of machines:

$$\frac{200\ 800}{126\ 000 \times 0.6} = 2.7 \text{ pieces/min (components)}$$

$$\frac{777\ 000}{126\ 000 \times 0.6} = 10.3 \text{ pieces/min (mortised holes)}$$

Three hollow chisel mortising machines and one multi spindle mortising machines with oscillating tool action would be needed.

6.1.13
Sanding

Units to be handled with sanding machine:

- panels	m/a	152 340
- wide doors	doors/a	30 000
- narrow doors	doors/a	4 000

Panels would be fed three at a time. Average lengtn of door leaf would be 2 m.

Required capacity of sanding machine

$$\frac{152\ 340/3 + 34\ 000 \times 2}{126\ 000 \times 0.6} = 1.6 \text{ m/min}$$

One wide belt sanding machine equipped with one contact roll and one sanding shoe above the feeding belt would be needed.

To sand both faces work pieces would have to be fed twice through the machine with an average feeding speed of 2 x 1.6 = 3.2 m/min.

Door sanding with narrow belt sanding machine

- horizontal parts of door leaf would be sanded with manually operated sanding machine
- door leaves to be sanded — leaves/a — 34 000

Required capacity of machine

$$\frac{34\ 000}{126\ 000 \times 0.6} = 0.5 \text{ doors/min}$$

One narrow belt sanding machine would be needed.

6.1.14
Moulding (Shaping)

Components to be machined

- panels	pieces/a	356 650
- panels	m/a	152 340

Average width of components 180 mm.

Required capacity of machine

$$\frac{356\ 650}{126\ 000 \times 0.6} = 5 \text{ panels/min}$$

$$\frac{2 \times 152\ 340 + 2 \times 0.18 \times 356\ 650}{126\ 000 \times 0.6} = 6 \text{ m/min}$$

Two spindle moulder with sliding table, one tilting arbor saw, one single end tenoning machine and two routing machines would be needed.

6.1.15
Mortising for Hardware

Components to be machined

- frames	frames/a	90 010
- door leaves	door leaves/a	34 000

Required machine capacity

$$\frac{90\ 010}{126\ 000 \times 0.6} = 1.2 \text{ pcs/min}$$

$$\frac{34\ 000}{126\ 000 \times 0.6} = 0.5 \text{ doors/min}$$

One hardware mortising machine for frame pieces and one hardware recessing and mortising machine for door leaves would be needed.

6.1.16
Assembling of Doors

Doors to be assembled

- door leaves/a 34 000

Required machine capacity

$$\frac{34\ 000}{126\ 000 \times 0.8} = 0.337 \text{ doors/min} = 3.0 \text{ min/door}$$

Two machines would be needed when capacity per machine is 6.0 min/door.

6.1.17
Gluing

The component to be joined

- head and jamb pieces after joining m/a 155 500
- head and jamb pieces before joining m/a 406 300

Area of glue joint would be about 0.05 x 406 300 = 20 320 m^2/a

Machine data
- filling rate 0.7
- operating time factor 0.6
- capacity of machine with a generator power of 12 kW is 0.5 m^2/min

Number of gluing lines

$$\frac{20\ 320}{0.7 \times 0.6 \times 126\ 000 \times 0.5} = 0.8$$

One gluing line would be needed.

6.1.18
Lacquering of Doors

- Door leaves to be finished with lacquer leaves/a 34 000
- Frame and sill components components/a 90 010
- Distance between pair of door leaves on drying conveyor m 0.5
- Frame components would be on stands hung from an overhead conveyor. There would be six components per stand and the distance between two stands m 0.5
- Drying time min 40+40

Speed of conveyor

$$\frac{34\ 000 \times 0.5}{2 \times 126\ 000 \times 0.8} = 0.084 \text{ m/min}$$

$$\frac{90\ 010 \times 0.5}{6 \times 126\ 000 \times 0.8} = 0.074 \text{ m/min}$$

Total 0.158 m/min

Length of the drying zone 0.158 x 80 = 12.6 m

6.1.19
Stores

a) Storage area for wood raw material for 3 months

- logs	m^3	1 800
- sawnwood	m^3	600
Total	m^3	2 400

Storage area for sawnwood

- specific area for sawnwood	m^3/m^2	1.0
- specific area for logs	"	1.0

Storage area

for sawnwood $\frac{600}{1.0} = 600\ m^2$

for logs $\frac{1\ 800}{1.0} = 1\ 800\ m^2$

b) Store for dried sawnwood

- storage time one month equaling	m^3	520
- specific area	m^3/m^2	2.1

Floor area needed

- sawnwood $\frac{520}{2.1} = 250\ m^2$
- passages 450 "

Total area 700 m^2

c) Store for products

- storage time one month equalling 2730 doors
- effective storage area door/2 m^2 20
  door/m^2 10

Floor area needed

$\frac{2730}{10} = 273\ m^2$

passages 335 "

Total area 608 m^2

6.2
Process Description

6.2.1
General

The aim of this description is to give a general survey of the process flow and working methods in the factory.

The description is based on the drawings

- K3885-HM-2002
- K3885-HM-1001
- K3885-HM-2001

process flow diagram K3885-HMR4001 and the technical design and calculations presented in this study.

Most of the machines are separate units and all the manufacturing lines are for one production phase only. The degree of automation is low and each production unit requires an operator and receiver.

6.2.2
Handling of Wood Raw Material

This study is based on the assumption that 33 percent of dried sawnwood would be purchased as sawnwood and 67 percent as logs. Taking shrinkage and wood waste and logs into account the total consumption of wood raw material would be 9040 m^3/a.

The logs would be transported to the mill site by truck from the harbour where they have been shipped from Mindanao. On the mill site the raw material would be unloaded by front-end loader and piled in the log yard by species. No sprinklers would be provided. Logs would be sprayed with fire hoses when necessary. If logs are not debarked in the forest, they would be debarked at the log yard manually before sawing.

Sawnwood would also be delivered green by truck and unloaded by fork-lift truck. Green sawnwood would be stored in the area between the sawmill and door factory.

6.2.3
Sawing

The logs would be carried by front-end loader to the infeed deck (101-01) from where they would be conveyed via a log loader to the carriage of the log band saw (101-02). The carriage would be furnished with four clamps and necessary control devices. The band saw, with a saw pulley diameter of 1400 mm, would cut the logs into dimensions suitable for door manufacture and not generally obtainable from the existing sawmills. Part of the logs and flitches would be sawn in a resaw, depending on the cutting pattern.

The cutting pattern would be different from the traditional one, as it would be designed to produce special dimensions for the mill and to maximize the yield and quality. Because of the complexity of the pattern, which would have to be designed according to the log diameter and the dimensions in demand, no general cutting pattern can be given.

The sawnwood would go direct to the roll conveyor (101-03) and the sorting table.

Vane or irregular pieces would fall on a table beside the board edger for edging.

A cross conveyor (101-04) would take part of the logs or flitches to the feeding table of existing band resaw (101-05) for cutting into desired thicknesses. Unsuitable sawnwood dimensions would be fed with a cross conveyor (101-04) direct to resawing, if required.

Thicker pieces would be fed back to roll table (101-09) via conveyors (101-07) and (101-08) and further to the resaw.

Ready sawnwood pieces would go to the sorting table by roll conveyor (101-06). Board to be edged would go to cross conveyor (101-10) and further to the board edger (101-11). The board edger would be equipped with two saw blades and operated manually.

Sawn boards, battens and planks would be sorted manually on the sorting table (101-13) by pulling them onto the carriage (101-14). At this stage the sawnwood would be sorted by thicknesses only. Final sorting by thickness and width would take place after drying.

During green sorting part of the kiln stack would be piled on the carriage with sticks between each layer. The size of the kiln stack after sorting would correspond to a third of the full kiln load. The full stack would be moved by fork-lift truck to the kiln carriage. Kiln loads would be made of three stacks on top of each other.

All strips from machines (101-02), (101-05) and (101-11) would go to the sorting table (101-13) where they would fall onto a transport stand and be carried for intermediate storage near the boiler plant.

Saw blades would be sharpened in the saw doctoring room with special sharpening machines.

6.2.4
Kiln Drying and Storing of Sawnwood

Sawnwood purchased from outside sawmills would be stickered direct onto kiln carriages (111-02). This work would be done manually.

Kiln loads with a height of 3.2 m would be pushed along the track into the kiln chamber (111-01) using a transversally moving transfer car (111-03).

The kiln chambers would be equipped with air circulation fans, heating coils, throttle valves and remote-controlled air conditioning equipment. The kiln schedule would be determined according to wood species and wood properties individually for each chamber.

The drying time depends on the initial moisture content, thickness and properties of the wood. However, drying should be mild, because strong drying would reduce wood quality.

Effective recording and sample testing during drying is absolutely necessary.

After drying the kiln loads would be moved manually to the cooling shed where they would be cooled before piling. The purpose of cooling is to reduce internal tension in the wood before processing.

Unloading and final sorting by dimensions of cooled ad would be done manually in the sawnwood store. Pil s of 1 m x 1 m x length would be moved in the store by .ift truck.

Storing of dry sawnwood and the consequent processing time should be minimized to avoid excessive moisture pick-up from the air. The maximum storing time in mill conditions for various species and markets should be determined, because the equilibrium moisture content of wood may vary from 5 percent to 15 percent depending on the country and season. The storing time of dry sawnwood may be increased by tight piling and by covering the piles e.g. with plastic.

6.2.5
Machining

a) Cross-cutting

Dry sawnwood stacks (1 m x 1 m) would be carried from t e store by carriage to the saw infeed table.

Sawnwood would be fed manually to the infeed table. There would be two air-operated saws (121-02) and one radial cut-off saw (121-01).

The work pieces would be sorted manually by length and partly by colour on the sorting table (121-03).

Short pieces would be taken as multiple lengths. At the mill all transport would be by pallet lift-truck.

b) Sawing

The sawnwood would be cut into suitable dimensions in the sawmill. Narrow items such as frames of door leaf mouldings and frame pieces would be sawn from wider sawnwood with a multiple rip saw (121-05) or rip saw (121-06). The saws would be equipped with powered feeding units, but infeed and outfeed would be manual.

c) Planing, moulding

Panels that are too wide for the planing and moulding machines would be machined in a surface planer and jointer (121-07).

The thickness of wide panels would be adjusted in a thickness planning machine (121-09). After thickness trimming the work pieces would be manually classified by colour to ensure end products of even colour, which is an important quality aspect.

All items narrower than 225 mm would be machined in a planing and moulding machines (121-08). The final profile, including grooves, would be produced on these machines that would be equipped with 5 cutter heads. Straightening units would be installed ahead of the planing and moulding machines. The feeding speed would be variably controllable in the range 0-40 m/min.

Smaller items such as mouldings would be machined in a moulding machine (121-16).

d) Jointing

All frames i.e. heads and jambs would be jointed in a jointing station, including glue spreader, hydraulically operated press and high frequency generator for glue hardening.

The press would operate periodically, the maximum press opening being about 0.6 m.

Radio frequency jointing using dielectric heating is an old and well-known technique in wood gluing. In this method the energy is absorbed and stored in the glue joint in the form of electric polarization in the glue exposed to an electric field. In this way, heat is generated inside the material itself. By arranging the glue lines in the direction of the RF field, the heating is further concentrated in the glue,

i.e. just where it is wanted. The gluing time can thus be reduced to a few seconds. This is the economic reason why RF heating is much used particularly in joinery mills. This technique also has some other advantages:

- the glued products can be cut or planed immediately after leaving the press
- the press not only provides high production capacity, it also saves floor space
- the machines are easy to operate so the number of skilled workers can be minimized
- machines and electric parts require little maintenance

e) Profile sanding

When a fine quality profile surface is desired the pieces would be fed through a profile sanding machine (121-17). Particularly mouldings and sometimes profiled edges of stiles and rails would be processed in this machine.

f) Moulding, shaping, tapering, precision cross-cutting

The above-mentioned work stages would be needed for panel edges with different forms and profiles and for small size panels cut from multiple lengths.

For these work stages the following machines would be included:

- tilting arbor saw (121-12)
- single end tenoning machine (121-14)
- spindle moulders (121-13)

The machines would be operated manually.

g) Tenoning, precision cross-cutting and profiling

Normally all tenons for work pieces and precision cross-cutting for stiles would be done by a double end tenoning machine (121-15).

Rabbeting of door leaves would also be done by this machine, if required. The machine would be equipped with feeding chains, but the infeed and outfeed would be manual.

h) Mortising

Mortising for tenon joints would be machined with three hollow chisel mortising machines (121-18) and one multi spindle mortising machine (121-19) which would be equipped with four oscillating heads.

i) Routing

For special purposes of panels there would be two routers (121-23) with a spindle speed of 16 000 - 18 000 1/min.

Hand carved panels would also be used, but they would have to be ordered from outside workers.

j) Boring and mitre cross-cutting

Bore holes would be made with a multi-spindle boring machine (121-22). Cross-cutting for mouldings would be made by cross cutting machine (121-21).

6.2.6
Assembling, Hardware
Mortising and Finishing

a) Assembling

Frames of door leaves would be assembled with pneumatically operated assembly presses (122-03). Joints would be spread with adhesive before assembling.

Mouldings and parts of panels would be assembled on a table in the finishing department.

b) Mortising for hardware

Frame pieces would be mortised with a mortising machine (121-20).

Doors would be mortised after sanding and rabbeting and before assembling mouldings. All holes required for hinges, locks and cover plates would be mortised in the same machine (122-04).

c) Sanding

Flat panels would be sanded before assembling in the machine (122-01). Assembled frames of door leaves would be sanded in the same machine.

Cross-direction pieces of door leaves, excluding panels, would be sanded in a manually operated narrow belt sanding machine (122-02).

f) Finishing

A separate finishing department would be provided at the door factory. The finishing operations would be divided into the following stages:

- preoperational work
- staining
- waxing
- lacquer coating

Preoperational work would consist of repairing surfaces to be finished. For example small holes on the surface would be filled with putty with a colour corresponding to the colour of wood. Larger holes would be repaired by skilled carpenters using wood and glue.

For glossy surface doors the surface would be treated manually with sanding seales.

Staining would be carried out with ready-made staining solution or with a solution made from pigments according to the desired colour tone. Normally staining would be done manually, but a possibility for doing it with spraying equipment would be reserved.

Part of the doors and frames would be coated with wax. This work would be done manually.

Lacquer coating would be applied with special machinery (122-05) including spraying devices. For drying there would be a drying tunnel equipped with an overhead conveyor with attachments for components to be finished. The length of the drying tunnel has been calculated assuming that the entire production would be lacquer-coated.

Most of the lacquer would be low-gloss and possibly with an ultraviolet inhibitor. The type of resin in the lacquer would be mainly polyurethane but also melamine modified resin particularly for interior doors would be used. The number of coats to be applied would depend on the quality requirements of the customers.

Coating would be performed in the spraying cabinet using airless spraying to reduce the waste of lacquer. After spraying the lacquer coating would be hardened in the drying tunnel and sanded manually between each application. Dimming or polishing would be done manually, if required.

Glasses for door leaves would be fitted after all finishing operations. Glasses would be assembled with mouldings.

6.2.7
Storing of Finished Products

Door leaves would be packed by threading them into plastic bags. A thin steel plate would be used to facilitate threading. The end of the bag would be closed by heating, tape or similar. The bags would be wrapped in corrugated board before loading into containers for transport abroad. Similar packing would be used for the domestic market.

Frames and sills would be packed basically in the same way as door leaves but without assembling.

The door leaves would be piled in the store by type and size.

6.2.8
Waste Disposal and Handling

Sawdust from the sawmill would be conveyed by a pneumatic conveying system (100-01) (see drawing No. K3885-HM-2002) to a waste silo in the boiler plant. Strips and other waste wood from the sawmill would be carried by front-end loader to the storage area behind the boiler plant.

Shavings, sawdust, sanding dust and other waste from the door factory would be conveyed pnaumatically in pipes (123-01) (see drawing No. K3885-HM-1001) to the dust filter (123-02) where dust and waste would be separated from the suction air and then blown to the waste silo with a small pneumatic conveying system (123-03).

Cutting ends and strips from the door factory would be collected into the storage area behind the boiler plant from where part of the cutting ends would be sold to local furniture makers.

Part of the strips coming from the sawmill and door factory would be chipped and used as fuel in the boiler particularly during weekends, if other residues are not available.

Remaining strips and cutting ends would be sold without chipping to use as fuel in nearby houses.

In the waste silo the sanding dust would be mixed with shavings and sawdust. The mixture would be used as fuel in the boiler.

The residues would be fed from the silo to the boiler by a discharger device under the silo and by a screw-type feeder between the silo and the boiler.

The bark content of logs after transport would be about 7 percent. If all logs were debarked in the log yard, the annual amount of bark would be about $0.07 \times 6870 = 480\ m^3$.

Because there are enough wood residues for heat generation without bark, it would be removed from the mill site.

6.2.9
Heat Generation

Wood residues would be used to generate heat energy for kiln drying and hardening the lacquer coating.

The silo (721-01) would be made of steel plate and equipped with discharging device. The wood residue would be fed by screw conveyors from the silo to the boiler (721-02).

The wood waste boiler with a capacity of 1.0 MW would include all necessary control devices and valves and smoke stack. The heating medium would be water at a pressure of 3-4 bar.

A chipper (721-03) would be used for making fuel from strips if required for example during weekends.

6.3 Heat Power and Water Requirement

6.3.1 Heat Requirement

Heat Energy for Kiln Drying

All sawnwood would be kiln-dried to a moisture content of 10 percent. Calculation basis:

- sawnwood to be dried	m^3s/a	6114
- dried sawnwood	m^3s/a	5684
- initial moisture content of wood	%	80[1)]
- average wood weight moisture content 0 %	kg/m^3	502
- final moisture content of wood after drying	%	10
- specific energy consumption of kiln drying process including energy losses	GJ/t (water)	4.2

The annual consumption of heat energy in drying would then be 0.502 x (0.8 - 0.1) x 5684 x 4.2 = GJ/a 8390

Heat Energy for Lacquer Drying

Specific consumption, assuming that all 30 000 door sets are finished with lacquer, would be 1.0 GJ/h.

Annual consumption would thus be 1.0 x 300 x 8 = GJ/a 2400.

6.4 Power and Water Requirement

6.4.1 Power Demand

The estimated power demand would be 400 kW and the estimated annual energy 1440 MWh. The total installed motor power would be about 1000 kW.

1) For capacity calculation of boiler only

Installed power would be as follows:

	kW
- woodhandling and sawing	210
- door factory, dry kiln, dust collector and boiler plant	720
Total installed motor power	1 000

6.4.2
Water Supply

The present water facilities would be adequate. No other water system for the mill would be feasible. The present water supply equipment includes an overhead water storage tank with a capacity of 5000 gallons and a deepwell pump. These would also be adequate for the new factory.

The suitability of water for the boiler and for use as drinking water must be tested, and water treatment systems designed accordingly.

7
MILL SITE

7.1
Site Description

The proposed mill site of 26 850 m^2 is owned by Vintawood Inc. It is situated beside the Mac Arthur highway in De la Pas, San Fernando, Pampanga. The feeder road from the highway to the mill site is about 300 m.

An area about 50 km on both sides of the highway has been recently declared an industrial zone.

Electricity and telephone system would be easy to arrange.

The mill site would be improved by paving mill roads and area and by landscaping.

The following areas and roads would be paved:

- feeder roads	(macadam)	m_2	300
- mill roads	(gravel)	m_2	5000
- mill areas	(gravel)	m_2	2000
- log yard	(gravel)	m^2	3600

7.2
Buildings

7.2.1
Existing Buildings

a) Sawmill building

The present sawmill building would be demolished, because it is too small for the new equipment of sawmill. The present resaw machine would, however, be used in the new sawmill.

b) Kiln drying building

The existing buildings with an area of 100 m^2 consist of two chambers. Being totally unsuitable they would be demolished and new dry kilns installed in the same place.

Two drying chambers are not sufficient and their present condition does not fullfill the requirements of proper kiln drying.

c) Factory buildings

On the mill site there are two factory buildings with a floor area of 1858 m^2 each. Steel is used in the bearing structure, with concrete and bricks as wall materials.

The floors of both buildings are concrete. The floor surfaces are good which is extremely important in a joinery factory where loads are conveyed by pallet lift-truck.

The existing factory buildings would need only minor changes at the renovation stage.

Partition walls separating stores, maintenance and office rooms would be erected, and lighting and air ventilation improved.

d) Toilet, washing and canteen

These buildings are situated in the corner of the site. They are made of concrete and bricks.

The buildings would be renovated and provided with new indoor furnishing.

7.2.2
New Buildings

a) Sawmill building

The building area would be about 865 m^2, including rooms for foremen and saw doctoring (170 m^2). The building would have one storey with the bearing structure of steel and floor of concrete. Walls would be built of timber and corrugated steel. The roof would be made of corrugated steel sheets.

The shed above the green sorting table, with a floor area of about 400 m^2, would be built with steel columns and steel beams as a bearing structure but with no walls or floor. The roof would be corrugated steel.

b) Kiln drying building

The kiln drying chambers would be made of steel or aluminium elements on a concrete foundation. No separate roof would be needed. The foundation area would be about 470 m^2.

c) Shed between dry kilns and factory building

The shed for storing kiln loads would be constructed in the same way as the shed above the green sorting table. In addition, foundations for tracks would be made. The total floor area would be about 530 m^2.

d) Building between existing factory buildings

This building would be constructed in the same way as the existing buildings.

An area of 700 m^2 would be reserved for dry sawnwood and an area of 1050 m^2 for the door factory. The total area to be built would thus be 1750 m^2.

e) Storage for surface finishing materials and other chemicals

A building of about 25 m^2 would be built beside the parking area using wood and steel sheets as construction materials.

7.3 Heat Generation and Supply

7.3.1 General

Heat energy would mainly be needed for sawnwood dry kilns and for the lacquer drying tunnel in finishing.

The temperature range in the above-mentioned processes is 40-80°C so steam generation would not be needed. The heating medium would be hot water at a pressure of 2-3 bar.

The heat energy would be generated using wood waste as fuel. The price of heating oil is very high in the Philippines. For example bunker-oil costs ₱ 2120/t = USD 277/t.

7.3.2 Wood Waste Available for Heat Energy Generation

The following amounts of wood waste would be available:

Wood residues from sawing		
- strips and other residues	m^3s/a	1 970
- sawdust	"	830
Total	m^3s/a	2 800
Wood residues from milling and finishing in joinery		
- strips	m^3s/a	126
- cutting waste	"	569
- shavings, sawdust and other waste from milling and finishing	"	1 705
Total	m^3s/a	2 400

7.3.3 Heat Content of Wood Waste

Specific heat content of wood waste:

- residues from sawing		
- heat content at 40 % moisture	GJ/t	8
- weight	t/m^3s	0.605
- residues from joinery		
- heat content at 10 % moisture	GJ/t	15
- weight	t/m^3s	0.531

Total heat content	GJ/a
- residues from sawing	
- strips and other residues	9 540
- sawdust	4 020
Total	13 560
- residues from joinery	
- strips	1 000
- cutting waste	4 530
- shavings etc.	13 580
Total	19 110

7.3.4
Capacity of the Boiler

The need for heat energy in the mill would be:

	GJ/a
Kiln drying	8 390
Lacquer drying	2 400
Total	10 790

The capacity of the boiler with an efficiency of 0.70

Kiln drying

$$\frac{8390}{330 \times 24 \times 60 \times 60 \times 0.7} \times 1000 = 0.420 \text{ MW}$$

Lacquer drying

$$\frac{2400}{300 \times 8 \times 60 \times 60 \times 0.7} \times 1000 = 0.397 \text{ MW}$$

Total 0.817 MW

With a peak of 1.2 x 0.817 MW the capacity of the boiler would be 1.0 MW.

7.3.5
Wood Waste Consumption in Boiler

Wood waste to boiler	GJ/a
- sawdust from sawmill	4 020
- shavings etc. from joinery	13 580
Total heat content	17 600
- handling waste losses 6 %	1 060
	16 540

The need for wood waste with a boiler efficiency of 70 % would be

$$\frac{10\ 790}{0.7} = 15\ 400\ \text{GJ/a}$$

This means that the wood waste with a heat content of 16 540 GJ/a would be sufficient.

A chipper and blowing unit would, however, be reserved for chipping the strips for use as fuel in the boiler. This is necessary because boiler would have to be running 24 h/d whereas the waste supply from joinery would vary.

The remaining wood waste such as strips from sawing and strips and cutting waste from joinery, would be sold for use as fuel or to local small furniture plants.

7.4 Power and Water Supply

7.4.1 Power Distribution

The power demand and installed motor power are assessed in section 6.4.

The following voltages would be used:

Incoming supply	36 kV, 3-ph. 60 Hz
Secondary distribution and motors	440 V, 3-ph. 60 Hz solidly earthed
Lighting	220/110 V, 1-ph. 3-wire, 60 Hz solidly earthed, middle point

A one-line power distribution diagram is shown in drawing No. K3885-HE-4001.

The utility power would be supplied through a 36 kV overhead transmission line to the factory.

A 36/0.44 kV substation would be erected on the factory site close to the terminal pole of the 36 kV line. A transformer and 440 V switchboard would be mounted in an open shed. The switchboard would feed the motor control centers in the sawmill and door factory through under-ground cables, as shown in the one-line diagram.

Transformers

The 800 kVA, 36/0.44 kV power transformer would be outdoor type, three-phase oil-immersed transformer with an off-load tap-changer of $\pm$ 2 x 2.5 %. Lighting transformers would be small enclosed dry-type transformers in connection with the lighting boards.

Low Voltage Switchgear Assemblies

The LV motor control centers (MCC) and other LV switchboards would be box-type switchboards. The MCC's would be in the factory departments close to the power concentration. No electrical rooms would be needed.

Lighting and Outlets

General indoor lighting would be provided by luminaires fitted with fluorescent lamps and explosion-proof lighting fixtures in the painting section. Outside area lighting would be by lanterns mainly mounted on the roof or walls of the buildings.

7.4.2
Water Supply

Water from the existing water tank would be distributed through underground steel or plastic pipes to the office and personnel rooms.

7.5
Effluent Treatment

The mill would generate the following effluents and pollutants:

- solvent fumes from painting
- paint residues from spray painting
- flue gases from the boiler
- sanitary water
- wood dust

The solvent and paint fumes from painting and drying would be released into the air, as there is no practical way to clean the ventilation air.

Spray-painting would be done in a painting chamber where a water curtain would pick-up most of the residual paint. Water would be circulated and cleaned when necessary. Paint residues would be collected e.g. into old paint barrels and disposed of.

There is no viable way of cleaning the soot from the flue gases in such a small boiler as proposed here.

For sanitary water from the office and personnel rooms effluent piping and a septic tank would be installed.

Wood dust collection has been described in section 6.2.8.

7.6
Mill Layout

The mill layout is described in drawing No. K3885-HM-2001.

New and demolished buildings are shown in the layout.

The old buildings and their location on the site are based on the drawings of Vintawood Inc.

8
ORGANIZATION

8.1
Personnel Requirement

8.1.1
General

The organization for the door factory would be built up taking into account the capacity of the factory, the current ownership of the company and the experience and education of the personnel to be incorporated in the organization. Above all attention should be paid to its efficiency.

The structure of the organization should be clear and the tasks of each person in the organization should be specified in detail.

The flow of information upwards and downwards in the organization should be fast and efficient and the responsibilities for each task should be determined.

8.1.2
Type of Organization

The general supervision and management of the door factory would be subordinated to Vintawood Inc. in which the board of directors together with the president would have the highest decision-making power.

The organization would be as follows:

A mill manager e.g. the president would assume overall responsibility for the door factory.

The actual mill organization would be divided into three departments:

- Marketing department
- Production department
- Administration department

The main responsibilities of each department would be as described in the following:

Marketing department

- sales both in the local and foreign markets
- distribution of products
- pricing strategy and its development
- advertising
- cost control and sales budgeting
- long and short term planning of marketing

Production department

- supervision, coordination and control of manufacture and maintenance
- production planning and its development
- research and development of production techniques
- quality control
- control and planning of production flow and capacity
- raw material inventory
- methods and time studies
- product development
- long and short term planning of production and budgeting

Administration department

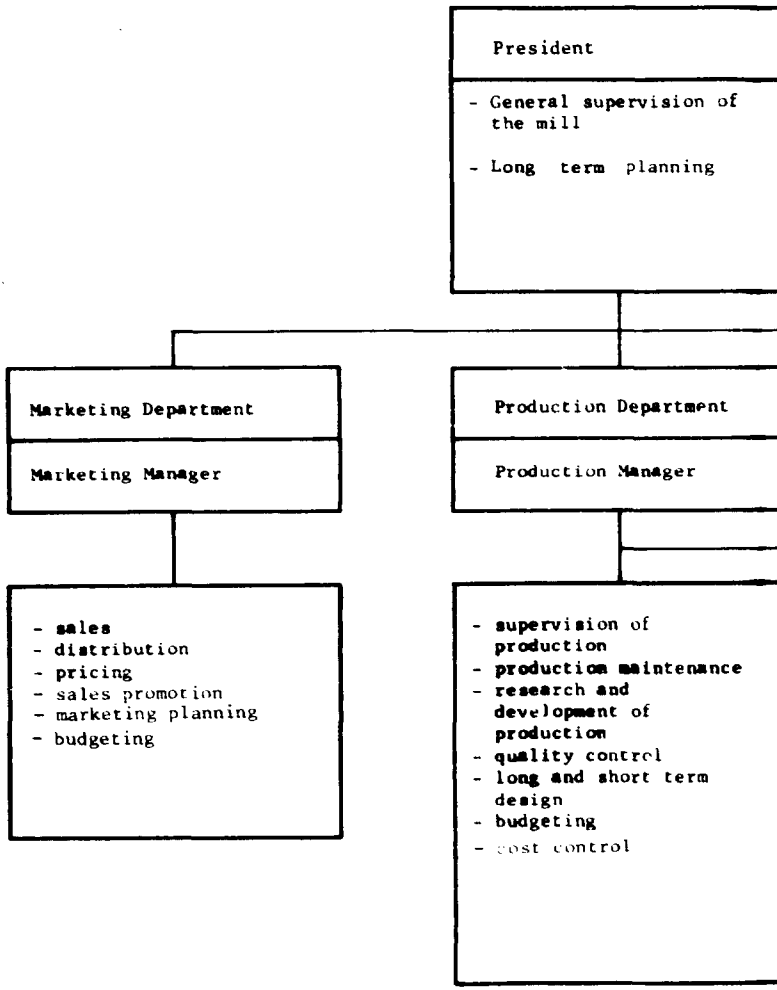
- financial planning
- accounting
- personnel administration
- purchasing
- cost control and reporting
- long and short term economic planning
- security
- budgeting and budget follow-up

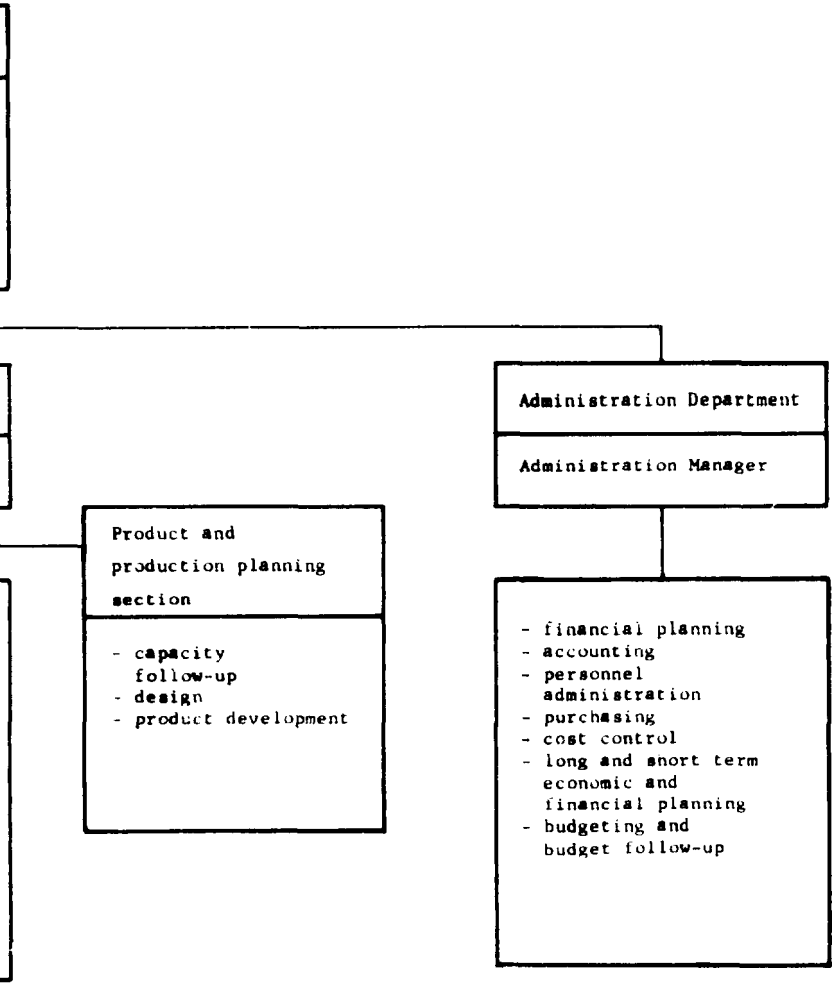
The proposed organization is described on the following page.

8.1.3
Personnel Requirement

	Number of persons
a) General supervision	
President	1
b) Marketing department	
Marketing manager	1
Sales representatives	2
Expediter	1
Clerks	1
Secretary	1
Total	6
c) Administration department	
Office and personnel manager	1
Accountant	1
Clerks	3
Guards	4
Purchasing manager	1
Secretary	1
Messanger	1
Driver	1
Total	13

Proposed Organization for Door Factors at Vintawood Products Incorporation




Administration Department
Administration Manager
- financial planning
- accounting
- personnel administration
- purchasing
- cost control
- long and short term economic and financial planning
- budgeting and budget follow-up
Product and production planning section
- capacity follow-up
- design
- product development

	Number of persons
d. Production department	
Salaried employees	
Production manager	1
Supervisor	1
Production planning and control coordinator	2
Draughtsmen	1
Clerk	2
Quality control inspector	1
Foremen	5
Development coordinator	1
Secretary	1
Total	15
Workers	
Sawing and kiln drying	
Skilled workers	8
Semi-skilled workers	5
Unskilled workers	8
Total	21
Milling	
Skilled workers	26
Semi-skilled workers	8
Unskilled workers	14
Total	48
Assembly, finishing and product storage	
Skilled workers	11
Semi-skilled workers	6
Unskilled workers	8
Total	25
Maintenance and boiler plant	
Electrician	1
Mechanic	1
Tool technician	1
Sharpeners and setters	3
Fitter/welder	2
Millwrights	2
Cleaner	1
Store keeper for spare parts and material	1
Firemen for boiler plant	4
Utility man	2
Helpers	3
Total	21
Reserve workers	6
Personnel total	155

8.2 Training Policy

8.2.1 General

A basic condition for successful operation of the factory is a skilled workforce with the necessary technical knowledge of practical factory work. The aim should be to reach a sufficient level of training for the whole factory personnel guaranteeing the best possible work input for the company.

To reach these aims money would have to be invested in training. In a small company these investments must, however, be realistically planned to avoid an excessive economic burden to the company.

The possibilities of getting government incentives for training should first be investigated as starting point for planning the training.

8.2.2 Personnel Selection

In personnel selection the main emphasis should be on recruiting personnel with the best possible skills. Above all, the marketing and administration departments should be manned with trained personnel as far as possible.

Before working out a training programme, the likely level of education and the need for training of potential employees should be investigated.

The need for training would probably be greatest for production and maintenance personnel, so the resources should primarily be concentrated on the production department's training needs.

8.2.3 Main Principles of Training Policy

In principle, the training could be carried out in two stages. In the first stage training would be concentrated on the technical aspects that are vital for operating the factory. In the second stage, when the factory would already be in operation, the training would be expanded and deepened to cover the entire personnel. In this way the factory could be started up and kept in operation, the production volume could be increased and the costs of training spread over a longer period.

This training policy requires a minimum need for training of marketing and administration personnel.

a) Aims of Short Term Training

The aim of short term training should be to start up the factory with minimum training costs by training the key personnel. This means that foremen, operators of main machines and the electricians and mechanics in the maintenance department would be trained in connection with the machine installation work.

To ensure efficient training the machine suppliers should be requested to give preliminary training assistance during the machine installation stage. In this way the personnel could get rapidly acquainted with the design, maintenance and spare parts of the machines.

The main emphasis of short term training should be on the following items:

- sawmilling techniques and the optimization of wood raw material usage with given sawnwood dimensions
- drying techniques and follow-up and measurement of drying result
- work planning and follow-up
- machine operation and maintenance
- tool maintenance and setworks adjustment
- gluing techniques and properties of various glues
- finishing techniques, materials and methods
- quality control, tolerances, measuring methods, quality follow-up
- safety and industrial hygiene

b) Aims of Long Term Training

The aim of long term training should be to deepen the technical skills of the personnel and to expand training to cover all functions of the factory. At this stage the factory would already be in operation.

The training would be divided as follows:

- specialized marketing training
- training for special sectors of administration
- training of production department personnel
- training of maintenance personnel
- development of the company's own research

The training of marketing and administration personnel would include short courses and seminars. In addition, trips would be organized to similar plants abroad.

Production department personnel would mainly be trained by courses in the company's own factory. The foremen and engineers would act as instructors.

The joint venture partner should provide special knowledge on marketing and quality requirements by sending specialists to lecture on these subjects. If local training of workers proved inadequate, the joint venture partner would have to send some instructors.

Training of maintenance mechanics should be given high priority at this stage, because troublefree operations of the factory is basic condition for successful operation.

Great attention should also be paid to preventive maintenance and the maintenance of knives and tools.

The development of the company's own research would include acquisition of relevant information on aspects related to the operation of the factory, such as:

- supplementing and up-dating of standards
- acquisition of technical literature
- studies related to the quality of products
- product development
- improvement of working methods
- improvement of work planning

8.2.4 Training Schedule

The training programme should be planned to correspond to the targets of short-term training, as described above.

Part of the training should take place before the start-up. This part would concentrate on lectures. The second part would involve practical instruction immediately after the start-up.

Only skilled workers would be trained. They should have previous experience on wood-working industries. In this way the training period could be short and would not become an economic burden to the company. The persons to be trained should be hired when the installation work starts so that they would take part in it and get familiar with the equipment. The lectures needed could then be given during the installation period at a very low cost.

The total training time required depends greatly on the previous experience and skills of the personnel to be hired and on each type of job. Therefore, it is very difficult to establish the required training time at this stage. However, as a general guideline 1-3 weeks for workers and 5 weeks for foremen can be used. Foremen would be used as instructors after their own training.

The estimated training requirement for various positions is shown below:

Position	Duration in weeks
Quality control inspector	2
Foremen	5
Sawing and kiln drying	
- skilled workers	1
Milling	
- skilled workers	2
Assembly, finishing and product storage	
- skilled workers	2
Maintenance and boiler plant	
- electrician	1
- mechanic	2
- tool technician	3
- sharpeners and setters	3
- fitter/welder	1
- millwrights	2
- firemen for boiler plant	1

9
REPAIR AND MAINTENANCE

9.1
General

The maintenance would be handled by the production department, because the factory and production would not be very big.

This means that bigger repairs and machining jobs would have to be done in an outside engineering workshop. It would still be essential to recruit skilled personnel for the mill's maintenance organization.

9.2
Main Objects of Mill Maintenance

a) Developing systematic maintenance including
- machine numbering systems
- spare part numbering systems
- machine cards
- work ordering
- maintenance reports

b) Preventive maintenance
- lubrication systems and quantities of lubricants
- periodic inspections
- periodic repairs

c) Machine repair and vehicle maintenance
- daily maintenance including small repairs
- tool maintenance
- jigs and gauges

d) Electrical maintenance
- daily maintenance and small repairs

e) Spare part service
- store keeping and purchasing of materials and spare parts needed

f) Maintenance planning
- short and long-term planning, including description of the work to be done

g) Maintenance of buildings, mill roads and areas
- cleaning
- repair

9.3 Repair Workshop

The repair workshop would be situated in the existing building near the spare part and material store.

The workshop would be common for all maintenance activities.

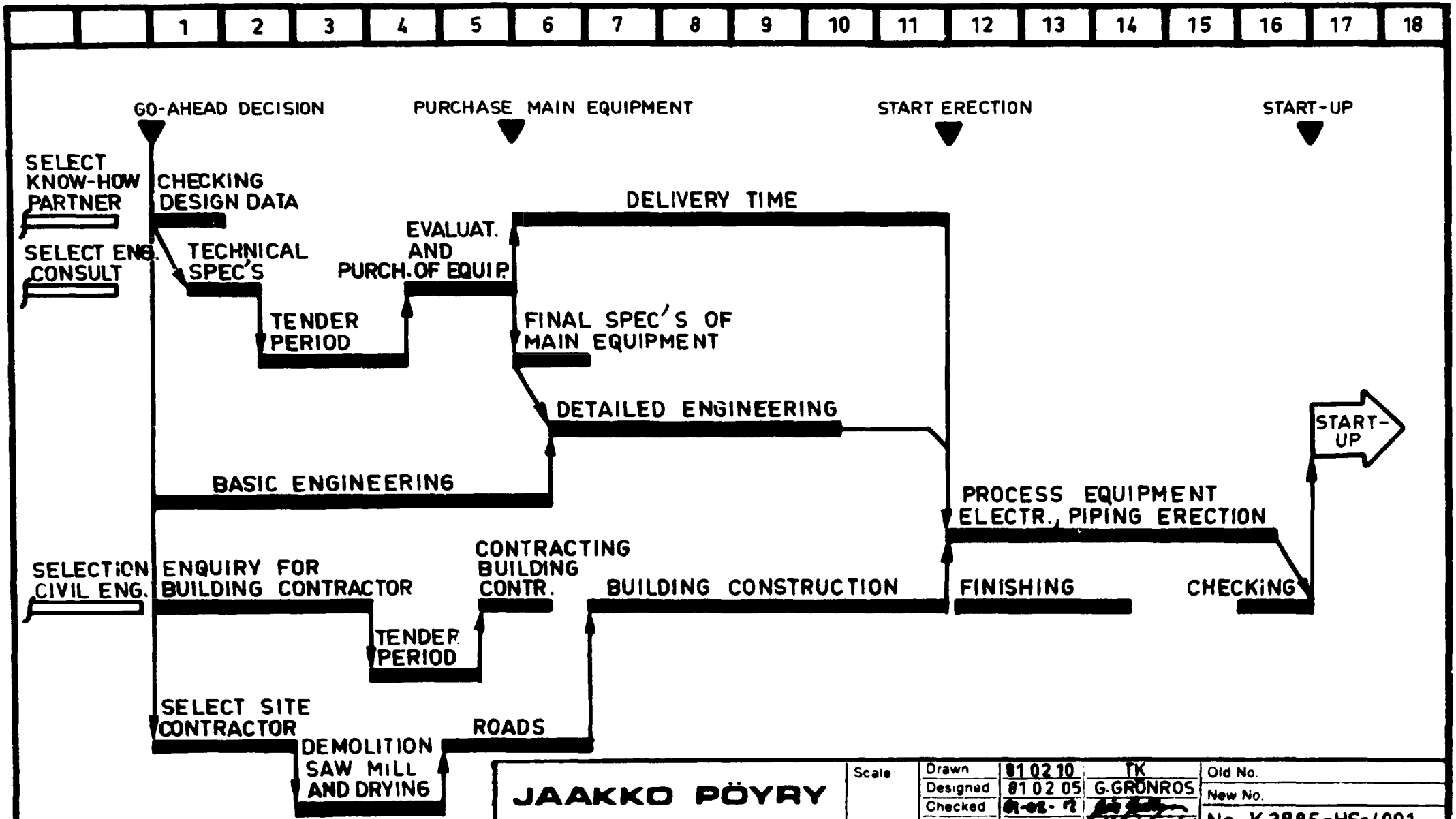
Tool maintenance would mainly be done in the saw doctoring room of the sawmill and in the filing room in the door factory.

Common repair devices and tools would, however, be purchased as shown in machine specification.

10
IMPLEMENTATION PROGRAMME

According to the proposed time schedule on the following page, the total construction period from go-ahead decision to start-up would be 16 months. Before the implementation stage a know-how partner, consultants and civil engineering contractors would have to be selected.

The total delivery time for main machines and equipment has been estimated at 6 months and the total erection time at 5 months.


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
GO-AHEAD DECISION
PURCHASE MAIN EQUIPMENT
START ERECTION
START-UP
SELECT KNOW-HOW PARTNER
SELECT ENG. CONSULT
CHECKING DESIGN DATA
TECHNICAL SPEC'S
TENDER PERIOD
EVALUAT. AND PURCH. OF EQUIP.
DELIVERY TIME
FINAL SPEC'S OF MAIN EQUIPMENT
DETAILED ENGINEERING
BASIC ENGINEERING
START-UP
PROCESS EQUIPMENT ELECTR., PIPING ERECTION
SELECTION CIVIL ENG.
ENQUIRY FOR BUILDING CONTRACTOR
TENDER PERIOD
CONTRACTING BUILDING CONTR.
BUILDING CONSTRUCTION
FINISHING
CHECKING
SELECT SITE CONTRACTOR
DEMOLITION SAW MILL AND DRYING
ROADS
JAAKKO PÖYRY
Scale
Drawn 81 02 10 TK
Designed 81 02 05 G.GRÖNROS
Checked
Approved
Old No.
New No.
No. K 3885-HS-4001
UNIDO VINTA WOOD PRODUCTS DOOR FACTORY
TARGET TIME SCHEDULE
Old No.
New No.

11
INVESTMENT REQUIREMENT

11.1
General Basis of Capital Estimates

The cost estimate is based on the Client's information for this study and the technical design of the mill presented in this report.

The costs of civil works such as site preparation, construction and building have been calculated using unit rates corresponding to the conditions at the Vintawood mill site in the Philippines.

Prices of process machinery, auxiliary machinery and equipment are based on feedback from similar projects, file data of Jaakko Pöyry Consulting Oy and some preliminary tenders requested for this study. The transport and erection costs for machinery and equipment have been calculated separately.

The cost estimate does not include taxes, duties, escalation or any costs outside the mill site.

Taxes and duties were excluded because Vintawood could benefit from various incentives, see Annex 3, negotiable when the project goes ahead. Escalation is included in the financial calculations in section 13.1.

The price level used in the cost estimates is that prevailing during the first quarter of 1981.

Local costs were collected during the field trip at the end of 1980 and escalated to the first quarter of 1981. Machinery and other costs were calculated on the basis of cost information on European machinery in JAAKKO PÖYRY's files adjusted to the same price level.

The costs have been estimated in dollars using the following exchange rates:

USD 1 = ₱ 7.65 (Peso)
USD 1 = FIM 3.9

A contingency of of 15 percent has been included.

11.2
Summary of Investment Requirement

Investment of the door factory[1)]

	USD 1000
- unclassified costs	638
- civil works	979
- machinery	3 104
- piping	43
- electrical	344
- spare parts	103
Total	5 211
Contingencies	782
Fixed investment	5 993

	USD 1000
- Fixed investment	5 993
- Interest during construction	260
- Working capital	1 036
TOTAL INVESTMENT	7 289

The fixed investment would be divided into local and foreign currency costs as follows:

	USD x 100
- local costs	2 273
- foreign costs	3 720
Fixed investments, total	5 993

11.3
Cost Codes and Objects

The costs have been classified by cost area and cost object. The main cost area classification is as follows:

Area 1	Mechanical wood industry including the whole door factory
Area 7	Common facilities
Area 8	Site Area
Area 9	Indirect costs

Chart of accounts is on the following page and the specified cost objects have been marked with crosses.

1) Items are specified in detail in section 11.4.

JAAKKO PÖYRY
HELSINKI STOCKHOLM MUNICH BUENOS AIRES

CHART OF ACCOUNTS

WORK No.

CUSTOMER: UNIDO/Vintawood Products Inc.

BY

DATE

PROJECT: Feasibility Study for Door Factory

COST OBJECT CLASSIFICATION

CODE	COST AREA CLASSIFICATION	UNCLASSIFIED 0	CIVIL WORKS 1	MACHINERY 2	PIPING 3	ELECTRICAL 4	PROCESS CONTROL 5	PAINTING, INSULATION 6			SPARE PARTS 9			REMARKS
1	MECHANICAL WOOD INDUSTRY													
10	Woodhandling and Sawing													
100	Common costs		x	x	x						x			
101	Sawing			x										
11	Kiln Drying and Sawnwood Storing													
110	Common costs		x	x	x						x			
110	Kiln drying			x										
12	Door Factory													
120	Common costs		x	x	x						x			
121	Milling			x										
122	Assembly and finishing			x										
123	Dust collecting			x										
7	COMMON FACILITIES													
72	Energy Supply													
721	Boiler plant		x	x	x						x			
722	Electricity supply and installations					x								
74	Mobile Equipment													
740	Common costs			x							x			
75	Maintenance and Office Facilities													
750	Common costs		x	x	x						x			
8	SITE AREAS													
81	Mill Site													
810	Common costs		x	x	x	x					x			
89	Temporary Facilities and Services													
890	Common costs													
892	Scaffolding													
893	Hoisting and transport equipment	x												
894	Installation utilities													
9	INDIRECT COSTS													
91	Project Engineering													
910	Common costs													
911	Home office engineering													
912	Consultants													

CHART OF ACCOUNTS

WORK No.

CUSTOMER

UNIDO/Vintawood Products Inc.

BY

DATE

PROJECT

Feasibility Study for Door Factory

COST OBJECT CLASSIFICATION

UNCLASSIFIED	CIVIL WORKS	MACHINERY	PIPING	ELECTRICAL	PROCESS CONTROL	PAINTING, INSULATION			SPARE PARTS		
0	1	2	3	4	5	6			9		

CODE	COST AREA CLASSIFICATION	REMARKS
92	Start-up	
920	Common costs	
921	Training	
922	Start-up supervision	
925	Modifications during start-up	
93	Construction Management, Site Supervision and Administration	x
930	Common costs	
931	Field costs	
934	Project administration and office	
935	Permits, insurance	

11.4 Cost Estimate and Machine Specification

The total investment is summarized on the first page. Contingencies, interest and working capital have also been added.

On the following two pages costs are listed by cost area.

On the next pages civil works, machinery, piping, electrical and spare part costs are listed. Machines and equipment are also specified.

JAAKKO PÖYRY	INVESTMENT ESTIMATE	COST AREA	DATE	PAGE No. 136
		Door Factory	PREP. BY	REG. No.
PROJECT			APPR. BY	PROJECT No.
Feasibility study for door factory				

AREA CODE	COST AREA SPECIFICATION	COST OBJECT									
		0 Unclassified	1 Civil Works	2 Machinery	3 Piping	4 Electrical	5 Process control	6 Painting & Insulation		9 Spare parts	0 ... 9 TOTAL
10	Woodhandling and sawing		273	531	7					27	838
11	Kiln drying and sawnwood storing		283	879	8					9	1 179
12	Door factory		271	1 273	20					50	1 614
72	Energy supply and generation		23	136		344				4	507
74	Mobile equipment			212						10	222
75	Maintenance and office facilities		18	60	8					3	89
81	Mill site		111	13							124
89	Temporary facilities and services	58									58
91-93	Total	580									580
	Total	638	979	3 104	43	344	incl.	incl.		103	5 211
	Contingencies 15 %										782
	Fixed investment total										5 993
	Interest during construction with interest rate of loan 14 %										260
	Working capital										1 036
	TOTAL INVESTMENT										7 289

JAAKKO PÖYRY	INVESTMENT ESTIMATE	COST AREA	DATE	PAGE No. 137
			PREP. BY	REG. No.
PROJECT: Feasibility study for door factory		10, 11 and 12	APPR. BY	PROJECT No.

AREA CODE	COST AREA SPECIFICATION	COST OBJECT 0 Unclassified	1 Civil Works	2 Machinery	3 Piping	4 Electrical	5 Process control	6 Painting & Insulation		9 Spare parts	0..9 TOTAL
10	Woodhandling and Sawing										
100	Common costs		273	69	7					27	376
101	Sawing		-	462	-					-	462
10	Woodhandling and Sawing Total		273	531	7					27	838
11	Kiln Drying and Sawnwood Storing										
110	Common costs		283	-	8					9	300
111	Kiln drying			879							879
11	Kiln drying and sawnwood handling total		283	879	8					9	1 179
12	Door Factory										
120	Common costs		271	35	20					50	376
121	Milling			766							766
122	Assembly and finishing			319							319
123	Dust collection			153							153
12	Door factory total		271	1 273	20					50	1 614

JAAKKO PÖYRY	INVESTMENT ESTIMATE	COST AREA	DATE	PAGE No. 138
			PREP. BY	REG. No.
PROJECT			APPR. BY	PROJECT No.
Feasibility study for door factory		72, 74, 75 and 81		

AREA CODE	COST AREA SPECIFICATION	COST OBJECT									
		0 Unclassified	1 Civil Works	2 Machinery	3 Piping	4 Electrical	5 Process control	6 Painting & Insulation		9 Spare parts	0 ... 9 TOTAL
72	Energy Supply and Generation										
721	Boiler plant		23	136						4	163
722	Electrical installation					344					344
72	Energy Supply and Generation total		23	136		344				4	507
74	Mobile Equipment										
740	Common costs			212						10	222
74	Mobile Equipment total			212						10	222
75	Maintenance and office Facilities										
750	Common costs		18	60	8					3	89
75	Maintenance and Office Facilities total		18	60	8					3	89
81	Mill Site										
810	Common costs		111	13							
81	Mill Site total		111	13							124

10 Woodhandling and Sawing — 100 Common Costs

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
100-1			Civil Works	Lo[1)]		
			Sawmill building - area m^2 864 - height m 6			
			Foundations for machines			
			Demolishing of old sawmill building			
			Shed for sorting chain - area m^2 396 - height m 4			
100-1			Civil Works total			.73
100-2			Machinery			
	100-1		Sawdust pneumatic conveying - piping - fan - cyclone - electric power kW 15	50 % Lo		
			Saw doctoring equipment			
	100-02		Planishing bench with rolling and stretching machine			
			- electic power 0.75 kW			
	100-03		Sharpening machine for circular and head band saw blades			
			- electic power 0,75 kW			
	100-04		Side dressing and relief grinding machine			
			- electic power 0.75 kW			
	100-05		Swaging and shaping machine for band and circular saw blades			
			- electic power 1.5 kW			
			Hand operated machinery and tools			
			Machines FOB		55.8	
			Freight of machinery		5.0	
			Erection of machinery		8.2	
100-2			Machinery total			69

1) Lo = Local supply

10 Woodhandling and Sawing — 100 Common Costs

Account No.	Pos. No.	Quantity	Specification	In thousands of USD		
				Unit price	Total price	Total price
100-3			Piping	Lo		
			Pipes for pressure air and potable water			
100-3			Piping total			7

10 Woodhandling and Sawing — 100 Common Costs

Account No.	Pos. No.	Quantity	Specification	In thousands of USD		
				Unit price	Total price	Total price
100-9			Spare Parts Spare parts for machinery and equipment (for pos. 100.01-101.14)			
100-9			Spare Parts total			27

10 Woodhandling and Sawing — 101 Sawing

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
101-2			Machinery			
	101-01	1	Log infeed deck			
			- width m 7.0			
			- length m 10.0			
			- log loader			
			- electric power kW 15			
	101-02	1	Log bandsaw			
			- wheel diameter m 1.4			
			- carriage with four clamping units			
			- electric power 60+5 kW 65			
	101-03	1	Roll conveyor			
			- width m 1.0			
			- length m 35.5			
			- electric power kW 3.0			
	101-04	1	Cross conveyor	Lo		
			- width m 7.0			
			- length m 12.5			
			- electric power kW 7.5			
	101-05	1	Resaw (existing)	Lo		
			- wheel diameter m 1.4			
			- overhauling			
			- electric power kW 40			
	101-06	1	Roll conveyor	Lo		
			- width m 0.7			
			- length m 14.0			
			- electric power kW 1.5			
	101-07	1	Cross conveyor	Lo		
			- width m 7.0			
			- length m 3.0			
			- electric power kW 3.0			
	101-08	1	Roll conveyor	Lo		
			- width m 0.7			
			- length m 19.0			
			- electric power kW 1.5			
	101-09	1	Roll table	Lo		
			- width m 7.0			
			- length m 1.5			

10 Woodhandling and Sawing — 101 Sawing

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
101-2	101-10	1	Cross conveyor	Lo		
			- width m 7.0			
			- length m 4.0			
			- electric power kW 3.0			
	101-11	1	Board edger			
			- feeding device			
			- manually operated			
			- electric power kW 15			
	101-12	3	Dropping chutes	Lo		
	101-13	1	Sorting table	Lo		
			- width m 7.5			
			- length m 29.5			
			- electric power kW 5			
	101-14	15	Carriages	Lo		
			Machinery FOB		372.9	
			Freight of machinery		33.6	
			Erection of machinery		55.5	
101-2			Machinery total			462

11 Kiln Drying and Sawnwood Storing — 110 Common Costs

Account No.	Pos. No.	Quantity	Specification	In thousands of USD: Unit price	Total price	Total price
110-1			Civil Works	Lo		
			Foundation for drying chambers and tracks			
			Sawnwood storage building - floor area m^2 700			
			Cooling shed for dried sawnwood - floor area m^2 525 - height m 5.0			
			Tracks - length m 336			
			Demolishing of existing kiln drying			
110-1			Civil Works total			283
110-3			Piping	Lo		
			Hot water pipes for dry kilns			
110-3			Piping total			8
110-9			Spare Parts			
			Spare parts for machinery and equipment for pos. 111.01-111-03			
110-9			Spare Parts total			9

11 Kiln Drying and Sawnwood Storage — 111 Kiln Drying

Account No.	Pr. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
111-2			Machinery			
	111-01	7	Kiln chambers - width m 5.0 - length m 13.5 - electric power (3 x 49) kW 147 - with electronic control device			
	111-02	40	Carriages	Lo		
	111-03	1	Transfer car	Lo		
			Machinery FOB		715.0	
			Freight		64.0	
			Installation		100.0	
111-2			Machinery total			879

12 Door Factory — 120 Common Costs

Account No.	Pos. No.	Quantity	Specification	In thousands of USD		
				Unit price	Total price	Total price
120-1			Civil Work	Lo		
			Factory building - floor area m^2 1050			
			Paint storage - floor area m^2 25			
			Foundations for some machines			
			Wall constructions inside the existing halls			
120-1			Civil Work total			271
120-2			Machinery			
			Ventilation equipment - electric power kW 20	Lo		
			Air compressor with air tank and cooling system - capacity 6 m^3/min - electric power kW 35			
120-2			Machinery total			35
120-3			Piping - pipes for pressure air and potable water	Lo		
120-3			Piping total			20
120-9			Spare Parts - spare parts for machinery and equipment for pos. 121-01-121-24 122-01-122-05 123-01-123-03			
120-9			Spare Parts total			50

12 Door Factory — 121 Milling

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
121-2			Machinery			
	121-01	1	Radial cut-off saw - infeed table - measuring table with 5 push-button operated stops - electric power kW 3.7			
	121-02	2	Cut-off saw - pneumatically operated - infeed table - measuring table with 5 push-button operated stops - outfeed table - electric power (4+4) kW 8			
	121-03	2	Sorting table - width m 2.2 - length m 6 - electric power (2+2)kW 4	Lo		
	121-04	1	Belt conveyor - width m 0.5 - length m 12.0 - electric power kW 1.5	Lo		
	121-05	1	Multiple ripsaw - maximum working height mm 100 - diameter of saw-blade mm 300 - feeding speed m/min 6-48 - electric power (18 + 1.1) kW 19.1			
	121-06	1	Ripsaw - one sawblade, dia mm 300 - feeding device - electric power (1.1 + 1₁) kW 12.1			
	121-07	1	Surface planer and jointer - length of table mm 2700 - width of table mm 430 - electric power kW 3			
	121-08	2	Planing and moulding machine - number of cutter heads 5 - maximum allowable size of timber mm x mm 100 x 225 - straightening unit - feeding device hydraulically operated - feeding speed m/min 0-40 - electric power (11 + 5 x 7.5) kW 48			

12 Door Factory — 121 Milling

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
121-2	121-09	1	Planer and thickessing machine - cutter above the feed table - working length mm 630 - max. thickness of work piece mm 230 - feed speed m/min 6-20 - sorting table, length m 3 - electric power (5.5 + 1.5) kW 7			
	121-10	2	Sorting table - width m 2.2 - length m 6 - electric power (2+2) kW 4	Lo		
			Jointing station			
	121-11	1	Glue spreader - infeed table - outfeed table - working width m 0.15 - electric power (0.75+0.75) kW 1.5			
		1	Gluing press - working width m 0.6 - working length m 2.5 - hydraulic unit of press - generator for RF-heating - electric power (4+12) kW 16			
	121-12	1	Tilting arbor saw - sliding table - speed of spindle 1/min 3850 - electric power kW 3 - diameter of saw mm 300			
	121-13	2	Spindle moulder - with sliding table - size of table mm x mm 900 x 1100 - electric power (7.5+7.5) kW 15 - spindle speeds 3000, 4500, 6000 and 7200 1/min			
	121-14	1	Single end tenoning machine - working length m 2.5 - number of heads 5 - electric power (4 x 2.2 + 3.7) kW 12.5			
	121-15	1	Double end tenoning machine - working length m 2.5 - number of heads 10 - electric power (6x3.7 + 4x5.5) kW 44.2 - speed of cutter spindles 1/min 6000			

12 Door Factory — 121 Milling

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
121-2	121-16	1	Moulding machine - number of cutter heads 4 - maximum allowable size of timber mmxmm 100x180 - feeding speed m/min 10-46 - electric power (4x5.5 + 1x5.5) kW 27.5			
	121-17	1	Profile sanding machine - 3 sanding heads - feeding belt - feeding speed m/min 4-18 - electric power 1x0.75 + 3x1.1 kW 4.4			
	121-18	3	Hollow chisel mortising machine - manually operated - electric power (3.x1.5) kW 4.4			
	121-19	1	Multi spindle mortising machine - number of working heads 4 - oscillation speed 1/min 2200 - electric power (4 x 1.1) kW 4.4			
	121-20	1	Hardware mortiser for frames - electric power kW 3			
	121-21	1	Cross-cutting machine for mouldings - electric power kW 1.0			
	121-22		Multi-spindle boring machine - electric power kW 1.0 - number of spindles 3			
	121-23	2	Router - spindle speed 1/min 16 000-18 000 - belt drive with two phase motor - size of table mxmm 900x770 - electric power kW 12			
	121-24	1	Bandsaw - band wheel diameter mm 900 - table size mmxmm 840x1280 - electric power kW 5.5			
			Machinery FOB		617.7	
			Freight of machinery		55.6	
			Erection of machinery		92.7	
121-2			Machinery total			766

12 Door Factory — 122 Assembly and Finishing

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
22-2			Machinery			
	122-01	1	Wide belt sanding machiner - one contact roll unit - one sanding shoe unit - working width mm 1100 - brushing unit - feeding belt - feeding speed m/min 4.5-23 - electric power (11+15+0.4+1.1) kW 27.5			
	122-02	1	Narrow belt sanding machiner - working length mm 2500 - width of belt mm 150 - hand operated - electric power kW 3			
	122-03	2	Door assembly press - size mmxmm 3000x1700 - pneumatically operated - electric power (2+2) kW			
	122-04	1	Hardware mortising and recessing machine - electric power kW 5			
	122-05		Equipment for door laquering - drying tunnel - overhead chain conveyor with attachment - spraying devices - spraying cabinet - fans - length of drying tunnel m 18 - size of tunnel m^2 3 x 3.3 - electric power kW 23.3 - heat requirement 1 GJ/h			
			Machinery FOB		256.8	
			Freight of machinery		24.7	
			Erection of machinery		38.5	
122-2			Machinery total			319

12 Door Factory — 123 Dust Collecting

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
123-1			Machinery			
	123-01		Suction pipes			
	123-02		Dust filter - fans - extraction filters - foundation construction - feeder lock device - dust conveyor - electric power (2x75 + 37 + 2x1.1) kW 189			
	123-03		Pneumatic dust conveying system to dust silo - conveying pipes - cyclone - electric power kW 11	Lo		
			Machinery FOB		123.1	
			Freight of machinery		11.0	
			Erection of machinery		18.9	
123-2			Machinery total			153

72 Energy Supply and Generation — 721 Boiler Plant

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
721-1			Civil Work	Lo		
			Foundations for boiler plant and dust silo			
721-1			Civil Work total			23
721-2			Machinery			
	721-01		Dust silo - diameter m 5.0 - height m 6.0 - unloading device with screw - electric power kW 3	Lo		
	721-02		Wood waste boiler - capacity MW 1.0 - stoker type infeed device with screw conveyor - chimney - control devices - electric power (2 + 2) kW 5	Lo		
	721-03		Chipper with chip blowing system - capacity - electric power kW 50			
			Machinery FOB		109.6	
			Freight of machinery		9.9	
			Erection of machinery		16.5	
721-2			Machinery total			136
721-9			Spare parts			
			Spare parts for machinery and equipment for pos. 721-01-721-03			
721-9			Spare parts total			4

72 Energy Supply and Generation

722 Electrical Equipment and Installation

Account No.	Pos. No.	Quantity	Specification	In thousands of USD		
				Unit price	Total price	Total price
722-4			36/0.44 kV Substation - disconnector 36 kV - lightning arresters 36 kV - cable 36 kV - transformer 800 kVA - box-type distr. board 440 V Sawmill - 440 V motors 210 kW - MCC's incl. control - power cabling - lighting installation (1260 m^2) Door factory, dry kiln, dust collector and boiler - 440 motors 720 kW - MCC's incl. control - power cabling - lighting installation			
722-4				60 % Lo		344

74 Mobile Equipment — 740 Common Costs

Account No.	Pos. No.	Quantity	Specification	In thousands of USD Unit price	Total price	Total price
740-2			Machinery			
		1	Front-end loader with attachment for pallet fork and log grapple - lifting capacity t 4			
		1	Fork-lift truck - lifting capacity t 3.5			
		6	Pallet lifts (hand operated) - lifting capacity t 2			
740-2			Machinery total			212
740-9			Spare parts for mobile equipment			
			Spare parts for machinery			
740-9			Spare parts total			10

75 Maintenance and Office Equipment — 750 Common Costs

Account No.	Pos. No.	Quantity	Specification	In thousands of USD		
				Unit price	Total price	Total price
750-1			Civil Works	Lo		
			Partition walls for maintenance room, office, spare part store and material store			
			Improvement of existing toilets, washing and locker rooms and canteen			
750-1			Civil Works total			18

750-2			Machinery
			- circular saw grinder
			- knife grinder
			- universal tool grinder
			- column drilling machine
			- bench drilling machine
			- electric welding device
			- gas welding device
			- bench grinder
			- portable tools
			  - drills
			  - grinders
			- hand tools and metering device			

750-2			Machinery total			60
750-3			Piping - potable water pipes and sewage pipes for office rooms	Lo		
750-3			Piping total			8
750-9			Spare parts - spare parts for machinery and equipment			
750-9			Spare Parts total			3

81 Mill Site — 810 Common Costs

Account No.	Pos. No.	Quantity	Specification	In thousands of USD: Unit price	Total price	Total price
810-1			Civil Works	Lo		
			Asphalting of the feeder road - length m 300			
			Front fence			
			Gravel for mill roads, areas and log yard m^2 10 600			
			Landscaping			
810-1			Civil Works total			111
810-2			Machinery			
			Telecommunications for the mill	Lo		
		30	Fire extinguishers (dry)	Lo		
810-2			Machinery total			13

11.5
Working Capital

11.5.1
Basis of Calculation

a) Accounts receivable have been assumed to be 6 weeks.

b) Accounts payable have been assumed to be 2 weeks.

c) Inventories

- sawnwood	8 weeks
- materials	4 weeks
- intermediate products	2 weeks
- finished products in store	4 weeks

11.5.2
Calculation of Working Capital

	x 1000 USD
a) Accounts receivable $\frac{6}{52}$ x 4327	+ 499
b) Accounts payable $\frac{2}{52}$ x 2722	- 105
c) Inventories	
- sawnwood $\frac{8}{52}$ x 1956	+ 300
- materials $\frac{4}{52}$ x 407	+ 31
- maintenance materials	+ 50
- intermediate products $\frac{2}{52} \times \frac{1}{2}$ x 2722	+ 52
- finished products $\frac{4}{52}$ x 2722	+ 209
Working capital total	1 036

11.6
Foreign and Local Costs

11.6.1
Basis of Calculation

The fixed investment has been divided into local and foreign costs taking into account that about 80 percent of the erection costs for machinery and equipment would be local expenses. Instead all civil work, piping and about 60 percent of the electrical works would be delivered locally. Among the unclassified costs all temporary facilities would be local expenses as well as 30 percent of other unclassified costs.

11.6.2
Calculation

Fixed investment divided into local and foreign costs

	1000 USD		
	Local	Foreign	Total
Unclassified costs	264	470	734
Civil works	1 125	-	1 125
Machinery	618 [1)]	2 952	3 570
Piping	50	-	50
Electrical	216	180	396
Spare parts	-	118	118
Total	2 273	3 720	5 993

1) See machine specifications

12
PROFITABILITY OF THE PROJECT

12.1
Production Costs

12.1.1
Principles of Calculation

The production cost estimates have been made on the basis of the variable and fixed costs. The variable costs include items which vary directly with the output. Such items are:

- wood raw material
- glues
- finishing materials
- packaging materials
- hardware and other materials
- energy
- operating materials including lubricants, fuel for mobile equipment, knives, tools, sawblades, sanding belts, etc.

The fixed costs have been assumed to be essentially independent of the production volume and have therefore been calculated as annual expenditures. The following cost items have been included in this group:

- manpower, i.e. wages and salaries, including fringe benefits
- maintenance materials, including spare parts, general repair materials, etc. but excluding replacement investments
- general overheads, including advertising, office materials, communications, insurance, travel, car leasing and other miscellaneous expenses

12.1.2
Unit Costs

Unit prices are based mainly on the information received from Vintawood Products Inc. and the data of the market survey. The cost level is that prevailing during the first quarter of 1981.

a) Wood raw material

Logs		
- light coloured wood species	USD/m^3	124.1
	₱/Mfbm	2239
- dark coloured wood species	USD/m^3	187.7
	₱/Mfbm	3386
- freight of logs	USD/m^3	17.3
	₱/Mfbm	312.0

Sawnwood		
- light coloured wood species	USD/m^3	340.0
	₱/Mfbm	6134
- dark coloured wood species	USD/m^3	423.0
	₱/Mfbm	7631
- freight of sawnwood	USD/m^3	2.3
	₱/Mfbm	41.5

b) Glues (ready glue solution)

- urea formaldehyde glue	USD/t	1540
- ureaformaldehyde glue modified with melamine formaldehyde glue	USD/t	2050
- polyvinyl acetate glue	USD/t	1950

c) Finishing materials

- putty	USD/gallon	4.0
- wax	USD/gallon	2.0
- sanding sealer	USD/l	1.3
- brown and red powder	USD/kg	0.5
- wood stain	USD/kg	3.2
- laquer and laquer thinner	USD/kg	5.3
- other finishing materials	USD/door set	0.5

d) Packaging materials

- plastic bags	USD/kg	3.0
- corrugated cartons	USD/m^2	0.2
- other packaging materials, such as tapes, cords, etc.	USD/door set	0.5

e) Hardware and other materials

- nails, screws, etc.	USD/door set	0.3
- glass, thickness 4 mm, clear	USD/glass door	15.0

f) Energy

Electricity		
- demand	USD/kW	2.4
- first 200 kWh	USD/MWh	47
- next 200 kWh	USD/MWh	32
- excess kWh	USD/MWh	39

g) Operating materials

The cost of operating materials has been estimated at about 12 USD/m^3 sawnwood used in production.

h) Unit wage and salary costs

	Basic salary or wage ₱/a	Social costs[1] ₱/a	Total ₱/a	Total USD/a
Director	64 860	24 640	89 500	11 700
Sales manager	45 400	17 250	62 650	8 190
Sales representative	6 490	2 460	8 950	1 170
Expediter	5 190	1 970	7 160	936
Clerk	7 780	2 960	10 740	1 404
Secretary	6 490	2 460	8 950	1 170
Office manager	45 400	17 250	62 650	8 190
Accountant	10 380	3 940	14 320	1 872
Guard	7 780	2 960	10 740	1 404
Driver	7 780	2 960	10 740	1 404
Messenger	7 780	2 960	10 740	1 404
Purchasing manager	12 970	4 930	17 900	2 340
Production manager	45 400	17 250	62 650	8 190
Supervisor	12 970	4 930	17 900	2 340
Production planning and control coordinator	10 380	3 940	14 320	1 872
Draughtsman	6 490	2 460	8 950	1 170
Quality control inspector	20 750	7 890	28 640	3 744
Foreman	10 380	3 940	14 320	1 872
Development coordinator	7 990	3 030	11 020	1 440
Skilled workers	8 180	3 110	11 290	1 476
Semi-skilled workers	4 870	1 400	6 720	878
Unskilled workers	4 220	1 600	5 820	761
Electrician	6 490	2 460	8 950	1 170
Mechanic	6 490	2 460	8 950	1 170
Tool technician	6 490	2 460	8 950	1 170
Sharpener	5 190	1 970	7 160	936
Fitter/welder	5 990	2 270	8 260	1 080
Millwright	5 190	1 970	7 160	936
Cleaner	4 220	1 600	5 820	761
Store keeper for spare parts	7 780	2 960	10 740	1 404
Fireman	5 990	2 270	8 260	1 080
Utility man	5 190	1 970	7 160	936
Helper	4 220	1 600	5 820	761

1) 13th month's pay and bonuses 15 %
Paid holidays and vacation 10 %
Sick leave 5 %
Social security, living allowance and other social costs 8 %
38 %

i) Maintenance materials

Maintenance materials have been estimated about 1 percent of the mill investment

j) General overhead costs

General overhead costs have been estimated at 2.0 percent of the sales revenue.

12.1.3
Production Cost Calculation

Variable costs	USD 1000/a
a) Wood raw material	
- logs (light)	591.1
- logs (dark)	551.5
- sawnwood (white)	451.8
- sawnwood (dark)	361.6
Wood raw material total	1 956.0
b) Glues	
- ureaformaldehyde glue	3.2
- ureaformaldehyde glue modified with melamine glue	14.7
- polyvinyl acetate glue	2.0
c) Finishing materials	
- putty	0.3
- wax	1.0
- sanding sealer	0.9
- brown and red powder	0.3
- wood stain	1.9
- laquer and laquer thinner	128.4
- other finishing materials	15.0
d) Packaging materials	
- plastic bags	46.9
- corrugated cartons	34.0
- other packaging materials	15.0
e) Hardware and other material	
- nails, screws etc.	9.0
- glass	3.2
f) Energy	
- electric energy	56.2
- demand	1.0
g) Operating materials	74.0
Total variable costs excluding wood raw material	407.0
Total variable costs of full capacity	2 363.0

Fixed costs	USD 1000/a
a) Personnel costs including fringe benefits	
- general supervision	11.7
- marketing department	14.0
- administration department	26.2
- production department	
- salaried employees	33.0
- workers	
- sawing and kiln drying	22.3
- milling	56.0
- finishing and production storage	27.6
- maintenance and boiler plant	21.0
- reserve	7.2
Total personnel costs	219.0
b) Maintenance materials	50.0
c) General overhead costs	90.0
Total fixed costs at full capacity	359.0

Total manufacturing costs at full capacity	
- variable costs	2 363
- fixed costs	359
Total	2 722

12.2 Sales Revenue

12.2.1 General

The unit prices of door sets have been determined on the basis of their thickness and size. In other words, the average price is independent of the door type.

The prices are based on the information obtained during the market study and have been calculated net at mill.

The economic calculations are based on a sales price of USD 127/door set for a representative average door (9 M x 21 M), (section 3.7). As the production programme includes also more expensive double and arch doors, the arithmetic average price of the production is a little higher, USD 144/door set.

12.2.2
Average Unit Prices[1] of Door Sets Including Frames and Sills

Door sets with one door leaf

Thickness mm	Size MxM	Unit price USD
35	8 x 21	108
35	9 x 21	121
35	10 x 21	135
40	9 x 21	139
40	10 x 21	154
40	9 x 24	158
40	10 x 24	176
44	9 x 21	152
44	10 x 21	169
44	9 x 24	174
44	10 x 24	193

Door sets with double door leaf

35	12 x 21	162
35	15 x 21	203
40	12 x 21	185
40	15 x 21	231
44	12 x 21	203
44	15 x 21	254

12.2.3
Detailed Door Set Prices

Type	Thickness mm	Size MxM	Unit price/USD PH	WE	NA	AUST	MEA	JAP
Door sets with one door leaf								
A	35	8x21	139	129	119	114	124	124
B	"	"	107	99	92	88	95	95
C	"	"	100	93	86	82	89	89
D	"	"	118	109	101	97	105	105
E	"	"	137	127	117	112	122	122
A	"	9x21	156	144	133	128	139	139
B	"	"	120	111	103	99	106	106
C	"	"	112	104	96	92	100	100
D	"	"	132	122	113	109	118	118
E	"	"	153	142	131	125	137	137

PH = Philippines
WE = Western Europe
NA = North America
AUST = Australia
MEA = Middle East
JAP = Japan

1) weighted with door types, sales prices and sales volumes in each country

Type	Thickness mm	Size MxM	Unit price/USD PH	WE	NA	AUST	MEA	JAP
Door sets with one door leaf (cont.)								
A	35	10x21	174	161	148	143	155	155
B	"	"	134	124	115	110	118	118
C	"	"	125	116	107	103	112	112
D	"	"	147	136	126	122	132	132
E	"	"	171	158	146	140	153	153
A	40	9x21	174	161	149	143	155	155
C	"	"	126	117	108	103	112	112
D	"	"	147	136	126	121	131	131
E	"	"	172	160	148	142	154	154
A	"	10x21	193	178	165	158	172	172
C	"	"	140	130	120	114	124	124
D	"	"	163	151	140	134	145	145
E	"	"	191	177	164	157	171	171
A	"	9x24	198	183	169	163	176	176
C	"	"	143	133	123	117	127	127
D	"	"	167	155	143	138	149	149
E	"	"	196	182	168	161	175	175
A	"	10x24	220	204	189	181	196	196
C	"	"	160	148	137	130	142	142
D	"	"	186	172	160	153	166	166
E	"	"	218	203	187	180	195	195
A	44	9x21	190	176	163	156	170	170
C	"	"	138	128	118	113	123	123
D	"	"	161	149	138	132	143	143
E	"	"	188	175	162	155	168	168
A	"	10x21	212	196	181	174	188	188
C	"	"	153	142	131	125	136	136
D	"	"	179	165	153	147	159	159
E	"	"	209	195	180	173	187	187
A	"	9x24	218	202	187	179	194	194
C	"	"	158	146	135	129	140	140
D	"	"	184	170	158	151	164	164
E	"	"	215	200	185	178	193	193
A	"	10x24	242	224	207	199	215	215
C	"	"	175	162	150	143	156	156
D	"	"	204	189	175	168	182	182
E	"	"	239	222	205	197	214	214
Door sets with double door leaf								
G	35	12x21	192	179	165	158	172	172
H	"	"	168	156	144	138	150	150
F	"	15x21	208	192	177	170	185	185
I	"	"	245	227	210	201	219	219
G	40	12x21	206	191	176	169	184	184
F	"	15x21	235	218	201	193	210	210
I	"	"	279	259	239	229	249	249
G	44	12x21	226	210	194	186	202	202
F	"	15x21	258	240	221	212	230	230
I	"	"	307	285	263	252	274	274

12.2.4
Sales Revenue

Door sets with one door leaf

Thickness mm	Size MxM	Production unit/a	Sales revenue USD/a x 1000
35	8 x 21	1 700	183
35	9 x 21	10 200	1 234
35	10 x 21	5 100	689
40	9 x 21	1 216	169
40	10 x 21	2 836	437
40	9 x 24	136	22
40	10 x 24	316	56
44	9 x 21	1 214	185
44	10 x 21	2 834	479
44	9 x 24	134	23
44	10 x 24	314	60
Total, one door leaf		26 000	3 537

Door sets with double door leaf

Thickness mm	Size MxM	Production unit/a	Sales revenue USD/a x 1000
35	12 x 21	1 498	243
35	15 x 21	1 502	305
40	12 x 21	65	12
40	15 x 21	437	101
44	12 x 21	60	12
44	15 x 21	438	111
Total, double door leaf		4 000	784
Total sales revenue from doors net at the mill			4 321

Sales revenue from wood waste

Wood waste would be sold to persons living near the mill site for use as fuel and part of cutting ends to nearby furniture makers. A total of about 2000 m^3/a of wood waste would be available to sale.

The average unit sales price would be USD 3 per m^3.

The sales revenue from wood waste would be

3 x 2000 = USD 6000/a

	USD 1000
Total sales revenue	4 321
(waste)	6
	4 327

12.3 Profitability

12.3.1 ROI Calculation (Return on Investment)

The ROI calculation is a method for measuring the profit in which the operating profit is divided by the total mill investment.

With this method the profit is calculated assuming that the mill operates at full capacity.

	x USD 1000
Sales revenue	4 327
Variable costs	2 363
Contribution margin	1 964
Fixed costs	359
Operating profit before capital costs and taxes	1 605

Total mill investment including working capital and interest during construction is 7 289 000 USD.

$$ROI = \frac{1\ 605}{7\ 289} \times 100 = 22.0\ \%$$

12.3.2 Discounted Cash Flow (DCF) Calculation

The DCF is a measure of the interest at which the total value of the discounted annual income equals the annual discounted expenses during the lifetime of the project.

The following criteria have been used for the calculation:

a) The total economic lifetime of this mill has been assumed to be 13 years. No re-investments are envisaged as the mill design has been based on reliable main machinery. The cost of re-tooling is covered by the cost of operating materials.

b) Production schedule

The production volume of the mill would increase as follows:

Year	Production volume % (of full capacity)	
1	0	construction years
2	0	
3	75	
4	90	
5-15	100	

c) Distribution schedule of working capital

Year	Annual change of working capital x USD 1000	
1	-	construction years
2	+ 50	
3	+675	
4	+207	
5	+104	
6-15	-	

d) Distribution of investment without working capital and interest during construction

Year	Annual distribution of investment x USD 1000	
1	530	construction years
2	5 100	
3	363	
4-15	-	

The DCF of the project would be 19,9 %. The calculations, including a cash flow analysis and cash flow statement, are presented on the following pages.

JAAKKO PÖYRY

PROJECT K3885 FEASIBILITY STUDY OF DOOR FACTORY FOR CLIENT UNIDO/VINTAWOOD
CASE: 1

C A S H F L O W A N A L Y S I S 1000 USD

DISCOUNTED CASH FLOW RATE 19.90%

	TOTAL INVEST-MENTS	OPER. PROFIT	CASH FLOW	DISC-COUNTED CASH FLOW	CUM. DISC. CASH FLOW
1	530.0	.0	-530.0	-530.0	-530.0
2	5150.0	.0	-5150.0	-4295.3	-4825.3
3	1038.0	1114.0	76.0	52.9	-4772.4
4	207.0	1408.6	1201.6	697.1	-4075.3
5	104.0	1605.0	1501.0	726.3	-3349.0
6	.0	1605.0	1605.0	647.8	-2701.2
7	.0	1605.0	1605.0	540.3	-2161.0
8	.0	1605.0	1605.0	450.6	-1710.4
9	.0	1605.0	1605.0	375.8	-1334.6
10	.0	1605.0	1605.0	313.4	-1021.1
11	.0	1605.0	1605.0	261.4	-759.7
12	.0	1605.0	1605.0	218.0	-541.7
13	.0	1605.0	1605.0	181.9	-359.8
14	.0	1605.0	1605.0	151.7	-208.2
15	-1036.0	1605.0	2641.0	208.2	.0

PREPARED BY CJH USING IFPS MODEL CFLOWAN AND REPORT CFLOWFT
TIME: 1982-1-19 12:23

JAAKKO PöYRY

PROJECT K3885 FEASIBILITY STUDY OF DOOR FACTORY FOR CLIENT UNIDO/VINTAWOOD
CASE: 1

C A S H F L O W S T A T E M E N T (1000 USD)

	1	2	3	4	5	6
TOTAL SALES INCOME	0	0	3245	3894	4327	4327
VARIABLE COSTS						
-WOOD RAW MATERIAL	0	0	1467	1760	1956	1956
-OTHER VARIABLE COSTS	0	0	305	366	407	407
TOTAL VARIABLE COSTS	0	0	1772	2127	2363	2363
CONTRIBUTION MARGIN	0	0	1473	1768	1964	1964
FIXED COSTS						
-PERSONNEL COSTS	0	0	219	219	219	219
-OTHER FIXED COSTS	0	0	140	140	140	140
TOTAL FIXED COSTS	0	0	359	359	359	359
TOTAL MANUFACTURING COSTS	0	0	2131	2486	2722	2722
OPERATING PROFIT	0	0	1114	1409	1605	1605
INVESTMENTS						
-FIXED INVESTMENT	530	5100	363	0	0	0
-WORKING CAPITAL	0	50	675	207	104	0
TOTAL INVESTMENTS	530	5150	1038	207	104	0
CASH FLOW	-530	-5150	76	1202	1501	1605

REPORT PREPARED BY CJH USING IFPS MODEL INCOME AND REPORT INCOMEENG
TIME: 1982-1-19 12:10

JAAKKO PÖYRY

PROJECT K3885 FEASIBILITY STUDY OF DOOR FACTORY FOR CLIENT UNIDO/VINTAWOOD
CASE: 1

C A S H F L O W S T A T E M E N T (1000 USD)

	7	8	9	10	11	12
TOTAL SALES INCOME	4327	4327	4327	4327	4327	4327
VARIABLE COSTS						
-WOOD RAW MATERIAL	1956	1956	1956	1956	1956	1956
-OTHER VARIABLE COSTS	407	407	407	407	407	407
TOTAL VARIABLE COSTS	2363	2363	2363	2363	2363	2363
CONTRIBUTION MARGIN	1964	1964	1964	1964	1964	1964
FIXED COSTS						
-PERSONNEL COSTS	219	219	219	219	219	219
-OTHER FIXED COSTS	140	140	140	140	140	140
TOTAL FIXED COSTS	359	359	359	359	359	359
TOTAL MANUFACTURING COSTS	2722	2722	2722	2722	2722	2722
OPERATING PROFIT	1605	1605	1605	1605	1605	1605
INVESTMENTS						
-FIXED INVESTMENT	0	0	0	0	0	0
-WORKING CAPITAL	0	0	0	0	0	0
TOTAL INVESTMENTS	0	0	0	0	0	0
CASH FLOW	1605	1605	1605	1605	1605	1605

REPORT PREPARED BY CJH USING IFPS MODEL INCOME AND REPORT INCOMEENG
TIME: 1982-1-19 12:10

JAAKKO PÖYRY

PROJECT K3885 FEASIBILITY STUDY OF DOOR FACTORY FOR CLIENT UNIDO/VINTAWOOD
CASE: 1

C A S H F L O W S T A T E M E N T (1000 USD)

	13	14	15
TOTAL SALES INCOME	4327	4327	4327
VARIABLE COSTS			
-WOOD RAW MATERIAL	1956	1956	1956
-OTHER VARIABLE COSTS	407	407	407
TOTAL VARIABLE COSTS	2363	2363	2363
CONTRIBUTION MARGIN	1964	1964	1964
FIXED COSTS			
-PERSONNEL COSTS	219	219	219
-OTHER FIXED COSTS	140	140	140
TOTAL FIXED COSTS	359	359	359
TOTAL MANUFACTURING COSTS	2722	2722	2722
OPERATING PROFIT	1605	1605	1605
INVESTMENTS			
-FIXED INVESTMENT	0	0	0
-WORKING CAPITAL	0	0	-1036
TOTAL INVESTMENTS	0	0	-1036
CASH FLOW	1605	1605	2641

REPORT PREPARED BY CJH USING IFPS MODEL INCOME AND REPORT INCOMEENG
TIME: 1982-1-19 12:10

12.4 Sensitivity Analysis

12.4.1 Basis of Calculation

The sensitivity of the DCF rate to a change in each of the following factors has been calculated:

- total sales revenue
- wood raw material costs
- fixed investment
- total variable costs
- total fixed costs
- production volume (graphically)

12.4.2 Sensitivity of DCF

The sensitivity of the DCF to various changes is illustrated on the following pages.

The results show that a change in the sales revenue has the strongest effect on the profitability.

A change in variable costs has the second strongest influence on the DCF rate, whereas a change in fixed costs has the smallest effect, assuming that the change is in the range 0 to $\pm$20 %.

The result of the sensitivity analysis is shown on the following pages.

JAAKKO PÖYRY

PROJECT K3885 FEASIBILITY STUDY OF DOOR FACTORY FOR CLIENT UNIDO/VINTAWOOD
CASE: 1

S E N S I T I V I T Y A N A L Y S I S F O R D C F - R A T E

VARIABLE TO BE CHANGED

	-50%	-20%	-10%	-5%	0%
TOTAL SALES INCOME	-100	5.4%	13.1%	16.6%	19.9%
WOOD	33.7%	25.6%	22.8%	21.4%	19.9%
FIXED INVESTMENT	37.8%	24.9%	22.2%	21.0%	19.9%
TOTAL VARIABLE COSTS	36.4%	26.8%	23.4%	21.7%	19.9%
TOTAL FIXED COSTS	22.8%	21.0%	20.5%	20.2%	19.9%

	0%	5%	10%	20%	50%
TOTAL SALES INCOME	19.9%	23.1%	26.2%	32.2%	49.1%
WOOD	19.9%	18.4%	16.9%	13.8%	3.1%
FIXED INVESTMENT	19.9%	19.9%	17.9%	16.2%	12.1%
TOTAL VARIABLE COSTS	19.9%	18.1%	16.3%	12.4%	-1.4%
TOTAL FIXED COSTS	19.9%	19.6%	19.3%	18.8%	17.0%

*** DISCOUNTED CASH FLOW RATE COMPUTED ON TOTAL INVESTMENT ***

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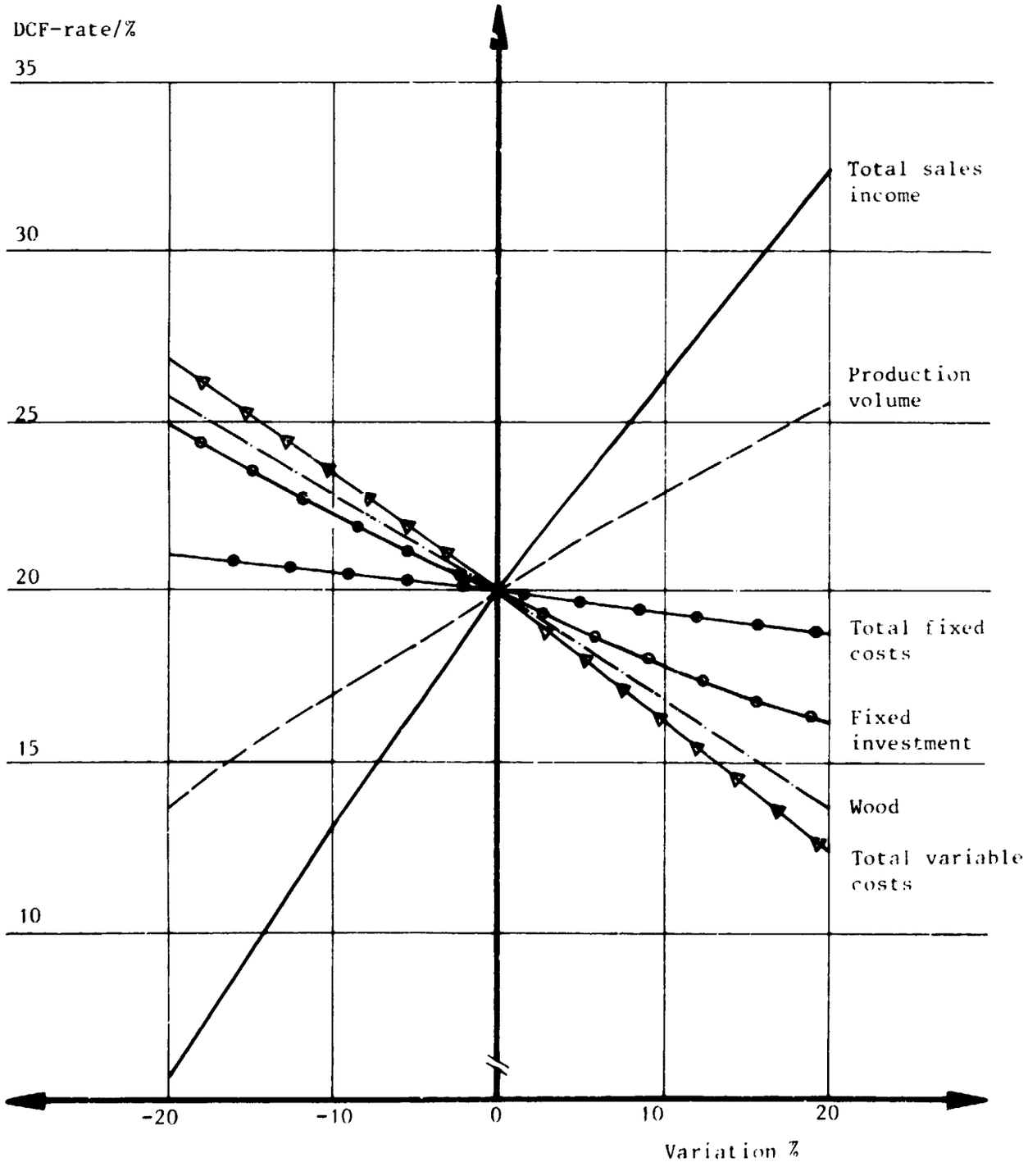
TIME: 1982-1-19 12:25

Sensitivity Analyse for DCF Rate

- economic lifetime of the project 13 years
- basic value of DCF rate is 19,9 %



13
PROJECT FINANCING

13.1
Financial Requirement

The total financial requirement of the porject differs from the investment estimates in that the time factor has been included in the calculations in the form of escalation. The total financial requirement of the project has been estimated based on two alternative interest rates: 14.0 % and 8.75 %. The first one can be considered a typical rate for a commercial loan whereas the second one could be a combination of soft loans and suppliers' credits.

In addition to the interest rates, the calculations are based on following assumptions:

- the construction period would be 16 months
- loans would be raised in the middle of the year
- there would be no financial fees or they are included in the interest rates
- average inflation rate would be 12 percent
- working capital would be financed separately with short-term loans (14 % interest rate)
- equity would be 40 percent of the total fixed investments

Based on the above assumptions the financial requirement and break-down of equity and debts is as follows:

	1	2	3	Total
		USD 1000		
Investment cost				
- fixed investment	530	5 100	363	5 993
- escalation	20	840	70	930
sub-total	550	5 940	433	6 923
- working capital	-	50	675	725
- escalation	-	8	158	166
Sub-total	-	58	833	891
Total investment	550	5 998	1 266	7 814
Interest during construction				
- alt. commercial loans	15	300	-	315
- alt. soft loans	10	189	-	199
Total financial requirement				
- alt. commercial loans	565	6 298	1 266	8 129
- alt. soft loans	560	6 187	1 266	8 013

The total financial requirement of the project has been estimated at USD 8.1 million, if financed with commercial loans and USD 8.0 million, if softer loans were available.

Assuming a 40 percent equity participation, the total equity would be:

	Total equity, USD 1000
- commercial loans	3 184
- soft loans	3 137

13.2 Financial Viability

The project would be financially viable even with commercial loans. This is shown in Table 13-1.

The figures in Table 13-1 have been calculated with constant costs and prices with the financial assumptions presented in section 13.1. Both the commercial and soft loans have been assumed to be amortized within 8 years from the start-up; the total loan period would thus be 10 years. Amortizations have been assumed to be paid in equal annual instalments. Short-term loand have been assumed to be amortized immediately as the cumulative cash-flow allows, i.e. in the 5th year with commercial loans, and in the 4th year if soft loans were available. After the 5th year from the project start-up, or 3rd year from the mill start-up, the project would rapidly start to accumulate a cash flow.

The following financial ratios are presented in Table 13-1:

- debt to equity
- long term debt to equity
- interest times covered
- current assets to current liabilities

The debt to equity ratio measures the solidity of the project. During the start-up year the debts of the project would be at worst 1.6 times greater than the equity, then starting rapidly to decrease.

The project is intended to be financed mainly with long term loans. Therefore the difference between the long term debt to equity and the debt to equity ratios is fairly small.

Table 13–1
Tentative Financing Budget and Financial Ratios

	Commercial Loans						Soft Loans					
Years	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
Use of Funds												
Fixed investment	530	5 100	363	–	–	–	530	5 100	363	–	–	–
Working capital	–	50	675	207	104	–	–	50	675	207	104	–
Interest on long term loans	23	272	513	462	396	330	14	167	315	284	243	203
Interest on short term loans	–	–	7	102	102	–	–	–	7	102	102	–
Amortizations, long term	–	–	472	472	472	472	–	–	463	463	463	463
Amortizations, short term	–	–	–	–	725	–	-	–	–	–	725	–
Total Use of Funds	**553**	**5 422**	**2 030**	**1 243**	**1 799**	**802**	**544**	**5 317**	**1 823**	**1 056**	**1 637**	**666**
Sources of Funds												
Equity	221	2 149	145	–	–	–	218	2 107	145	–	–	–
Long term loans	332	3 223	218	–	–	–	326	3 160	218	–	–	–
Short term loans	–	50	675	–	–	–	–	50	675	–	–	–
Operating profit	–	–	1 114	1 409	1 605	1 605	–	–	1 114	1 409	1 605	1 605
Total Sources of Funds	**553**	**5 422**	**2 152**	**1 409**	**1 605**	**1 605**	**544**	**5 317**	**2 152**	**1 409**	**1 605**	**1 605**
Cash flow	0	0	122	166	–194	803	0	0	329	353	–32	939
Cumulative cash flow	0	0	122	288	94	897	0	0	329	682	650	1 589
Financial Ratios												
Debt to equity	1.5	1.5	1.6	1.4	0.9	0.8	1.5	1.5	1.6	1.4	0.9	0.8
Long term debt to equity	1.5	1.5	1.3	1.1	0.9	0.8	1.5	1.5	1.3	1.1	0.9	0.8
Interest times covered	–	–	2.1	2.5	3.8	4.9	–	–	3.5	4.6	6.2	7.9
Current assets to current liability	–	-	1.6	2.0	5.5	10.7	–	–	2.1	2.7	9.5	20.8

Interest times covered is the ratio of gross income available to the suppliers of long-term capital (both equity and debt) to the interest charges on the long-term debt. Gross income is annual operating profit after allowing for interest due to short-term loans. This ratio shows the amount of income cover available to meet the long-term interest charges. A ratio of 3:1 of profits to loan interest would indicate that profits could fall two thirds and still be adequate to meet the total loan interest. The ratio is calculated on income gross of tax.

Current assets comprise cash and those assets which can be, and usually are, turned into cash within a short period (within a year). The current assets within the project are, in addition to cumulative cash flow, working capital and operating profit. Conversely, current liabilities embrace those liabilities which fall due for settlement within a year. In this case such payments are all interest payments and short term loans.

The current ratio is the principal concern of all short-term lenders, the suppliers giving trade credit, the banks providing overdraft facilities, and the banks and discount companies lending on trade bills. A current ratio of about 2:1 would generally be considered very good (after the second year from the start-up) and 1.5:1 would probably be considered a normal acceptable minimum. The more liquir the assets, the lower the acceptable ratio.

To summarize the financial ratios it can be said that especially interest times covered and the current ratio in the case of commercial loans would be fairly close to the minimum acceptable level, whereas in the case of soft loans these ratios would be moderate or good. In both cases the debt to equity ratio would, however, be sufficient to allow economic operation.

Although the project looks financially feasible, it may run into problems when raising the necessary loans if it is not backed by a strong credit. This credit backing may be limited to the critical construction and start-up period (year 1 to 3) rather than the life of the project. It may take the form of direct or indirect guarantees, take-or-pay contracts or economic necessity. The collateral of the project alone is normally insufficient to support financing.

ANNEXES

ANNEX I STANDARDS FOR WOOD DOOR MANUFACTURING

a) ISO norms
b) Fed. Rep. of Germany
c) Netherlands
d) Belgium
e) France
f) England
g) Canada
h) Japan
i) Australia
j) USA
k) European (EN) standards

a) ISO norms

(International Organization for Standardization, Situation 1981-04)

TC 162		**Doors and windows**
		UDC 69.028
ISO/R 1226-1970	7	Symbolic designation of direction of closing and faces of doors, windows and shutters – Part I
ISO 1804-1972	8	Doors – Terminology
ISO 6443-1980	2	Door leaves – Measurement of dimensions and of defects of squareness
ISO 6444-1980	1	Door leaves – Test of behaviour under humidity variations (successive uniform climates)
TC 59		**Building construction**
		UDC 69
ISO 2776-1974	1	Modular co-ordination – Co-ordinating sizes for doorsets – External and internal

b) Fed. Rep. of Germany

DIN (Deutsches Institut für Normung)

610

DK 69.022/.024 Wände. Verbände. Dächer
Walls. Frameworks. Roofs

18100[1)]		9.55	Türöffnungen für den Wohnungsbau, Rohbau-Richtmaße
E 18100		12.76	Türen; Wandöffnungen für Türen Doors; wall openings for doors

612

DK 69.028.1 Türen
Doors

18101		7.55	Holztüren für den Wohnungsbau; Türblattgrößen, Bandsitz und Schloßsitz
▶ E 18101	T1	6.80	Türen; Türelemente, Türblätter und Türzargen, Gegenseitige Abhängigkeit der Maße, Bandsitz und Schloßsitz, Türblattmaße [6] Doors; door-sets, door leaves and door frames, interdependence of dimensions, location of door hinge and lock, door-leave-dimensions
68706	T1	1.80	Sperrtüren, Begriffe, Vorzugsmaße, Konstruktionsmerkmale für Innentüren [5] Plywood-doors; concepts, priority sizes, contruction characteristics for interior doors
E 68706	T2	10.78	Sperrtüren; Bezeichnungen Plywood-doors, designations
EN 24		7.76	Türen; Prüfung von Fehlern in der allgemeinen Ebenheit von Türblättern [5] *(En, Fr)* Doors; measurement of defects of general flatness of door leaves
EN 25		7.76	Türen; Prüfung der Abmessungen und der Rechtwinkligkeit von Türblättern [5] *(En, Fr)* Doors; measurement of dimensions and of defects of squareness of door leaves
EN 43		7.76	Prüfmethoden für Turen; Verhalten von Turblattern unter verschiedenen Feuchtigkeitsbedingungen in aufeinanderfolgenden allseitig einheitlich einwirkenden konstanten klimatischen Verhältnissen [5] *(En, Fr)* Methods of testing doors; behaviour under humidity variations of doors placed in successive uniform climates
EN 79		11.79	Prüfverfahren an Türen; Verhalten von Turblattern zwischen zwei unterschiedlichen Klimaten *(En, Fr)* Test methods on doors, behaviour of door leaves within two different climates
E EN 108		12.77	Prüfverfahren für Turen, Verschiebung in der Turblattebene *(En, Fr)* Methods of testing doors, test for deformation in the plane of the leaf
E EN 129		2.80	Prüfung von Türen; Prüfung der Verformung von Türblättern durch Verwinden [5] *(En, Fr)* Methods of testing doors; test for deformation in torsion of the door leaves
E EN 130		2.80	Prüfung von Türen; Prüfung der Steifigkeit von Türblättern durch wiederholtes Verwinden [6] *(En, Fr)* Methods of testing doors; test for the change in stiffness of the door leaves by repeated torsion
E 18106	T1	1.81	Türen; Wandöffnungen für Türen, Maße nach der Modulordnung, Vorzugsgrößen *(Vorgänger war in Gruppe 810)*
E 18100	T2	1.81	Türen; Wandöffnungen für Türen, Maße nach der Maßordnung, Vorzugsgrößen *(Vorgänger war in Gruppe 810)*
E 18103		3.81	Einbruchhemmende Türen; Widerstand gegen mechanischen Angriff, Begriffe, Anforderung und Prüfung [6]
EN 85		1.81	Prüfverfahren an Türen; Prüfung von Türblättern gegen harten Stoß [5] *(E, F)*

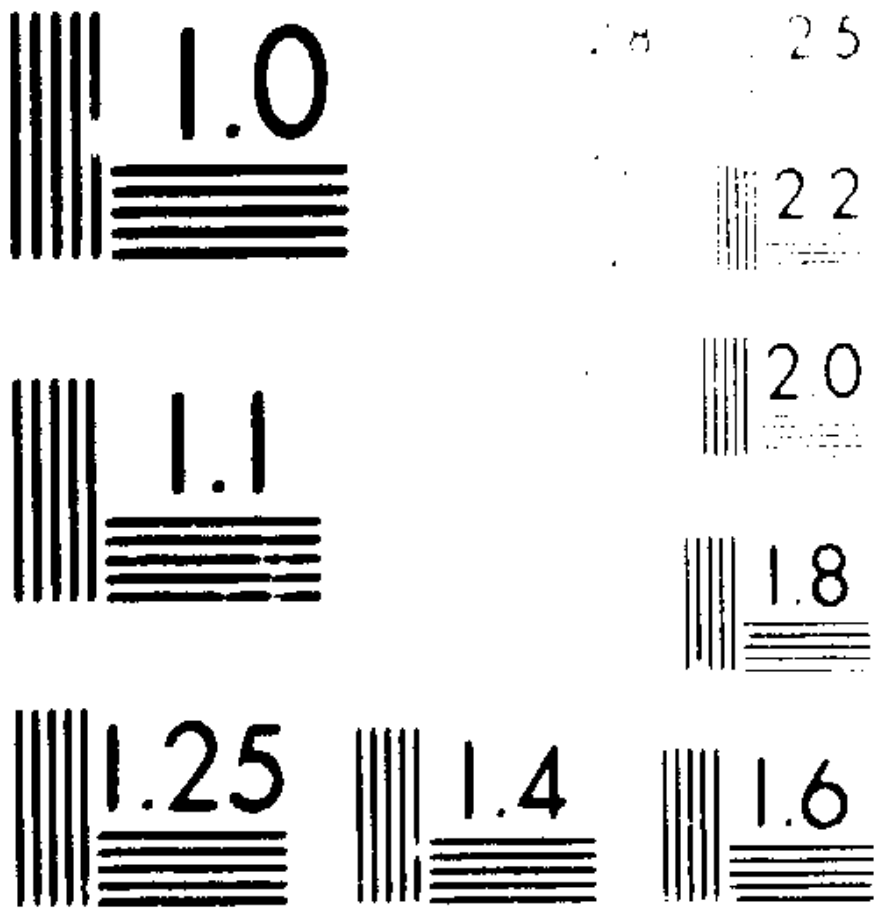
1) suggestion

[illegible] 10.79 VOB Verdingungsordnung für Bauleistungen, Teil C Allgemeine Technische Vorschriften für Bauleistungen, Zimmer- und Holzbauarbeiten [7] *(En)*
Contract procedure for building works, part C general technical specifications for building works, carpentry and constructional timber works

[illegible] 10.79 VOB Verdingungsordnung für Bauleistungen, Teil C: Allgemeine Technische Vorschriften für Bauleistungen, Tischlerarbeiten [6] *(En)*
Contract procedure for building works, part C general technical specifications for building works, joinery works

EN = EURO norms prepared by CEN (European Committee for Standardization)

Each member of CEN has undertaken to work out a national standard within a specified time.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1.4
1.6

c) Netherlands

NNI (Nederlands Normalisatie-institut)
Situation 1981-01

822

UDC 69.028 Deuren, ramen en kozijnen

N 1180	51	Deuren voor gebouwen. Aanduiding van draairichting en beweegbaarheid	8	2	A4
NEN 2637	72	Maten van binnendeuren	12	4	A4
NEN-EN 24	76	Deuren. Het meten van afwijkingen van de algemene vlakheid (Ned.)	16	4	A4
NEN-EN 25	76	Deuren. Het meten van de afmetingen en afwijkingen van de haaksheid (Ned.)	16	4	A4
NEN-EN 43	76	Beproevingsmethoden voor deuren. Gedrag van deuren geplaatst tijdens opeenvolgende perioden in klimaten met verschillende vochtigheid (Ned.)	16	4	A4
Ontw. EN 79	75	Beproeving van deuren. Gedrag van deuren tussen twee verschillende klimaten (Eng.)	5	6	A4
Ontw. EN 85	76	Beproeving van deuren. Kogelvalproef (Eng.)	5	6	A4
Ontw. EN 108	77	Beproeving van deuren. Bepaling van de vervorming in het vlak van de deur (uithangproef) (Eng.)	5	4	A4
Ontw. EN 129	80	Beproeving van deuren. Bepaling van de vervorming door torsie (Eng.)	10	8	A4
Ontw. EN 130	80	Beproeving van deuren. Bepaling van de verandering van de stijfheid door herhaalde torsie (Eng.)	12	10	A4

d) Belgium

IBN (Institut Belge de Normalisation)
Situation 1981-01

B 25 - PORTES ET FENETRES

B 25-201	1977	HIX	5	Deuren-Het meten van afwijkingen van de algemene vlakheid (Europese norm EN 24)
B 25-202	1977	HIX	5	Deuren-Het meten van de afmetingen en afwijkingen van de haaksheid (Europese norm EN 25)
B 25-203	1977	HIX	5	Beproevingsmethoden voor deuren-Gedrag van deuren geplaatst tijdens opeenvolgende perioden in klimaat met verschillende vochtigheid (europese norm EN 43)
°B 25-207	1979	hIX	9	Méthodes d'essais des portes - Comportement des vantaux de portes placés entre deux climats différents (norme européenne EN 79)
°B 25-208	1980	hIX	3	**Méthodes d'essais des portes - Essai de choc de corps durs sur les vantaux de portes (norme européenne EN 85)**
B 25-211	1980	hIX	5	Méthodes d'essais des portes - Essai de déformation dans le plan du vantail (norme européenne EN 108)
°B 25-212		PIX	2	Méthodes d'essais des portes - Essai de déformation en torsion des vantaux de portes
°B 25-213		PIX	2	Méthodes d'essais des portes - Essai de rigidité des vantaux de portes par torsion répétée
B 25-205	1979	hIX	11	**Méthodes d'essais des fenêtres - Essais de résistance au vent (norme européenne EN 77)**
B 25-206	1979	hIX	7	**Méthodes d'essais des fenêtres - Présentation d'un rapport d'essai (norme européenne EN 78)**
B 25-209	1980	hIX	9	**Méthodes d'essais des fenêtres - Essai d'étanchéité à l'eau sous pression statique (norme européenne EN 86)**
B 25-210	1980	hIX	14	**Méthodes d'essais des fenêtres - Essais mécaniques (norme européenne EN 107)**

e) France

AFNOR (Association francaise de normalisation)

P - BATIMENT ET GENIE CIVIL

P 01 - DIMENSIONS DES CONSTRUCTIONS

NF P 01-001	JUILL. 1974	HOM	02	COORDINATION MODULAIRE - MODULE DE BASE
NF P 01-005	NOV. 1969	HOM	02	DIMENSIONS DES PORTES A VANTAUX BATTANTS

P 10 - GENERALITES

NF P 10-402	AVRIL 1944	HOM	01	DIMENSIONS DES BAIES POUR PORTES

P 20 - GENERALITES

NF P 20-511	NOV. 1974	HOM	01	PORTES - MESURAGE DES DEFAUTS DE PLANEITE GENERALE DES VANTAUX DE PORTES (NORME EUROPEENNE EN 24)
NF P 20-512	NOV. 1974	HOM	01	PORTES - MESURAGE DES DIMENSIONS ET DES DEFAUTS D'EQUERRAGE DES VANTAUX DE PORTES (NORME EUROPEENNE EN 25)
NF P 20-513	DEC. 1975	HOM	01	METHODES D'ESSAIS DES PORTES - COMPORTEMENT AUX VARIATIONS D'HUMIDITE DES VANTAUX DE PORTES PLACES DANS DES CLIMATS UNIFORMES SUCCESSIFS (NORME EUROPEENNE EN 43)
NF P 20-514	SEPT. 1977	HOM	01	METHODES D'ESSAIS DES PORTES - COMPORTEMENT DES VANTAUX DE PORTES PLACES ENTRE DEUX CLIMATS DIFFERENTS (NORME EUROPEENNE EN 79)
★NF P 20-51E	AOUT 1980	HOM	01	METHODES D'ESSAIS DES PORTES - ESSAI DE CHOC DE CORPS DUR SUR LES VANTAUX DE PORTES (NORME EUROPEENNE EN 85)

P 21 - CHARPENTE EN BOIS

NF P 21-202	MARS 1946	HOM	05	REGLES D'UTILISATION DU BOIS DANS LES CONSTRUCTIONS - REGLES DE CALCUL - EXECUTION DES ASSEMBLAGES (VOIR : NF B 52-001, MARS 1946 - REGLES D'UTILISATION DU BOIS DANS LES CONSTRUCTIONS - QUALITES DES BOIS ET CONTRAINTES ADMISSIBLES)

P 23 - MENUISERIE EN BOIS

NF P 23-302	JANV. 1970	HOM	08	PORTES PLANES INTERIEURES EN BOIS - TERMINOLOGIE ET CARACTERISTIQUES GENERALES
NF P 23-303	DEC. 1973	HOM	08	PORTES PLANES INTERIEURES EN BOIS - PORTES DE COMMUNICATION
NF P 23-304	DEC. 1973	HOM	08	PORTES PLANES INTERIEURES EN BOIS - PORTES PALIERES
NF P 23-305	JUILL. 1974	HOM	05	SPECIFICATIONS TECHNIQUES DES FENETRES ET PORTES-FENETRES EN BOIS
P 23-405	AVRIL 1965	FD	08	FENETRES A LA FRANCAISE, SIMPLES OU COMPOSEES SANS MENEAUX, A SIMPLE FEUILLURE
P 23-432	AVRIL 1965	FD	08	FENETRES A LA FRANCAISE, SIMPLES OU COMPOSEES SANS MENEAUX, A DOUBLE FEUILLURE
P 23-444	JUIN 1974	FD	01	PORTES DE CAVE
P 23-461	AVRIL 1965	FD	01	PORTES-FENETRES
NF P 23-501	DEC. 1973	HOM	06	PORTES PLANES INTERIEURES EN BOIS - TECHNIQUE DES ESSAIS

f) England

BSI (British Standards Institution)

BS **1567 : 1953 (1960) Wood door frames and linings**
28 page Gr 5 Amendments PD 1666, July 1953; PD 1848, April 1954; PD 2214, June 1955; PD 3051, May 1958; PD 3837, June 1960; PD 5464, February 1965. R
For external doors opening inwards and outwards, and for internal door frames and linings. For frames with wing lights the window portion is required to comply with BS 644: Part 1. Frames for fire check doors are excluded (BS 459: Part 3). Construction, priming. (Confirmed 1960.)
(SBN : 580 01975 6)

BS **4787 : —— Internal and external wood doorsets, door leaves and frames**

4787 : Part 1 : 1980 Specification for dimensional requirements 8 page A4 size Gr 5
Specifies metric sizes for dimensionally co-ordinated internal and external wood doorsets, door leaves and frames. (ISBN 0 580 11404 X)

BS **5277 : 1976 Doors. Measurement of defects of general flatness of door leaves [EN 24]**
4 page A4 size. Gr 3
Determines method to use to measure twist and bending. English language version of EN 24.
(ISBN : 0 580 08608 9)

BS **5278 : 1976 Doors. Measurement of dimensions and of defects of squareness of door leaves [EN 25]**
4 page A4 size. Gr 3
English language version of EN 25. (ISBN : 0 580 08628 3)

BS **5369 : 1976 Methods of testing doors; behaviour under humidity variations of door leaves placed in successive uniform climates [EN 43]** 4 page A4 size. Gr 3
Applicable to all flat and rigid doors containing hygroscopic materials. Test consists of placing the door leaves for a determined duration in successive uniform climates and measuring any changes in flatness and noting any resulting degradations. English language version of EN 43.
(ISBN : 0 580 09354 9)

BS **CP 151 : --- Doors and windows including frames and linings**

➔ **CP 151 : Part 1 : 1957 Wooden doors** 52 page Gr 7 Amendment PD 5567, July 1965 R
This part of the code deals with wooden doors of all types for normal purposes and with the different methods employed in hanging doors and fixing their frames and linings. Recommendations are given on weather protection, draught exclusion, precautions against fire, spread of flame, thermal insulation and durability. The various types of doors and their different methods of opening are fully described with accompanying sketches, and guidance is given on economy, strength, rigidity and dimensional stability. (SBN : 580 05063 7)

BS 459 : —— Doors

459 : Part 1 : 1954 Panelled and glazed wood doors
20 page Gr 4 Amendments PD 2[illegible], PD 5063, May 1[illegible] PD 2[illegible], February 1961; PD 5459, February 1[illegible] PD [illegible]

Design, dimensions and construction of flush and panelled doors and their panels, and glazed wood doors for internal and external purposes and for garages (SBN [illegible])

459 : Part 2 : 1962 Flush doors 16 page Gr 4 Amendments PD 5584, February 1965; PD 6161, May 1967; PD 6375, April [illegible]

Internal and external doors, adhesives, timber, facings, plywood, hardboard, adhesives, lippings, provision for glazing, fanlights and letter plates, wedges, door stops, water bars, flatness and finish (SBN [illegible])

459 : Part 3 : 1951 Fire check flush doors and wood and metal frames (half-hour and one-hour types) 16 page Gr 4 Amendments PD 3062, September 1[illegible] PD 3567, December 1959; PD 4[illegible], September 1961; PD 5455, February [illegible] PD [illegible] August [illegible] AMD 1449, June 1974 (for [illegible])

Doors and frames for internal and external use that have been shown to provide fire barriers to the passage of fire for half-hour and one-hour periods when exposed to the standard fire test with all the requirements for [illegible] specified in BS [illegible] (also referred to as 'fire-check'). Materials, construction (SBN [illegible])

459 : Part 4 : 1955 Matchboarded doors 12 page Gr 3 Amendment PD 5586, March 1965.

Ledged and braced, framed, ledged and braced doors. Timber, adhesives, construction, workmanship, sizes (SBN [illegible])

BS 1186: Part 1: 1971
Specification for quality of timber and workmanship in joinery. Part 1. Quality of timber.

BS 1186: Part 2: 1971
Specification for quality of timber and workmanship in joinery. Part 2. Quality of workmanship.

BS 476: Part 8: 1972
Test methods and criteria for the fire resistance of elements of building constructions.

g) Canada

CSA (Canadian Standards Association)

•O132.2-M1977	Wood Doors
O132.4-M1980	Hinged Exterior Wood Door Frames

CSS (Standards Council of Canada)

CAN 4 —*S104	Standard Method for Fire Tests of Door Assemblies	M..y 1977
CAN 4 -**	Standard Specification for Wood Core Doors Meeting the Performance Required by CAN4-S104-77 for Twenty Minute Fire Rated Closure Assemblies (Supersedes CAN4-S113-77)	Feb 1979

h) Japan

JIS (Japanese Industrial Standards Committee)

A 4601 1973 Wooden Fittings (Panelled Door, Flash Door)
(¥100)

i) Australia

SAA (Standards Association of Australia)

1224–1972 **Preferred sizes of building components (metric units)** 12pp A4 c

Gives preferred coordinating dimensions for certain building components and assemblies which are dimensionally critical. Items dealt with include masonry and precast units, sheet materials, ceramic (or similar) tiles, doorsets, windows, roofing and cladding, roof lights, ceiling panels, flooring, and paving slabs. Recommendations for sizes of masonry panels, spacing of timber studs, and spacing of ceiling suspension rods are also given. Dimensions given are consistent with recommendations for coordinated preferred dimensions in building given in AS 1234 in which a basic module of 100 mm is used.

1908–1976 **Timber doorsets**

1909–1976 **Code of practice for the installation of timber doorsets** (bound together) 44pp e

The specification applies to basic, general purpose doors and doorsets of dimensionally coordinated sizes. It covers flush doors with cellular, blockboard or particleboard infill, and joinery doors of the ledged and braced, framed and ledged, panelled and louvred types. The code provides rules for handling, installation and finishing of timber doorsets, and includes a symbolic designation of the direction of closing and faces of doors.

j) USA

NBS Technical Note 948. Tabulation of Voluntary Standards and Certification Programs for Consumer Products. U.S. Department of Commerce/National Bureau of Standards 1977.

AWI = Architectural Woodwork Institute
FHDA = Fir and Hemlock Door Association
NWMA = National Woodwork Manufactures
ANSI = American National Standards Institution

Doors, panel, flush or slab	AWI 1300 AWI 1400 FHDA 5 NAAMM #34 NAAMM CHM-1 NWMA I.S.-1 NWMA I.S.-5

AWI	1300	Quality Standard for Flush Solid and Hollow Core Doors
AWI	1400	Quality Standard for Stile and Rail Doors
FHDA	5	Product Standard for Douglas Fir, Western Hemlock and Sitka Spruce Doors and Blinds
NWMA	I.S. 1	Industry Standards for Wood Flush Doors
NWMA	I.S. 5	Industry Standards for Stock Ponderosa Pine Doors

Ponderosa Pine Doors, ANSI/NWMA I.S. 5-73, $3.00 [A200.2]
Wood Sliding Patio Doors, ANSI/NWMA I.S. 3-70, $2.00 [A200.4]

k) European standards (EN)

The standards have been adopted by the European Committee for Standardization (CEN).

Member countries of CEN and the initials of the National Standards Bodies (CEN member bodies) are as follows:

Countries	Member bodies
Austria	ON
Belgium	IBN
Denmark	DS
Finland	SFS
France	AFNOR
Germany	DIN
Greece	ELOT
Ireland	IIRS
Italy	UNI
Netherlands	NNI
Norway	NSF
Portugal	DGQ
Spain	IRANOR
Sweden	SIS
Switzerland	SNV
United Kingdom	BSI

EN 24 (E)"Doors - Measurement of defects of general flatness of door leaves"

(F)"Portes - Vérification de la planéité générale des vantaux de portes."

(D)"Türen - Prüfung der allgemeinen Ebenheit bei Türblättern"

Date of adoption/Date d'adoption/Annahmedatum 1974-12-30

COUNTRY PAYS LAND	ADOPTION ANNAHME (X)	NATIONAL REFERENCE REFERENCE NATIONALE NATIONALE BEZEICHNUNGS-NUMMER	DATE OF PUBLICATION DATE DE PUBLICATION VERÖFFENTLICHUNGS-DATUM	LANGUAGE LANGUE SPRACHE
AUSTRIA	X	ÖNORM EN 24	1976-04-01	GERMAN
BELGIUM	X	NBN B 25-201	1977-01	FRENCH/DUTCH
DENMARK	X	DS/EN 24	1976-10	DANISH
FINLAND	X	SFS 3972	1974-12-30	Endors. not FINNISH
FRANCE	X	NF P 20-511	1974-11	FRENCH
GERMANY	X	DIN EN 24	1976-07	GERMAN
GREECE	-	-	-	
IRELAND	X	-	-	
ITALY	X	UNI EN 24	1975-11-18	ITALIAN
NETHERLANDS	X	NEN-EN 24	1976-11	DUTCH
NORWAY	-	1)	1)	
PORTUGAL	-	-	-	
SPAIN	X	UNE 56-824-76	1976-06-15	SPANISH
SWEDEN	-	-	-	
SWITZERLAND	X	-	1979-12 2)	
UNITED KINGDOM	X	BS 5277	1976-01-30	ENGLISH

1981-07-01

1) incorporated in NS 3141 of 1974 which is not exactly the same as EN 24

2) Recommendation to apply the EN (endorsement)

EN 25 (E) "Doors - Measurement of dimensions and of defects of squareness of door leaves"

(F) "Portes - Vérification des dimensions et de l équerrage des vantaux de portes"

(D) "Türen - Prüfung der Abmessungen und der Rechtwinkeligkeit des Türblattes"

Date of adoption/Date d'adoption/Annahmedatum 1974-12-30

COUNTRY PAYS LAND	ADOPTION ANNAHME (X)	NATIONAL REFERENCE REFERENCE NATIONALE NATIONALE BEZEICHNUNGS-NUMMER	DATE OF PUBLICATION DATE DE PUBLICATION VEROFFENTLICHUNGS-DATUM	LANGUAGE LANGUE SPRACHE
AUSTRIA	X	ONORM EN 25	1976-04-01	GERMAN
BELGIUM	X	NBN B 25-202	1977-01	FRENCH/DUTCH
DENMARK	X	DS/EN 25	1976-10	DANISH
FINLAND	X	SFS 3973	1974-12-30	Endors. notice: FINNISH
FRANCE	X	NF P 20-512	1974-11	FRENCH
GERMANY	X	DIN EN 25	1976-07	GERMAN
GREECE	-	-	-	
IRELAND	X	-	-	
ITALY	X	UNI EN 25	1975-11-18	ITALIAN
NETHERLANDS	X	NEN-EN 25	1976-11	DUTCH
NORWAY	-	NS 3142	1)	
PORTUGAL	-	-	-	
SPAIN	X	UNE 56-821-75	1975-11-28	SPANISH
SWEDEN	-	-	-	
SWITZERLAND	X	-	1979-12 2)	
UNITED KINGDOM	X	BS 5278	1976-01-30	ENGLISH

1981-07-01

1) incorporated in NS 3145 of 1975 which is not exactly the same as EN 25

2) Recommendation to apply the EN (endorsement)

EN 43 (E) "Methods of testing doors. Behaviour under humidity variations of door leaves placed in successive uniform climates"

(F) "Méthodes d'essais des portes. Comportement aux variations d'humidité des vantaux de portes placés dans des climats uniformes successifs"

(D) "Prüfmethoden für Türen. Verhalten von Türblättern unter verschiedenen Feuchtigkeitsbedingungen in aufeinanderfolgende allseitig einheitlich einwirkenden konstanten klimatischen Verhältnisse

Date of adoption/Date d'adoption/Annahmedatum 1975-10-15

COUNTRY PAYS LAND	ADOPTION ANNAHME (X)	NATIONAL REFERENCE REFERENCE NATIONALE NATIONALE BEZEICHNUNGS-NUMMER	DATE OF PUBLICATION DATE DE PUBLICATION VERÖFFENTLICHUNGS-DATUM	LANGUAGE LANGUE SPRACHE
AUSTRIA	X	ONORM EN 43	1976-08-01	GERMAN
BELGIUM	X	NBN B 25-203	1977-01	FRENCH/DUTCH
DENMARK	-	-	-	
FINLAND	-	-	-	
FRANCE	X	NF P 20-513	1975-12	FRENCH
GERMANY	X	DIN EN 43	1976-07	GERMAN
GREECE	-	-	-	
IRELAND	-	EN 43:1975	1978 2)	ENGLISH
ITALY	X	UNI EN 43	1976-07-15	ITALIAN
NETHERLANDS	X	NEN-EN 43	1976-11	DUTCH
NORWAY	-	1)	1)	
PORTUGAL	-	-	-	
SPAIN	X	UNE 56-825-76	1976-03-09	SPANISH
SWEDEN	-	-	-	
SWITZERLAND	X	-	1979-12 3)	
UNITED KINGDOM	X	BS 5369	1976-04-30	ENGLISH

1981-07-01

1) incorporated within NS 3143

2) published by IIRS in the format on an Irish standard but not having the status of a national standard

3) Recommendation to apply the EN (endorsement)

EN 79 (E) "Methods of testing doors. Behaviour of door leaves placed between two different climates"

(F) "Méthodes d'essais des portes - Comportement des vantaux de portes placés entre deux climats différents"

(D) "Prüfverfahren an Türen - Verhalten von Türblättern zwischen zwei unterschiedlichen Klimaten"

Date of adoption/Date d'adoption/Annahmedatum 1977-08-26

COUNTRY PAYS LAND	ADOPTION ANNAHME (X)	NATIONAL REFERENCE REFERENCE NATIONALE NATIONALE BEZEICHNUNGS-NUMMER	DATE OF PUBLICATION DATE DE PUBLICATION VEROFFENTLICHUNGS-DATUM	LANGUAGE LANGUE SPRACHE
AUSTRIA	X	ONORM EN 79	1978-02-01	GERMAN
BELGIUM	X	NBN B 25-207	1979-01	FRENCH/DUTCH
DENMARK	-	-	-	
FINLAND	X	SFS 3298	1978-11-27	ENDORS. NOTIC FINNISH
FRANCE	X	NF P 20-514	1977-09	FRENCH
GERMANY	X	DIN EN 79	1979-11	GERMAN
GREECE	-	-	-	
IRELAND	-	-	-	
ITALY	X	UNI EN 79	1977-12-12	ITALIAN
NETHERLANDS	X	2)	-	
NORWAY	-	-	-	
PORTUGAL	X	-	1)	
SPAIN	X	UNE 56-829-78	1978-12-04	SPANISH
SWEDEN	-	-	-	
SWITZERLAND	X	-	1979-12 3)	
UNITED KINGDOM	-	-	-	

1981-07-01

1) in course of preparation

2) incorporated within NEN 3660

3) Recommendation to apply the EN (endorsement)

EN 85 (E) Methods of testing doors: hard body impact test on door leaves

(F) Méthodes d'essais des portes: essai de choc de corps dur sur les vantaux de portes.

(D) Prüfverfahren an Türen - Prüfung von Türblattern gegen harten Stoss

Date of adoption/Date d'adoption/Annahmedatum 1980-04-04

COUNTRY PAYS LAND	ADOPTION ANNAHME (X)	NATIONAL REFERENCE REFERENCE NATIONALE NATIONALE BEZEICHNUNGS-NUMMER	DATE OF PUBLICATION DATE DE PUBLICATION VEROFFENTLICHUNGS-DATUM	LANGUAGE LANGUE SPRACHE
AUSTRIA	X	ONORM EN 85	1980-12-01	GERMAN
BELGIUM	X	NBN B 25-208	1980-08	FRENCH/DUTCH
DENMARK	-			
FINLAND	-			
FRANCE	X	NF P 20-515	1980-08	FRENCH
GERMANY	X	DIN EN 85	1981-01	GERMAN
GREECE	-			
IRELAND	X			
ITALY	X	UNI/EN 85	1)	ITALIAN
NETHERLANDS	X			
NORWAY	-			
PORTUGAL	-			
SPAIN	X			
SWEDEN	-			
SWITZERLAND	X			
UNITED KINGDOM	-			

1981-07-01

1) in course of preparation -

EN 108 (E) Methods of testing doors - Test for deformation in in the plane of the leaf"

(F) Méthodes d'essais des portes - Essai de déformation dans le plan du vantail

(D) Prüfverfahren für Türen - Verschriebung in der Türblattebene

Date of adoption/Date d'adoption/Annahmedatum 1980-10-22

COUNTRY PAYS LAND	ADOPTION ANNAHME (X)	NATIONAL REFERENCE REFERENCE NATIONALE NATIONALES ZEICHEN	DATE OF PUBLICATION DATE DE PUBLICATION VERÖFFENTLICHUNGS-DATUM	LANGUAGE LANGUE SPRACHE
AUSTRIA	X	ÖNORM EN 108	1981-04-01	GERMAN
BELGIUM	X	NBN B 25 - 211	1980-12	FRENCH/DUTCH
DENMARK	-			
FINLAND	-			
FRANCE	X	NF P 20-516	1981-01	FRENCH
GERMANY	X			
GREECE	X			
IRELAND	-			
ITALY	-			
NETHERLANDS	X			
NORWAY	-			
PORTUGAL	-			
SPAIN	X			
SWEDEN	-			
SWITZERLAND	-			
UNITED KINGDOM	-			

1981-07-01

ANNEX II IMPORTS OF STUDY PRODUCTS INTO KEY MARKETS

Annex 2.1

THE PHILIPPINE EXPORTS OF WOOD JOINERY
AND MINOR WOODWORKING PRODUCTS

Customs code		Quantity	FOB value dollars
653.30.01	Builders carpentry and joinery (including prefabricated and sectional building and assembled parquet flooring panels)	-	-
	(1978)	-	259
653.30.02	Assembled parquet flooring panels (for blocks strips and frizzes for parquet flooring panels, not assembled)		
	- Japan	184 018	153 179
	- Others	57 164	86 400
	TOTAL (1979)	241 182	239 579
	(1978)	286 698	270 253
653.30.04	Wooden doors (GK)[1]		
	- United Kingdom	1 316 438	785 528
	- United States	206 043	[illegible] 144
	- Japan	510 699	113
	- Others	199 467	31
	TOTAL (1979)	2 232 647	[illegible] 674 516
	(1978)	2 186 164	2 167 477
635.30.09	Other builder's woodwork (GK)[1]		
	- Canada	4 112 373	2 177 833
	- Australia	5 775 563	2 249 372
	- Japan	2 440 830	1 463 719
	- United States	17 785 779	8 163 072
	- Others		
	TOTAL (1979)	35 243 071	16 549 930
	(1978)	30 917 460	10 [illegible] 366

1) gross kilos

		Quantity	FOB value dollars
635.49.01	Cabinet work and small joiner made articles (e.g. boxes, pen cases, wall cost racks) NO)		
	- United States	147 217	226 596
	- Others	102 630	159 382
	TOTAL (1979)	249 847	385 978
	(1978)	135 795	163 471
635.49.02	Book and wall shelves (NO) [1]		
	- Federal Republic of Germany	1 000	2 650
	- Others	543	2 238
	TOTAL (1979)	1 543	4 888
	(1978)	10 815	18 329

1) number

Annex 2.2a

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE TO THE USA

1
IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN 1979

Customs code		- 1000 USD -	- number -
635.30.10	Wooden doors, flush	11 429	650 018
	- Mexico	4 967	396 043
	- Taiwan	4 659	138 406
	- Canada	998	85 291
	- Brazil	392	21 094
	- Colombia	201	2 732
	- Philippines	72	3 003
	- Others	140	3 449
635.30.20	Wood doors, except flush	16 107	802 660
	- Taiwan	8 666	601 457
	- Mexico	4 696	107 913
	- Canada	1 106	48 953
	- Philippines	650	18 684
	- Colombia	211	2 383
	- Others	778	23 270
635.30.45	Window and door casings of wood	902	
	- Canada	261	
	- Germany, F.R.	142	
	- Philippines	141	
	- Taiwan	133	
	- Malaysia	70	
	- Others	156	
635.30.50	Window units and sash, of wood, whether or not knocked-down, open or glazed	3 694	
	- Denmark	2 720	
	- Canada	495	
	- Others	479	
635.42.20	Household utensils	73 486	
	- Taiwan	45 896	
	- Thailand	6 925	
	- Philippines	5 047	
	- Hong Kong	2 841	
	- Japan	2 679	
	- India	1 220	
	- Italy	1 035	
	- United Kingdom	926	
	- Canada	811	
	- Others	6 106	

Annex 2.2b

IMPORTS BY COMMODITY FROM THE PHILIPPINES 1979 TO THE USA

	Value		Number	
	1000 USD	% of total imports		%
Wood doors, flush	72	0.6	3 003	0.5
Wood doors, except flush	650	4	18 684	2
Window and door casings of wood	141	16	..	..
Forks, spoons, and household utensils uspf, of wood	5 047	7	..	..
Jewelry boxes, silverware chests, cigar and cigarette boxes, etc., of wood, not lined	128	2	123 942	4
Wood carvings	970	7	..	..
Tools, tool bodies, tool handles and backs, etc., of wood, except paint brush/roller handles	116	1	..	..

Annex 2.3a

IMPORTS OF BUILDERS' CARPENTRY AND JOINERY
AND WOODEN FURNITURE TO CANADA

1
IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN 1979

Customs code		- 1000 CAD -	- number -
336.09	Doors of wood	8 595	439 525
	- USA	6 071	149 614
	- Taiwan	2 327	284 152
	- Denmark	87	1 156
	- Philippines	49	2 992
	- Italy	21	990
	- Mexico	21	318
	- New Zealand	8	100
	- United Kingdom	7	147
	- Germany, F.R.	4	56
336.35	Windows, door and window frames, wood	23 505	
	- USA	16 460	
	- Malaysia	3 331	
	- Philippines	1 615	
	- Taiwan	699	
	- Korea, Rep.	615	
	- Denmark	373	
	- Singapore	169	
	- Colombia	115	
	- Ecuador	81	
	- Others	47	
336.99	Millwork, nes	25 975	
	- USA	21 607	
	- Philippines	1 069	
	- Malaysia	986	
	- Taiwan	745	
	- Colombia	541	
	- Korea, Rep.	291	
	- Singapore	161	
	- Ecuador	105	
	- Others	470	

Annex 2.3b

IMPORTS BY COMMODITY FROM THE PHILIPPINES 1979

	Value		Number	
	1000 CAD	% of total		%
Doors of wood	49	0.6	2 992	0.7
Windows, doors and window frames, wood	1 615	7	..	
Millwork nes	1 069	4	..	

Annex 2.4a

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE TO BELGIUM - LUXEMBURG

1
IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN 1979

Customs code		- 1000 BEF -	- number -
4423.510	Wooden doors	602 759	441 928
	- EEC	535 004	394 645
	- Others	67 755	47 283
4423.550	Windows	838 083	245 204
	- EEC	832 621	242 114
	- Others	5 462	3 090
			- tons -
4424.000	Household utensils	198 661	1 655
	- EEC	126 720	891
	- Taiwan	38 667	460
	- Thailand	9 130	118
	- Others	24 144	186

Annex 2.5a

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE TO FRANCE

1
IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN

Customs code		- 1000 FRF -	- number -
44.23.51.0-1	Wooden doors	45 423	511 555
	- EEC	35 983	320 026
	- Taiwan	6 200	166 421
	- Others	3 240	25 108
44.23.55.0	Windows, doors & window frames	103 620	308 254
	- EEC	101 149	299 612
	- Tunisia	1 104	4 510
	- Others	1 367	4 132
			- tons -
44.24.00.0	Household utensils	77 130	7 657
	- EEC	37 380	4 281
	- Taiwan	15 273	1 242
	- Spain	8 834	318
	- Thailand	3 363	273
	- Portugal	2 526	221
	- Romania	1 796	387
	- Sweden	1 629	64
	- Albania	1 155	263
	- Czechoslovakia	1 098	222
	- Philippines	714	51
	- Others	3 362	335

Annex 2.5b
2
IMPORTS BY COMMODITY FROM THE PHILIPPINES 1979 TO FRANCE

Commodity	Value		Quantity	
	1000 FRF	% of total imports	tons	%
Household utensils	714	0.9	51	0.7

Annex 2.6a

GERMANY, FED. REP.

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE
TO THE FED. REP. OF GERMANY

1
IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN 1979

Customs code		- 1000 DEM -	- number -
44.23.51.0	Wooden doors	80 990	1 954 600
	- EEC	54 613	867 607
	- Taiwan	7 818	703 152
	- Sweden	5 557	51 997
	- Austria	3 725	20 865
	- Yugoslavia	3 221	64 496
	- Rest of Europe[1)]	1 556	14 338
	- North America	1 638	71 927
	- Indonesia	1 264	90 117
	- Others	1 598	70 101
44.23.53.0	Windows, window sash of wood	82 912	417 622
	- EEC	67 795	318 030
	- Austria	8 649	57 453
	- Singapore	4 956	32 869
	- Sweden	472	1 679
	- Switzerland	584	1 298
	- Yugoslavia	247	1 054
	- Norway	107	384
	- Others	102	4 855
44.33.80.0	Builders' carpentry and joinery n.e.s. (excl. parquet)	43 203	15 807
	- Austria	16 647	5 618
	- EEC	16 643	5 763
	- Finland	4 019	2 171
	- Switzerland	2 976	556
	- Sweden	1 179	707
	- Malaysia	498	444
	- Taiwan	338	140
	- Others	903	408
44.24.00.0	Household utensils of wood	39 861	10 005
	- Thailand	11 608	4 572
	- EEC	9 315	1 813
	- Taiwan	9 113	1 779
	- Philippines	1 525	310
	- Sweden	1 269	174
	- Portugal	1 172	199
	- Others	5 859	1 158

1) countries not specified here

Annex 2.6b

IMPORTS BY COMMODITY FROM THE PHILIPPINES 1979
TO THE FED. REP. OF GERMANY

Commodity	Value		Quantity	
	1000 DEM	% of total imports	tons	%
Household utensils of wood	1 525	4	310	3

Annex 2.7a

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE TO THE NETHERLANDS

1
IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN

Customs code		- 1000 NLG -	- number -
44.23.51.0	Wooden doors	27 706	595 464
	- EEC	10 467	200 304
	- Taiwan	9 922	209 150
	- USA	1 616	48 512
	- Thailand	1 094	4 621
	- Spain	826	25 044
	- South Africa	760	42 998
	- Canada	601	26 527
	- Rest of Europe [1]	1 129	12 554
	- Others	1 291	25 754
44.23.55.0	Windows, frames	35 457	197 347
	- EEC	26 603	100 202
	- Taiwan	6 325	74 876
	- Sweden	1 959	12 542
	- Thailand	374	1 125
	- Singapore	74	7 780
	- Others	122	822
			- tons -
44.23.80.0	Builders' carpentry and joinery n.e.s.	17 987	7 273
	- EEC	14 265	6 169
	- Sweden	1 629	537
	- Spain	638	86
	- Finland	390	207
	- Taiwan	358	60
	- Philippines	164	38
	- USA	163	61
	- Canada	128	25
	- Austria	90	36
	- Korea, Rep.	77	10
	- Others	85	44
44.24.00.0	Household utensils	18 359	3 786
	- EEC	6 178	850
	- Taiwan	5 048	1 077
	- Thailand	3 236	929
	- Czechoslovakia	792	326
	- Philippines	564	70
	- Portugal	538	89
	- Germany, Dem. Rep.	308	65
	- Sweden	290	22
	- Romania	240	75
	- Others	1 165	283

1) countries not specified here

Annex 2.7b

IMPORTS BY COMMODITY FROM THE PHILIPPINES 1979
TO THE NETHERLANDS

Commodity	Value 1000 NLG	Value % of total imports	Quantity tons	Quantity %
Builders' carpentry and joinery n.e.s.	164	0,9	38	0,5
Household utensils	564	3	70	2

Annex 2.8a

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE
TO THE UNITED KINGDOM

1
IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN 1979

Customs code		- 1000 GBP -	- tons -
635.30	Builders' carpentry & joinery (incl. prefabricated & sectional buildings & assembled parquet flooring panels)	27 758	43 942
	- Taiwan	8 716	12 411
	- Ireland	2 378	5 288
	- Sweden	1 937	2 681
	- Portugal	1 629	3 133
	- Indonesia	1 496	4 102
	- Denmark	1 469	2 028
	- Spain	1 391	1 067
	- Rest of EEC [1)]	1 550	1 852
	- Others	7 192	11 380
635.42	Household utensils of wood	7 841	8 797
	- Taiwan	2 587	2 480
	- Thailand	715	516
	- Denmark	541	439
	- Hungary	473	768
	- Germany, F.R.	433	629
	- France	394	196
	- Czechoslovakia	375	518
	- Poland	273	386
	- Rest of EEC [1)]	215	184
	- Others	1 835	2 681

1) countries not mentioned here separately

Customs code		- 1000 GBP -	- tons -
635.49	Domestic or decorative articles of wood nes	7 897	4 431
	- Taiwan	2 146	1 498
	- Sweden	990	294
	- Italy	792	274
	- Spain	547	361
	- India	308	268
	- Rest of EEC[1)]	857	242
	- Others	2 257	1 494
635.91	Tools, handles, broom & brush bodies & handles, boots & shoe lasts & trees of wood	5 013	6 504
	- Brazil	1 452	3 809
	- Germany, F.R.	697	404
	- Sweden	695	319
	- Italy	422	142
	- Ireland	389	528
	- Denmark	349	178
	- USA	276	227
	- Rest of EEC	112	97
	- Others	621	800
635.99	Other articles of wood nes	14 900	27 585
	- Canada	2 020	5 062
	- Sweden	1 927	2 563
	- Malaysia	1 150	3 044
	- Italy	1 105	794
	- Germany, F.R.	1 098	1 670
	- USA	878	1 207
	- Denmark	778	567
	- Netherlands	732	1 762
	- Belgium/Lux.	439	1 201
	- Rest of EEC[1)]	1 243	3 218
	- Others	3 530	6 497

1) countries not mentioned here separately

Annex 2.9a

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE TO AUSTRALIA

1
ANNUAL SUMMARY

Commodity	1967 -68	1974 -75	1975 -76	1976 -77	1977 -78	1978 -79
			1000 AUD			
Builders' carpentry and joinery (incl. prefabricated bldgs)	557	4 014	6 531	8 491	5 718	6 639

Annex 2.9b

IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN 1977-78 TO AUSTRALIA

Customs code		- 1000 AUD -	- number -
635.40.02	Wooden louvre doors	1 685	460 910
	- Taiwan	1 325	350 233
	- Philippines	251	93 003
	- Rest of Southeast Asia [1)]	95	15 815
	- Oceania	13	1 859
635.40.07	Wooden carved doors	1 003	52 755
	- Taiwan	904	49 509
	- Oceania	62	2 577
	- North America	25	332
	- Malaysia	8	255
	- Others	4	82
635.40.09	Wooden doors nes	634	58 234
	- Taiwan	333	50 024
	- Oceania	208	4 484
	- Rest of Southeast Asia [1)]	52	2 444
	- North America	32	687
	- Denmark	10	580
	- Others	1	15
635.40.19	Wooden builders' carpentry, excl. doors, parquet flooring	2 350	
	- Oceania	874	
	- North America	638	
	- Rest of Southeast Asia [1)]	292	
	- Taiwan	267	
	- Europe	245	
	- Philippines	34	

1) countries not mentioned here separately

Annex 2.9c

IMPORTS BY COMMODITY FROM THE PHILIPPINES 1977-78 TO AUSTRALIA

Commodity	Value		Number	
	1000 AUD	% of total imports		%
Wooden louvre doors	251	15	93 003	20
Wooden builders' carpentry, excl. doors, parquet flooring	34	1	..	..
Wooden picture, photograph, mirror frames	28	5	..	..
Wooden spoons, forks	26	11	109 090	5
Wooden household utensiles nes	413	17	..	..
Wooden statuary figures	85	34	..	..
Wooden figures as household ornaments	64	31	..	..
Wooden smoking requisites, snuff boxes	23	31	..	..
Wooden boxes, cases, caskets, wallets, etc.	51	7	..	..
Wooden tool, broom, brush bodies	3	4	..	..
Articles of wood nes	40	1	..	..

Annex 2.10a

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE TO JAPAN

1
IMPORTS BY COMMODITY
AND COUNTRY OF ORIGIN 1979

Customs code		- million JPY -	- tons -
44.23.01.0	Door, window sash and the like	4 053	10 894
	- Taiwan	1 783	5 802
	- Thailand	1 469	3 807
	- North America	258	380
	- Malaysia	233	383
	- Philippines	233	423
	- Rest of Europe[1)]	62	70
	- Rest of Southeast Asia[1)]	9	16
	- Oceania	5	12
	- India	1	1
44.23.09.0	Builders' carpentry and joinery, n.e.s.	1 549	5 293
	- North America	552	1 986
	- Finland	400	1 983
	- Taiwan	266	412
	- Sweden	111	336
	- Philippines	50	158
	- Norway	44	104
	- Hong Kong	37	41
	- Thailand	31	69
	- Rest of Southeast Asia[1)]	37	163
	- Oceania	12	28
	- Rest of Europe[1)]	7	6
	- Others	2	7

Annex 2.10b

IMPORTS BY COMMODITY FROM THE PHILIPPINES 1979

Commodity	Value		Quantity	
	1000 JPY	% of total imports	tons	%
Door, window sash and the like	232 735	6	423	4
Builders carpentry and joinery, n.e.s.	50 189	3	158	3
Household utensils of wood, n.e.s.	414 862	14	578	23
Wooden tools, tool bodies, tool handles, broom and brush bodies and handles of wood	3 125	2	37	6

1) countries not mentioned here separately

Annex 2.11

IMPORTS OF BUILDERS' CARPENTRY
AND JOINERY AND WOODEN FURNITURE TO SAUDI ARABIA

1
IMPORTS BY COMMODITY [1]
AND COUNTRY OF ORIGIN 1979

	- 1000 SAR -	- tons -
Wooden doors, windows, railings and window frames and blinds[2]	322 742	52 247
- Jordan	37 535	5 275
- USA	31 976	2 727
- Taiwan	31 177	6 757
- Italy	25 092	3 991
- Germany, F.R.	19 390	3 208
- Kuwait	19 035	3 474
- Syria	14 794	2 363
- Lebanon	11 663	1 601
- China	9 789	1 940
- France	8 326	1 451
- Australia	7 381	787
- Sweden	7 091	1 150
- Not defined	41 948	7 177
- Others	57 545	10 346
Prefabricated and sectional buildings and assembled panels[2]	584 964	80 744
- USA	159 859	20 707
- Germany, F.R.	75 693	10 799
- Italy	59 025	8 121
- United Kingdom	51 859	7 316
- Netherlands	26 359	3 504
- France	23 838	3 612
- Syria	22 625	3 603
- Canada	21 046	2 550
- Norway	11 506	1 306
- Philippines	150	35
- Not defined	37 381	4 925
- Others	95 623	14 266

1) According to the Saudi Economic Survey 1979, which does not present the Customs codes.

2) not necessarily of wood

ANNEX III INCENTIVES ATTAINABLE UNDER THE PRESENT (1980) PROMOTIONAL DEGREES IN THE PHILIPPINES

I. REGISTERED ENTERPRISES

Incentives Attainable Under the Export Incentives Act and the Investment Incentives Act and Their Amendments by Presidential Decress	Export Incentives Act			Investment Incentives Act		
	Export Producer	Export Trader	Service Exporter	Filipino-owned		Foreign-owned
				Pioneer	Non-Pioneer	Pioneer
A. Rights & Guarantees to Registered Enterprises						
1. Basic rights and guarantees under the Constitution	x	x	x	x	x	x
2. Right to repatriate investments and remit earnings*;	x	x	x	x	x	x
3. Right to remit foreign exchange to service foreign loans and obligations arising from technological assistance contracts*;	x	x	x	x	x	x
4. Freedom from expropriation of property except for public use, national welfare and defense upon payment compensation; and	x	x	x	x	x	x
5. Freedom from requisition of investment, except in event of war or national emergency and only for the duration thereof and with just compensation.	x	x	x	x	x	x

	Export Incentives Act			Investment Incentives Act		
	Export Producer	Export Trader	Service Exporter	Filipino-owned		Foreign-owned
				Pioneer	Non-Pioneer	Pioneer
B. Incentives to Registered Enterprises						
1. Deduction of organizational and pre-operational expenses from taxable income over a period of not more than 10 years from start of operation;	x			x	x	x
2. Deduction of labor training expenses from taxable income equivalent to 1/2 of expenses but not more than 10% of direct labor wage;	x(5)			x	x	x
3. Accelerated depreciation;	x			x	x	x
4. Carry-over as deduction from taxable income of net operating losses incurred in any of the first 10 years of operation deductible for the six years immediately following the year of such loss;	x(3)	x(3)		x	x	x
5. Exemption/reduction and/or deferment of tariff duties and compensating tax on importations of machinery, equipment and spare parts;	x(5)(16)	x(6)(16)		x(11)(16)	x(10)(16)	x(11)(16)

	Export Incentives Act			Investment Incentives Act		
	Export Producer	Export Trader	Service Exporter	Filipino-owned		Foreign-owned
				Pioneer	Non-Pioneer	Pioneer
6. Tax credit equivalent to 100% of the value of compensating tax & customs duties that would have been paid on machinery, equipment and spare parts (purchased from a domestic manufacturer) had these items been imported;	x(5)		x(6)	x	x	x
7. Tax credit for tax withheld on interest payments on foreign loans provided such credit is not enjoyed be lender-remittee in his country and registered enterprise has assumed liability for tax payment;				x	x	x
8. Right to employ foreign nationals in supervisory technical or advisory positions within five years from registration;	x(14)			x	x	x
9. Deduction from taxable income in th year reinvestment was made of a certain perentage of the amount of undistributed profits						

	Export Incentives Act			Investment Incentives Act		
	Export Producer	Export Trader	Service Exporter	Filipino-owned		Foreign-owned
				Pioneer	Non-Pioneer	Pioneer
or surplus transferred to capital stock for procurement of machinery and equipment and other expansion;	x(5)			x	x	x
10. Anti-dumping protection;	x(5)			x	x	x
11. Protection from government competition;	x(5)			x	x	x
12. Exemption from all taxes under the National Internal Revenue Code, except income tax on a gradually diminishing percentage;	x(2)(16)			x(16)		x(16)
13. Cost operative tariff protection;	x(2)			x		x
14. Tax credits equivalent to sales, compensating and specific taxes and duties on supplies, raw materials and semi-manufactured products used in the manufacture, processing or production of export products;	x	x	x(1)	x	x	x

	Export Incentives Act			Investment Incentives Act		
	Export Producer	Export Trader	Service Exporter	Filipino-owned		Foreign-owned
				Pioneer	Non-Pioneer	Pioneer
15. Additional deduction from taxable income of direct labor cost and local raw materials utilized in the manufacture of export products but not exceeding 25% of total export revenues for producers; 20% of total export sales for traders; and 50% of total export fees for service exporters;	x(7)	x	x	x(9)	x(9)	x(9)
16. Additional deduction from taxable income an amount equivalent to expenses in establishing and maintaining an overseas office for the first five years of operation;		x(17)				
17. Exemption from sales taxes on export products sold to other export producers or export traders;	x(15)					
18. Preference in the grant of government loans;	(5)(12)(14) x	(12)(14) x	(12)(14) x		x	
19. Employment of foreign nationals within five years from operation or even after said period in exceptional cases;	x(2)(14)					

	Export Incentives Act			Investment Incentives Act		
	Export Producer	Export Trader	Service Exporter	Filipino-owned		Foreign-owned
				Pioneer	Non-Pioneer	Pioneer
.. Exemption from export and stabilization taxes:	x(16)	x(16)				
'. Additional deduction from taxable income of 1% incremental export sales; and	x(3)(8)	x(3)(4)				
.. Additional incentives wherever processing or manufacturing plant is located in an area designated by BOI as necessary for proper dispersal of industry or which is deficient in infrastructures, public utilities and other facilities.	x(8)					

II. INVESTORS IN REGISTERED ENTERPRISES

	Export Incentives Act						Investment Incentives Act			
	Filipino			Foreign			Filipino			Foreign
Incentives to Investors	Export Prod.	Export Trader	Service Exp.	Export Prod.	Export Trader	Service Exp.	Pioneer	Non-Pioneer	Pioneer	Non-Pioneer
1. Basic rights and guarantees;	x	x	x	x	x	x	x	x	x	x
2. Right to repatriate investments and remit earnings*;	x	x	x	x	x	x	x	x	x	x
3. Freedom from expropriation of property;	x	x	x	x	x	x	x	x	x	x
4. Freedom from requisition of investments;	x	x	x	x	x	x	x	x	x	x
5. Protection of patents and other proprietary rights;	x	x	x	x	x	x	x	x	x	x
6. Exemption from capital gains tax on disposition of capital assets provided proceeds of sales are invested in new issues of capital										

II. INVESTORS IN REGISTERED ENTERPRISES

	Export Incentives Act						Investment Incentives Act			
	Filipino			Foreign			Filipino			Foreign
	Export Prod.	Export Trader	Service Exp.	Export Prod.	Export Trader	Service Exp.	Pioneer.	Non-Pioneer	Pioneer	Non-Pioneer
Stock of a registered enterprise within six months from the date gains were realized;	x(13)	x(14)	x(14)	x	x(14)	x(14)	x	x	x(13)	x
Tax allowance to the extent of actual investment but not to exceed 10 % of taxable income;	x(2)						x			
Tax exemption on sale of stock dividends provided sale occurs within 7 years from date of registration; and	x(2)						x			
Preference in the grant of CSIS and SSS loans for purchase of shares (for members only)	x(5)						x	x		

III. SPECIAL INCENTIVES FOR LESS DEVELOPED AREA REGISTERED ENTERPRISES

1. Additonal incentives to less developed area registered enterprises in the form of all the incentives provided for a pioneer registered enterprise under its laws of registration, provided that less developed area registered enterprises engaged in non-pioneer activities shall not be exempt from the payment of sales taxes.

2. Tax allowance to the extent of actual investment but not to exceed thirty percent (30 %) of taxable income, inclusive of the normal tax allowance under its law of registration.*1

3. Financial assistance in the form of preferences in the grant of liberalized loans to less developed area registered enterprise.*2

4. Exemption from the provisions of the General Banking Act with respect to collateral requirements.*3

5. Exemption from the payment of filing, processing and all other fees of the Board of Investments and of the Securities and Exchange Commission of all less developed area registered enterprises with total assets worth less than one million (₱1,000,000) pesos.

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*1. Except in mining ventures and provided that the investment is made in subscribed shares in the original and/or increased capital stock of an enterprise within seven years from the date of registration of a less developed area registered enterprise, and that the shaves are held for a period of not less than three (3) years.

*2. Applicable to enterprises of either sole proprietorship of Filipino citizens or (60) percent Filipino-owned, or 60 percent Filipino-owned corporations or cooperatives.

*3. Section 78, Gen. Banking Act provides that loans against real estate security shall not exceed 70 % of the appraised value of the respective real estate security plus 70 % of the appraised value of insured improvements and such loans shall not be made unless title to the real estate, free from all encumbrances, shall be with the mortgagor.

*Subject to Central Bank Regulations.

(1) Applicable to service exporters producing and exporting television and motion pictures or musical recordings and catering primarily to foreign tourists (Tourism incentives are now granted by the Philippine Tourism Authority).

(2) Provided registered export producer is engaged in a pioneer area.

(3) Applicable whenever a registered export producer and export trader shall use a brand name for an export product that distinguishes it from products produced outside the Philippines.

(4) Applicable whenever financial assistance is extended by an export trader to export producers in an amount equivalent to not less than 20% of the export trader's export sales during the year.

(5) In general, applicable only to all projects for expansion or upgrading of export products under List A of the Export Priorities Plan and to both pioneer and non-pioneer projects under List B.

(6) Same as No. (1) but limited to expansion projects only and to service exporters catering primarily to foreign tourists (Tourism Incentives are now granted by the Philippine Tourism Authority).

(7) Applicable to all registered export producers, export foreign firms in non-pioneer areas exporting 70% of their production.

(8) Additional incentives consist of using an amount equivalent to double the export producer's direct labor cost in applying the reduced income tax formula and/or tax credit on infrastructure.

(9) In the case of traditional exports, local raw material component is not included in the computation of said deduction.

(10) Applicable to new and expanding non-pioneer projects with total assets not exceeding ₱500,000 for the first two years of commercial operation. Non-pioneer projects with assets exceeding said amount and expanding non-pioneer projects with less than 20% return on equity are entitled only to reduced tariff and compensating tax, on a deferred-payment basis for a period

not exceeding 10 years. Expanding non-pioneer projects with 20% or greater return on equity shall be entitled to mere deferment of taxes and duties without any reduction thereof.

(11) Applicable to new or expanding pioneer projects with less than 20% return on equity. Expanding pioneer projects with 20% or greater return on equity and existing pioneer projects desiring to replace and modernize their facilities are entitled to mere deferment of taxes and duties without any reduction thereof.

(12) Applicable to enterprises at least 60 percent Filipino owned.

(13) More liberal terms, e.g. shorter holding period required of Filipino investors in pioneer projects.

(14) Grant of incentives would depend on the extent of operations registered with the BOI.

(15) Subject to guidelines formulated by the Board of Investments in consultation with the Bureau of Internal Revenue.

(16) Provided that the Board of Investments may increase the rate of tax exemption to not more than fifty percent (50%) of the tax exemption enjoyed by the registered enterprises prior to the increase, subject to any or all of the criteria provided for in Executive Order No. 569.

(17) Provided the Central Bank shall provide the necessary foreign exchange required to maintain such overseas offices of a registered export trader.

ANNEX IV COMPLETIONS OF NEW DWELLINGS IN KEY EXPORT MARKETS

Annex 4.1
COMPLETION OF NEW DWELLINGS IN WESTERN EUROPE [1]

1 Total number of dwellings

Country	1970	1975	1976	1977	1978	1979
			1000 dwellings			
Austria	45.0	48.4	44.1	45.4	51.3	53.1
Belgium	47.7	83.6	81.7	77.3	70.6	68.1
Denmark	50.6	35.5	39.2	36.3	34.2	31.1
Finland	49.7	69.4	57.5	57.0	53.5	50.0
France	471.5	529.8	448.9	450.9	444.7	403.6
Fed. Rep. of Germany	478.1	436.8	392.4	409.0	368.1	289.2
Greece	114.7	120.9	128.6	158.3	187.0	158.0
Iceland	1.3	2.1	2.2	2.3	2.3	2.3
Ireland	13.6	25.9	24.0	24.6	25.4	26.5
Italy	377.2	219.6	184.3	149.4	153.8	140.0
Luxembourg	..	..	3.3	..	2.5	2.5
Malta	2.2	1.4	1.6	1.6	1.6	1.6
Netherlands	118.0	121.9	108.2	112.6	107.4	88.8
Norway	36.5	41.0	41.3	37.6	38.3	36.2
Portugal	27.7	35.4	33.2	38.0	36.6	38.0
Spain	308.0	374.4	319.8	324.4	334.0	258.8
Sweden	107.2	74.5	55.8	54.9	53.8	55.5
Switzerland	65.6	57.7	36.9	34.8	36.9	39.6
United Kingdom	368.2	332.4	333.6	322.6	300.0	255.7
Total	2 682.8	2 601.7	2 210.8	2 214.3	2 283.8	1 998.6

2 Structure of new dwellings completions (1979)

Country	In multi-dwelling buildings	In other types of building
	%	
Austria	62.2	37.8 [2]
Belgium	18.8	81.2 [2]
Cyprus	12.0	88.0
Denmark	13.5	86.5 [2]
Finland	50.3	49.7 [3]
France	46.2	53.8 [2]
Germany	29.6	70.4 [3]
Greece	72.0	28.0 [2]
Iceland	48.5	51.5
Ireland	4.6	95.4 [3]
Italy	64.4	35.6 [2]
Luxembourg	43.4	56.6 [2]
Malta	-	-
Netherlands	21.0	79.0 [2]
Norway	15.4	84.6 [3]
Portugal	42.4	57.6 [3]
Spain	96.3	3.7
Sweden	16.4	83.6
Switzerland	60.3	39.7
United Kingdom	24.2	75.8

1) Compiled from Housing and Buildings Statistics for Europe by UN/ECE

2) - 1978

3) - 1977

Annex 4.2
ADDRESSES OF SOME BUILDING MATERIAL IMPORTERS
IN WESTERN EUROPE

Belgium	Acapi-Ercat Sa Boulevard Manvice Lemonnier 99 B-1000 BRUXELLES
	ETS. Victor Ackermans SA Avenue du Port 25 B-1020 BRUXELLES
	Befion N.V Schaperbaan 16-18 1B-1811 Relegem
	ETS. Can Tillana Rue des Materiaux 69 B-1070 BRUXELLES
	SPRC Cigrosa Quai de L'Industrie 79-81 B-1070 Bruxelles
	Devilca-FB, S.A. Rue des College B-6830 BAUILLON
	Lamberts-Hermans Stationsraat 16 B-2900 Loaderzeel
The Netherlands	Koninklijke Houthandel William Port N.V P.O. Box 1009 ZAANDAAM
	J. Timmer Bouwstoffenim B.V. P.O. Box 6016 GRONINGEN
	Dijkstra Katwijk Bouwmaterialen B.V. Scheepmakerstraat 9 Katwijk a/d Rija
	Cooperative Vewriging NEBICO G.A. P.O. Box 274 ROTTERDAM
	Bouwstoffen UNIE B.V Limburglaan 24 EINDHOVEN

Imabo
Geestorp 36
WOERDEN

Hubo BV
P.O. Box 2222
UTRECHT

Federal Republic of Germany

Price & Pierce GmbH
6380 BAD HOMBURG

Bremer Holzagentur GmbH
P.O. Box 330109
2800 BREMEN

Rudolf Beyse
P.O. Box 700165
2000 HAMBURG

Fritz Begeman
P.O. Box 100324
5000 KOLN 71

France

Societe Copap
18 bis, Rue d'Anjon
F75008 PARIS

Agence Francoise
2 Rue Joseph Saasbeof
F75008 PARIS

Henri Laborier & Fils
7 Rue de Bel-air
F92190 MEUDON

United Kingdom

Albert Plaut Ltd.
Ilford, Essex 1G1 4PH

Price & Pierce Ltd.
51 Aldwyeh
London WC2B 4AZ

Lloyd & Duncan & Co Ltd.
London EC1Y 2BS

Churchil & Sims Ltd.
Croydon CR9 6HU

Montange L Meyer Ltd.
Villiers House, 41-47 Strand
London WC2N 5JG

Keizer Venesta (Southern) Ltd.
Rugby Boad, Twickenham
Middx.

UBM Group Ltd.
Aron Works, Winterstoke Road
Bristol BS99 7PL

Annex 4.3
COMPLETIONS OF NEW DWELLINGS IN NORTH AMERICA[1)]

Year	USA	Canada	Total
	- 1000 dwellings -		
1970	1452.1	178.4	1630.5
1975	1333.2	219.0	1552.2
1976	1386.8	238.2	1625.0
1977	1657.1	254.0	1911.1
1978	1867.5	248.5	2116.0
1979	1870.8	228.9	2099.7

1) US Building Statistics

Annex 4.4
ADDRESSES OF SOME BUILDING MATERIAL IMPORTERS
IN NORTH AMERICA

USA

American Forest Products Corp.
Building Material division
P.O. Box 3498
San Francisco
CA 94119

Continental Wood Products
842E. 29th street
Los Angeles
CA 90011

Hines Lumber Co
200 S. Michigan Ave
Chicago, IC 60604

ABM Building Materials
P.O. Box 385
Bronxville, NY 10708

Pro Hardware Inc.
26 sixth street
Stamford CT 06905

Wilkes Corp.
110 W.A Street
San Diego, CA 92101

Hardware Wholesalers Inc.
P.O. Box 868
Port Wayne, IN 46801

Canada

McMillan Jardine Ltd
1075 West Georgia Str.
Vancouver, B.C.
V6E 3R9

Hoh C & Co
1155 Dorchester Blvd west
Montreal 102
QUEBEC

Kenair Trading & Orient Trading Ltd.
Suite 1108-100
Park Royal
West Vancouver, B.C.
V7T 1A2

Annex 4.5
COMPLETIONS OF NEW DWELLINGS IN JAPAN[1)]

Year	Wooden houses	Other	Total
	- 1000 dwellings -		
1973	1120	785	1905
1974	870	446	1316
1978	958	591	1549
1980	752	521	1274

1) Japan Lumber Journal

Annex 4.6
ADDRESS OF SOME BUILDING MATERIALS IMPORTERS
IN JAPAN

Hayaya Trading Co. Ltd.
P.O. Box Nagoya Higashi 2P7
6-18 Nagahei-Cho
Higashi-ku
Nagoya 461

Saki Trading Co. Ltd.
Dai-Hyaku Seinoi Bldg
7, 2-chome, Sueyoshibashi Dori
Minans-ka
Osaka 542

Hasegawa Mangi Shoten
4-6 Tomioka 2-chome
Koto-ku
Tokyo

Takeuchi Lumberto Ad
5-13 Masaki-cho
Naka-ku
Nagoya 450

Yuda Mokou Co. Ltd.
2-5 Takashimadaira 6-chome
Nish-ku
Osaka 550

Annex 4.7
ADDRESSES OF SOME BUILDING MATERIAL IMPORTERS
IN THE MIDDLE EAST

General Import Company for steel and timber
P.O. Box 602
Baghdad
IRAQ

Building Materials Trading Co.
P.O. Box 10073
Riyadh
SAUDI ARABIA

Abdullah Mohammad Baroom
P.O. Box 1346
Jeddah
SAUDI ARABIA

Tivoli Commercial Co.
41 Sh Sherif
Cairo
EGYPT

Nish Company For Import
6 Adly street
Cairo
EGYPT

El Nasr Export & Import Co.
28 A Talat Harb Street
Cairo
EGYPT

Annex 4.8
COMPLETIONS OF NEW DWELLINGS IN AUSTRALIA[1)]

Year	Houses	Other	Total
	- dwellings -		
1977-1978	100 117	28 819	128 936
1978-1979	93 056	24 078	117 134
1979-1980	100 058	29 211	126 269

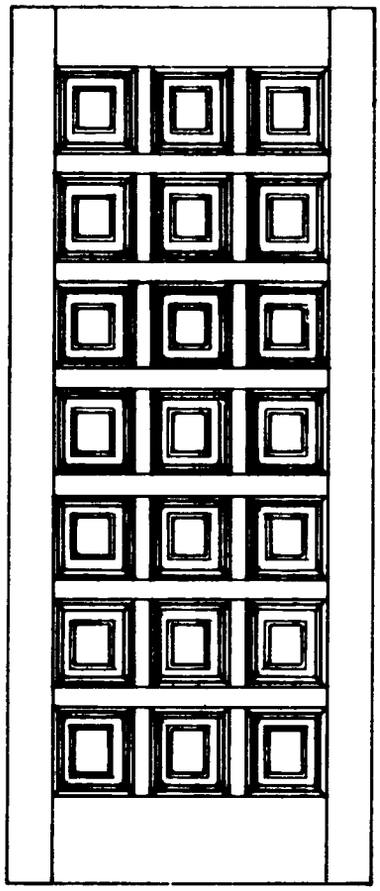
1) Australian Statistical Office

Annex 4.9
ADDRESSES OF SELECTED BUILDING MATERIAL IMPORTERS IN AUSTRALIA

Bismac PTY Ltd.
150 Queen street
Beaconsfield
SYDNEY

Mallison Sales Pty Ltd.
MELBOURNE

ANNEX V DOOR TYPES



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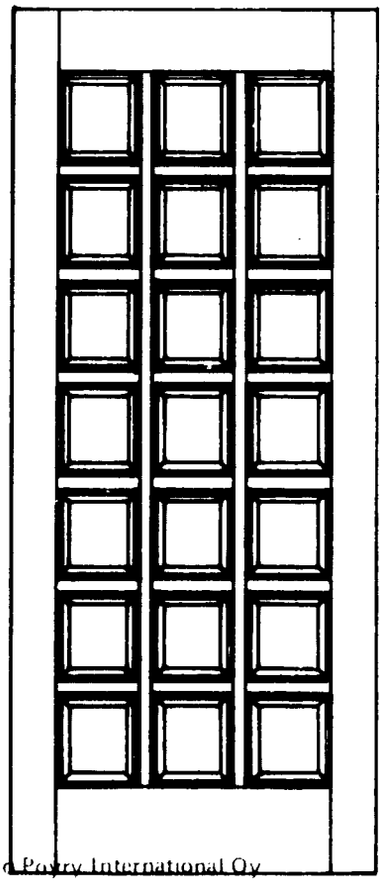

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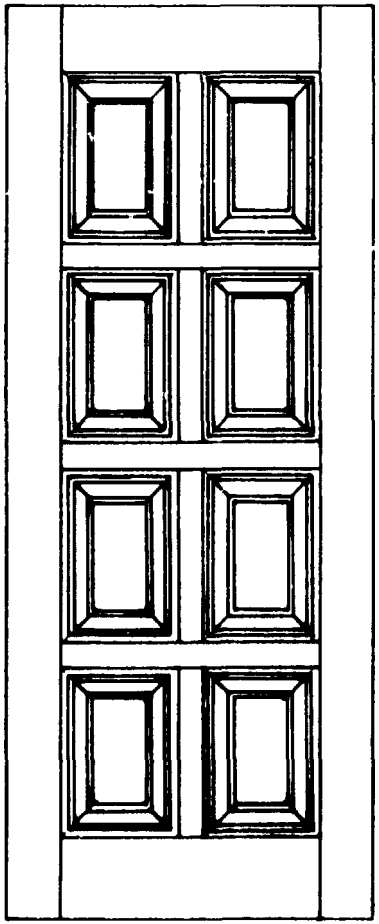

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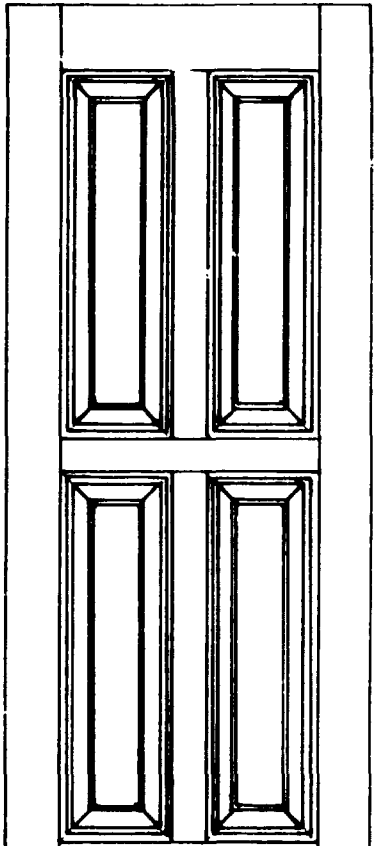

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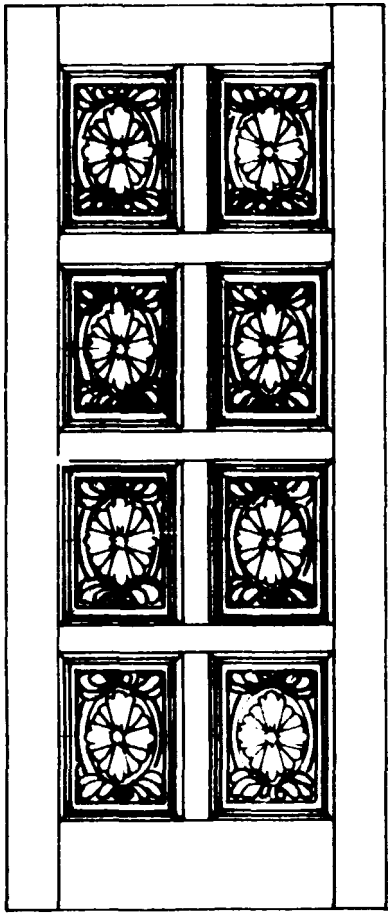

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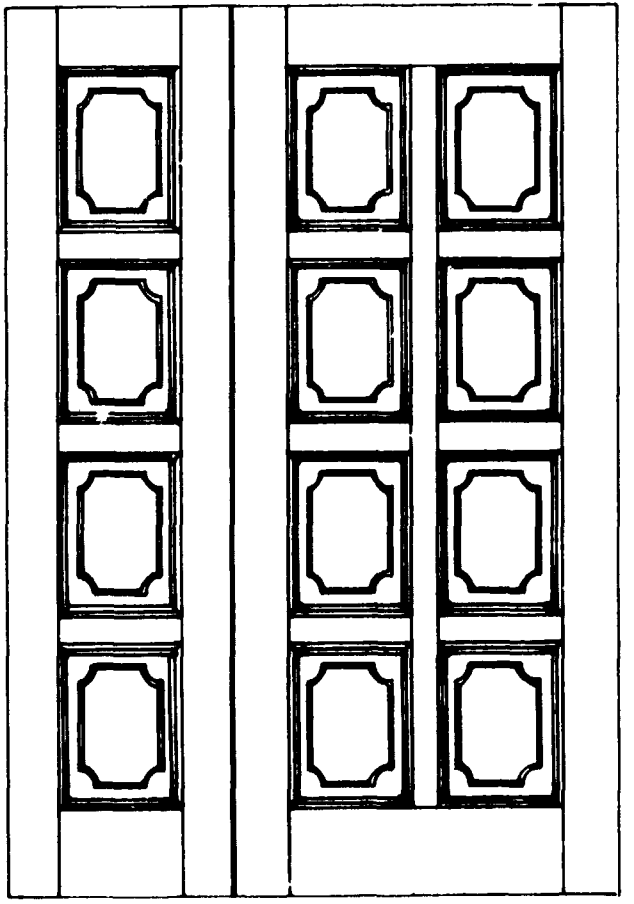

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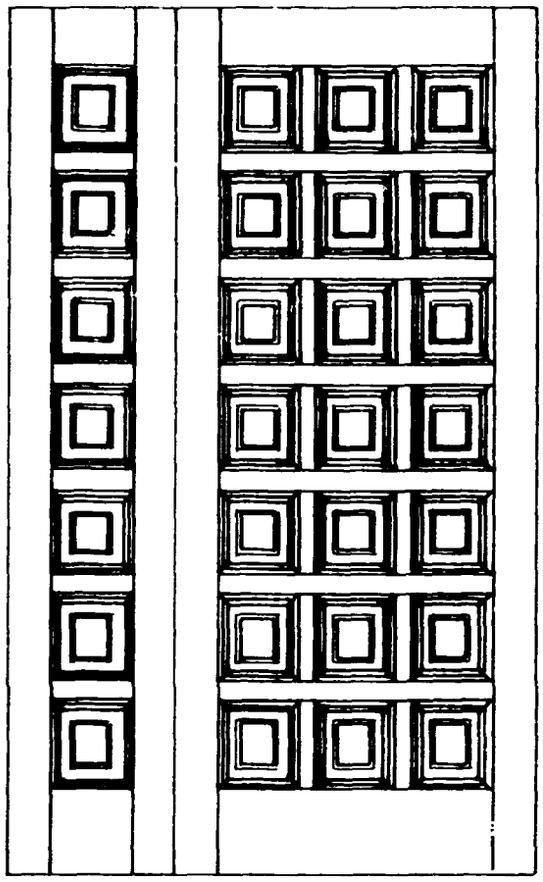

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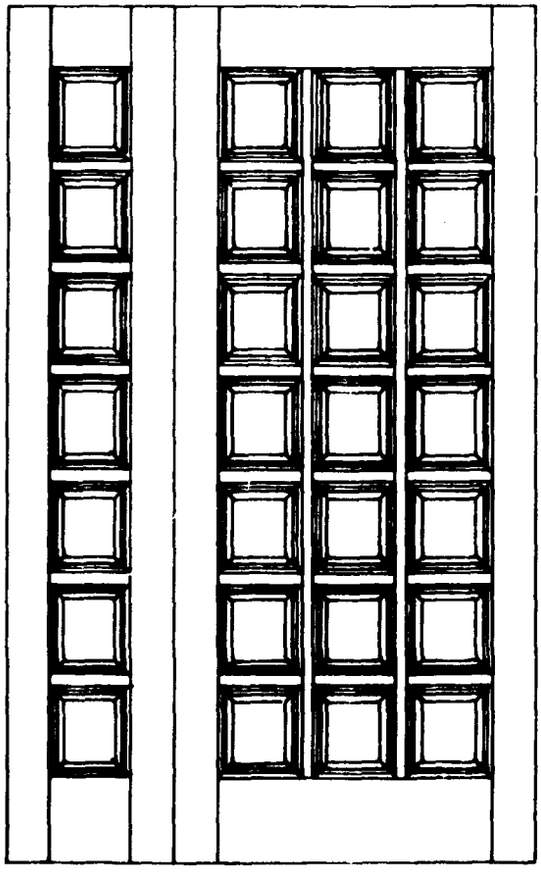
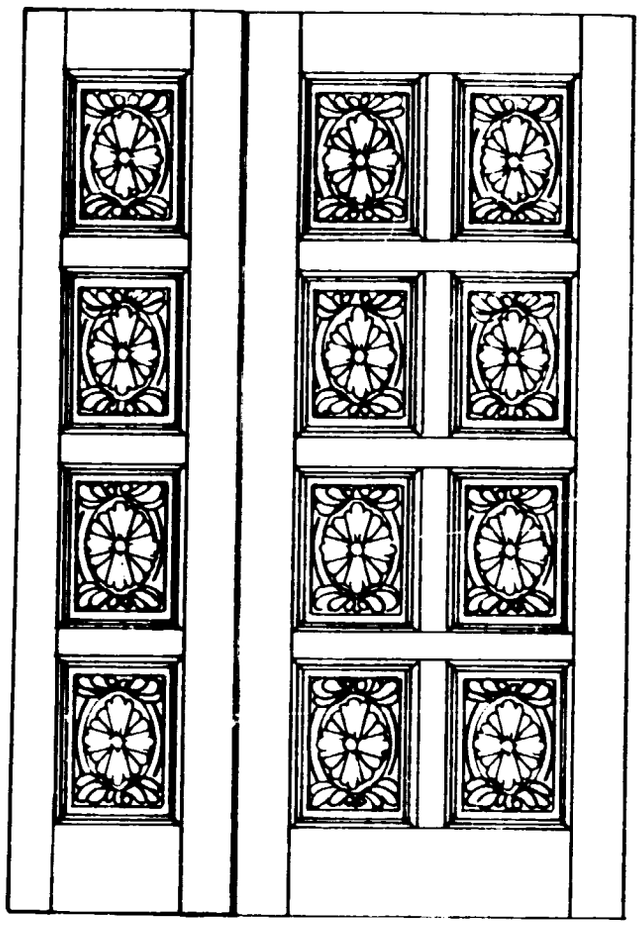


Type H
(with glass)



Type I

ANNEX VI DESCRIPTION OF SOME MAIN WOOD SPECIES USED IN PRODUCTS

Shorea negrosensis Foxw.,
Red lauan (Philippine mahogany)

The Timber

The sapwood is about 50 mm wide creamy or light grey in colour, and sharply defined from the reddish to dark red heartwood. It has acrossed or interlocked grain, showing a distinct ribbon-grain pattern on quarter-sawn surfaces. Weight about 630 kg/m^3 when dried.

Drying

Dries easily and with little degradation.

Durability

Moderately durable.

Working Qualities

Works easily with hand and machine tools, and yields a good finish in planing. Takes stains and polish well and glues satisfactorily. Peels well for veneer.

Myapis
Shorea squamata Dyer (red or white lauan)

The Timber

The sapwood is 25 mm to 50 mm wide, pinkish in colour and gradually merging into the reddish heartwoods. The colour of heartwood is variable. From some localities it is sufficiently red to pass as tangile or red lauan, while in other areas it is light red and is marked as white lauan. The wood is comparatively light, about 530 kg/m^3 when dried.

Drying

In some cases the wood has a high green moisture content. Very careful drying is necessary to avoid severe checking, warping and collapse.

Shrinkage green to 12 % moisture content is said to be 6.4 % tangentially and 4.4 % radially.

Durability

Moderate durable.

Working Qualities

Works readily, planes very well but is poor in shaping, turning, boring and mortising. Gluing properties are good.

Tiaong
Shorea agsaboensis Stern (red lauan)

The sapwood is 40 mm to 50 mm wide and sharply defined from the heartwood. The heartwood varies from white red to dark brownish-red in colour. It has few resin ducts which look like numerous broken lines on end-grain surfaces. The weight is about 630 kg/m^3 when dried.

Drying

Similar to Shorea almon.

Durability

Perishable

White lauan
Pentacme contorta Merr

The Timber

The sapwood is 50 mm to 90 mm wide, light grey in colour, while the heartwood is also greyish with a reddish tinge, or light pink. The grain is interlocked, sometimes crossed and the texture is moderately coarse. The resin ducts are in concentric arcs and are filled with white resin. Weight about 530 kg/m^3 when dried.

Drying

Dries easily and well. Shrinkage from green to 12 % moisture content 4.3 % tangentially and 1.8 % radially.

Durability

Moderately durable.

Working Qualities

Works and machines easily and finishes quite well in planing and moulding. There is a tendency for the wood to tear in boring and mortising. It peels well and takes glue, stains and polish satisfactorily.

Almon
Shorea almon Foxw., white lauan

The Timber

The sapwood is cream to light brown in colour, not sharply demarcated from the reddish to light brown heartwood. It is intermediate in colour between the red and white lauans. The resin ducts are filled with white resin and it is comparatively light in weight, about 580 kg/m^3 when dried.

Drying

Said to be the easiest to dry of all the species in the lauan group. Shrinkage from green to 12 % moisture content is 5.6 % tangentially and 2.8 % radially.

Durability

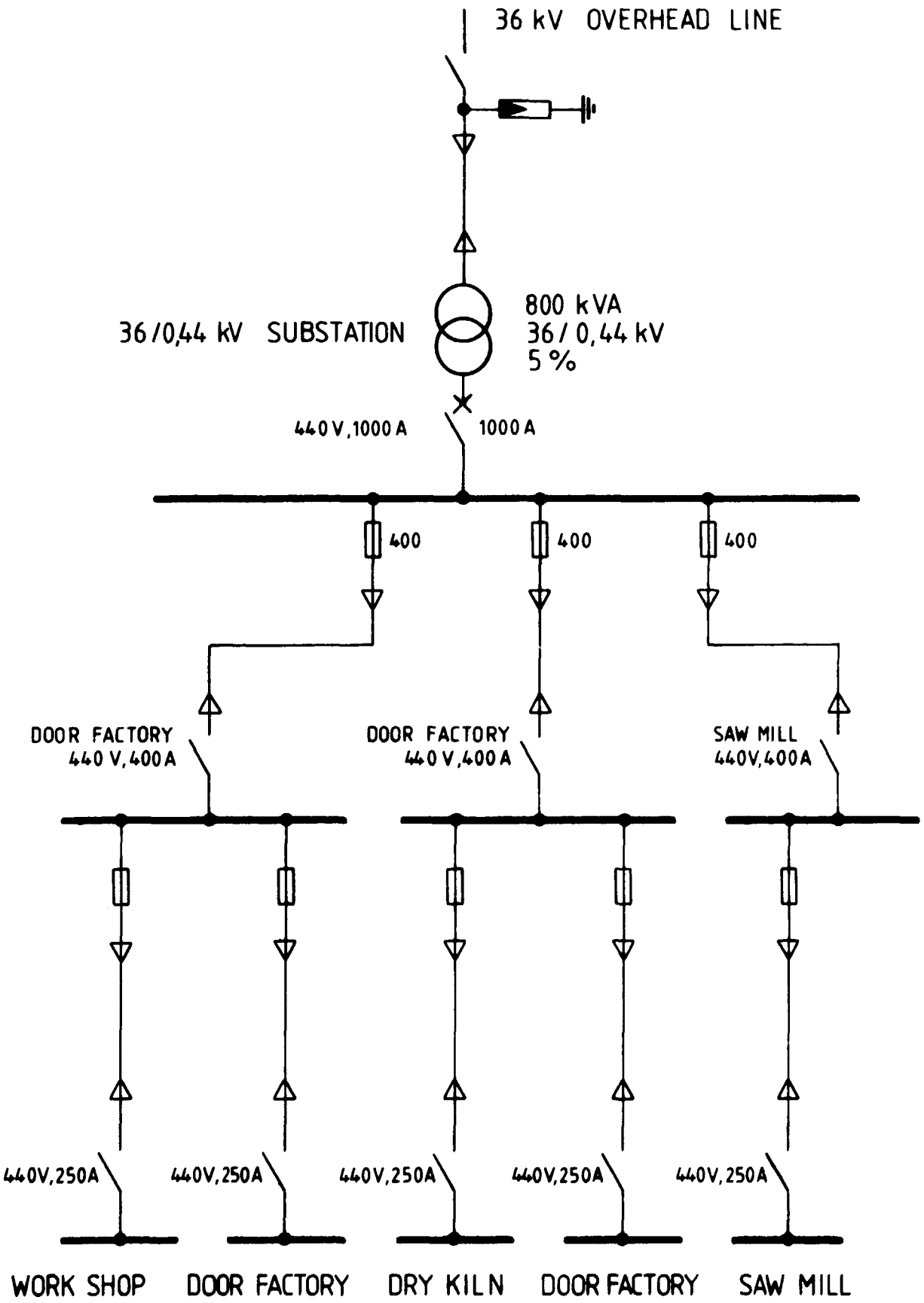
Moderately durable.

Working Qualities

Works quite well in most machine operations but the grain tends to tear in shaping, turning and boring. It can be planed to a smooth finish and takes glue, stains and polish satisfactorily. It peels well for veneer.

Source: Timbers of the World ...5,
Philippine and Japan, Timber Research and
Development Association 1978, England,
82 p.

DRAWINGS



JAAKKO PÖYRY	Scale:	Drawn	01-02-04	ir	Old No.
		Designed	01-02-03	KA	New No.
		Checked	1-02-04	KA	No. K3885-HE-4001
		Approved	01-02-05	PM	
VINTAWOOD DOOR FACTORY	POWER DISTRIBUTION				Old No. / New No. / No.