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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Austria

18494

Philippine Industrial Investment Opportunity Study
May 1990

**MANUFACTURE OF CEMENT RETARDER
AND GYPSUM BOARD**

FINAL REPORT

DP/PAS/85/010

**SGV
CONSULTING**
SYCIP, GORRES, VELAYO & CO



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Attention: Mr. S. Morozov
Chief, Contracts Section

Gentlemen:

Re: Assistance to COIME
- Preparation of Opportunity Studies
Contract No. 89/132SM

We are pleased to submit our final report on the Philippine Industrial Investment Opportunity Study on the Manufacture of Cement Retarder and Gypsum Board.

This study was conducted in accordance with the UNIDO Manual for the Preparation of Industrial Feasibility Studies. The report covers the following major topics:

- o Project background and history
- o Market and plant capacity
- o Material inputs
- o Plant location
- o Project engineering
- o Plant organization and overhead cost
- o Manpower
- o Project implementation
- o Financial evaluation

The financial evaluation used the UNIDO Computer Model for Feasibility Analysis and Reporting (COMFAR).

SGV & CO.

This study was prepared mainly to provide preliminary broad indications of the viability of the project and is not meant to serve as a detailed project feasibility study necessary for project implementation. Moreover, it is understood that the results of the study may not be realized if there are changes in the environment that may require revision in any of the critical assumptions used.

We will be glad to discuss any question you may have on this report.

Very truly yours,

SGV + Co.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Austria

Philippine Industrial Investment Opportunity Study
May 1990

**MANUFACTURE OF CEMENT RETARDER
AND GYPSUM BOARD**

FINAL REPORT

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1. EXECUTIVE SUMMARY

This opportunity study explores the possibility of setting up a plant in the Philippines to manufacture gypsum products, particularly gypsum board and cement retarder. The project will enjoy incentives from the Philippine Board of Investments. The production of cement retarder is listed as a non-pioneer enterprise while the manufacture of gypsum board is listed as a pioneer enterprise in the 1989 Investment Priorities Plan (IPP). The non-pioneer activity will enjoy tariff-free importation of equipment and four-year tax holiday. The pioneer activity will also enjoy tariff-free importation of equipment and a longer tax holiday of six years.

The proposed project has been identified for possible inclusion in the ASEAN Industrial Joint Venture (AIJV) Program. The product will enjoy a margin of tariff preference of 90 per cent for a period of four years. In some cases, the products are also entitled to exclusivity privileges for three years, meaning, no additional production capacity is allowed to be established within the ASEAN region for similar products unless 75 per cent of the production is exported outside the region.

We initially evaluated the market for cement retarder, plaster of paris, and gypsum board. However, based on findings, it was decided that the project will manufacture and sell only cement retarder and gypsum board, and exclude plaster of paris. The current domestic market for plaster of paris is small (less than 10,000 metric tons), growth is only 5.4 per cent per year and major users are very strict on quality. Ceramic export manufacturers import their plaster of paris requirements from Germany and France where quality is very high even though price is expensive.

1.1 MARKET AND PLANT CAPACITY

1.1.1 Demand and Market Study

Interviews with cement manufacturers, ceramics producers, and suppliers of construction materials indicate that the consumption of processed gypsum products in the Philippines in 1989 is about 226,000 metric tons. Cement retarder comprises 94 per cent of the domestic market while plaster of paris and gypsum board each account for about three per cent as shown in the succeeding table.

<u>Product</u>	<u>Metric Tons</u>	<u>Per Cent Share</u>
Cement Retarder	212,000	93.8
Plaster of Paris	8,000	3.5
Gypsum Board	<u>6,000</u>	<u>2.7</u>
Total	226,000 =====	100.0 =====

In the ASEAN region, Thailand, which has abundant reserves of natural gypsum, is a major exporter of gypsum products. In 1989, as shown in the tabulation below, Thailand had net exports of 14,000 metric tons of cement retarder, 25,000 metric tons of plaster of paris, and 6,200 metric tons of panels. The other ASEAN countries are net importers of different gypsum products. Malaysia and Singapore are net importers of cement retarder, with 1989 volumes of 196,000 metric tons and 27,000 metric tons, respectively. Indonesia, Malaysia and Singapore are net importers of plaster of paris. Their net imports in 1989 amounted to 17,000 metric tons for Indonesia, 26,000 metric tons for Malaysia and 14,000 metric tons for Singapore.

	<u>In Metric Tons</u>			
	<u>Indonesia</u>	<u>Malaysia</u>	<u>Singapore</u>	<u>Thailand</u>
Cement Retarder	78,000E	196,000	27,000	14,000E
Plaster of Paris	17,000	26,000	14,000	25,000E
Panels	47	810	3,600	6,200E

* E - net exports; other figures are net imports.

Trade statistics classify gypsum board under the more general heading SITC 6618-200 "panels, boards, tiles, blocks, and similar articles of vegetable fibre, or straw or of chips, sawdust or other mineral binder." This excludes plywood and other ligneous boards.

Based on trade statistics, Indonesia would not be a major market for gypsum board, with net imports of only 47 metric tons in 1989. Furthermore, it has an abundant supply of wood-based products including plywood which is the main type of panel used in the country.

The demand for cement retarder in the Philippines is projected to reach 480,000 metric tons in 1993, and 1.7 million metric tons in year 2006 as shown in the following table. This is based on interviews and the projected 1993 supply of cement as indicated by the Philippine Cement Manufacturers Corporation (PHILCEMCO). From 1993 to year 2006, demand is projected to grow at an average rate of 10.9 per cent per year. As for selected countries in the ASEAN region including Indonesia, Malaysia, and Singapore, the demand for cement retarder is expected to reach 796,000 metric tons in 1993 and 1.5 million metric tons by year 2006.

Plaster of paris requirement in the Philippines is estimated to grow at an average rate of 5.4 per cent per year from 9,700 metric tons in 1993 to 18,300 metric tons by year 2006. On the other hand, the aggregate demand for plaster of paris of Indonesia, Malaysia, and Singapore is projected to grow at an annual rate of 7.3 per cent. Requirements are projected to increase from 73,700 metric tons in 1993 to 171,300 metric tons by year 2006.

The Philippine requirements for gypsum board is projected to increase from 10,700 metric tons in 1993 to 36,900 metric tons by year 2006, reflecting an annual average growth of 10.9 per cent. The demand for gypsum board, on the other hand, of Malaysia and Singapore is projected to increase from about 5,700 metric tons in 1993 to 12,700 metric tons in by year 2006. This shows an average rate of increase of 6.9 per cent annually.

In Metric Tons

Cement Retarder				Plaster of Paris				Gypsum Board			
Year	Philippine	Selected ASEAN *	Total	Year	Philippine	Selected ASEAN *	Total	Year	Philippine	Selected ASEAN **	Total
1993	480,000	795,600	1,275,600	1993	9,700	73,700	83,400	1993	10,700	5,680	16,380
1994	528,000	836,000	1,364,000	1994	10,200	78,500	88,700	1994	11,700	6,000	17,700
1995	580,800	878,300	1,459,100	1995	10,700	83,700	94,400	1995	12,900	6,400	19,300
2000	935,400	1,125,300	2,060,700	2000	13,700	115,600	129,300	2000	20,800	8,700	29,500
2005	1,506,400	1,442,000	2,948,400	2005	17,500	160,400	177,900	2005	33,500	12,000	45,500
2006	1,657,100	1,515,400	3,172,500	2006	18,300	171,300	189,700	2006	36,900	12,700	49,600
Ave. Annual											
Growth	10.9%	5.5%	7.9%		5.4%	7.3%	7.1%		10.9%	6.9%	9.7%

* Indonesia, Malaysia, and Singapore.

** Malaysia and Singapore only.

1.1.2 Sales and Marketing

During the first year of operation, the project intends to supply about 50 to 55 per cent of unfilled domestic demand (total demand less domestic production) of 420,000 metric tons of cement retarder and 30 to 35 per cent of the unfilled domestic demand for gypsum board as shown in the succeeding table. These targets consider the domestic production of the sole local manufacturer of cement retarder which has a capacity of 60,000 metric tons per year, and the absence of a local manufacturer of gypsum board.

The project envisions to sell during the first year about 75,000 metric tons of cement retarder to selected ASEAN countries, i.e., Indonesia, Malaysia, and Singapore. This volume is about 20 to 25 per cent of the three countries' unfilled demand. The project also plans to sell about 1,200 metric tons of gypsum board to Singapore representing about 25 to 30 per cent of the country's unfilled demand.

In the next two years, the project would have established a more effective sales and distribution network so that it could account for 60 to 75 per cent of the unfilled domestic demand for cement retarder and 40 to 50 per cent of the unfilled domestic demand for gypsum board. Export sales to ASEAN markets of cement retarder

would be about 25 to 30 per cent of the unfilled demand, while for gypsum board, it would be about 30 to 40 per cent of Singapore's unfilled demand for the product.

	In Metric Tons		
	1993	1994	1995
<u>Cement Retarder</u>			
Philippine Market			
Demand	480,000	528,000	580,800
Domestic Production	60,000	60,000	60,000
Unfilled Demand	420,000	468,000	520,800
Target Market Penetration (% of Unfilled Demand)	50-55	60-65	70-75
Project's Domestic Sales	225,000	300,000	375,000
ASEAN Market			
Unfilled Demand			
Malaysia	238,200	250,100	262,600
Singapore	34,700	37,100	39,500
Indonesia	72,700	98,800	126,200
Total	345,600	386,100	428,800
Target Market Penetration (% of Unfilled Demand)	20-25	25-30	25-30
Project's Export Sales	75,000	100,000	125,000
<u>Gypsum Board</u>			
Philippine Market			
Demand	10,700	11,700	12,900
Domestic Production	-	-	-
Unfilled Demand	10,700	11,700	12,900
Target Market Penetration (% of Unfilled Demand)	30-35	40-45	45-50
Project's Domestic Sales	3,600	4,800	6,000
ASEAN Market			
Unfilled Demand			
Singapore	4,700	5,000	5,300
Target Market Penetration (% of Unfilled Demand)	25-30	30-35	35-40
Project's Export Sales	1,200	1,600	2,000

1.1.3 Production and Plant Capacity Utilization

The proposed plant will have an annual capacity of 400,000 panels or 8,000 metric tons of gypsum board and 500,000 metric tons of cement retarder, and will cater mainly to the Philippine market. The project is envisioned to sell 75 per cent of its production to the domestic market and the remaining quarter to the export market.

During the first year of operation (1993), the project will operate at 60 per cent of capacity and produce 300,000 metric tons of cement retarder and 4,800 metric tons of gypsum board. On the second year, production will be at 80 per cent of capacity; output will be 400,000 metric tons of cement retarder and 6,400 metric tons of gypsum board. By the third year, the project will operate at 100 per cent of rated capacity.

1.2 MATERIAL INPUTS

The major raw materials used in the manufacture of gypsum board include phosphogypsum, additives (i.e., foam agent, accelerator, retarder, starch, dispersant agent), and liners on both sides of the board. On the other hand, the major raw materials needed in the manufacture of cement retarder are phosphogypsum and quicklime.

At full capacity, the total raw material cost is estimated at US\$3,347.2 thousand --- US\$55.8 thousand for the manufacture of gypsum board and US\$3,291.4 thousand for cement retarder.

Utility requirements in the manufacture of gypsum board and cement retarder include electricity and fuel oil. At full capacity, the estimated cost of fuel oil is about US\$1,235.7 thousand.

Electricity requirement at full capacity is estimated at US\$536.2 thousand. Electricity cost is estimated at an average cost of ₱0.9493 or US\$0.0417 per kilowatt-hour based on the current Leyte grid electric rate. Water will be sourced from a deep well and pumped to serve requirements of the project. Electricity consumption of the pump is incorporated in the utility costs.

1.3 PLANT LOCATION

The proposed site for the project is Tolingon, Isabel, Leyte near the PHILPHOS complex which is the source of phosphogypsum raw material. It is outside the Leyte Industrial Development Estate (LIDE) which is an export processing zone. If the plant is located in LIDE, sales to Philippine customs territory would be subject to tariff duty and VAT. Cost of land in Tolingon is estimated at US\$2.20 (P50) per square meter.

1.4 PLANT ENGINEERING

The total land area for the project is 15,000 square meters. The building space requirement, including the factory, finished goods warehouse, raw materials and spare parts warehouse, and administrative building, will occupy 12,500 square meters. The remaining 2,500 square meters is allocated for the water and fuel tanks.

The manufacture of both gypsum board and cement retarder requires the dewatering and calcination of phosphogypsum. Phosphogypsum is washed and dewatered to remove as much water-soluble impurities as possible. The purified phosphogypsum is calcined in a hot air conveying steam, controlling the formation of the gypsum phases and crystals.

For gypsum board, the succeeding steps involve mixing the calcined gypsum with water and a series of unit operations of pressing, cutting, drying, calibrating, coating with paper and final drying.

For cement retarder, the calcined gypsum is mixed with water, neutralized and granulated. In order to save energy, a by-pass system is adopted. The relation between calcined and uncalcined refined gypsum depends on the formation of granules, strength, phosphogypsum properties and requirements of the cement industry.

Some of the major equipment needed for the project are the mixer, granulator, drier, and calciner.

The total cost of all production and auxiliary equipment is estimated at US\$22.0 million with BOI incentives.

1.5 ORGANIZATION AND MANPOWER

The organization is composed of three major departments - the finance and administrative group, the marketing group, and the production/plant group. Each department is headed by a manager. Overall management will be handled by the general manager.

At full capacity, the project will employ a total of 64 workers. Of this number, 50 are classified as direct labor and 14 as indirect labor. The direct labor force consists of 20 skilled workers and 30 unskilled workers. Aside from the plant personnel, there will also be 17 administrative officers and staff and nine marketing staff.

1.6 PROJECT IMPLEMENTATION

The first two years of the implementation timetable is the preproduction phase, followed by commercial production. Preoperating activities include the following: feasibility study and preparation of engineering specifications, site preparation, construction of buildings and civil works, delivery and installation of plant machineries, recruitment and training of production and maintenance personnel, procurement of raw materials for test run, and trial production and start of operations.

1.7 FINANCIAL EVALUATION

1.7.1 Total Investment Costs

Total investment requirement for the project is estimated at US\$24.9 million with BOI incentives (tariff-free importation of equipment). The biggest investment will be production machinery and equipment, which is US\$22.0 million or almost 88 per cent of total investment.

	<u>Amount</u> <u>(000 US\$)</u>
Land	33.0
Site preparation and development	164.8
Building, wharf and civil works	1,685.7
Auxiliary and service facilities	6.5
Plant machineries and equipment	22,006.2
Transport and office equipment	111.1

Total fixed investment costs	24,007.4*

Preproduction capital costs	929.1

Total initial investment costs	24,936.5
	=====

* Figures do not add up to total due to rounding.

1.7.2 Project Financing

Financing for the project will come from a combination of loan and equity investments to be made during the preoperating period. The breakdown is as follows:

	<u>Amount</u> <u>(000 US\$)</u>	<u>Percent</u>
Foreign Loan	14,463.0	58.0
	-----	-----
Equity		
Foreign	4,189.2	16.8
Local	6,284.3	25.2
	-----	-----
Sub-total	10,473.5	42.0
	-----	-----
Total	24,936.5	100.0
	=====	=====

Debt financing will account for 58 per cent of total project cost. The foreign loan will finance 63 per cent of foreign cost component.

Equity contributions will finance about 42 per cent of the total initial investment. It is assumed that 60 per cent of equity contributions will come from local proponents.

1.7.3 Production Costs

Annual production costs at full capacity (1995) is estimated at US\$9.3 million. The breakdown of the production costs is presented below:

	Amount (000 US\$)
Factory Costs	
Raw Materials	3,347.2
Utilities	536.2
Energy (fuel oil)	1,235.7
Direct Labor	126.7
Repairs and Maintenance	220.1
Spare Parts	330.1
Factory Overhead	273.7

Total Factory Costs	6,069.7

Administration Overhead	93.7
Sales and Distribution Costs	187.0
Financial Costs	1,398.8
Depreciation	1,582.2

Total Production Costs	9,331.4
	=====

1.7.4 Commercial Profitability

The project will have a financial internal rate of return (IRR) of 21.87 per cent.

Internal Rate of Return	21.87%
Payback Period (in years)	6.06
Net Present Value (at 20%)	US\$1,674,444.00
Breakeven *	29.81%
(% of sales at full capacity)	

* Excluding financing.

In the first year of production (1993), the net income is about US\$882.2 thousand or 10.6 per cent of the gross revenue. The net income will continue to increase up to the fourth year of production. At full capacity (1995), the net income will reach US\$4.5 million or 32.6 per cent of the gross revenue. These high net income/gross revenue ratios are caused by the decreasing financing cost (interest expense) and the income tax holiday. Interests on the long term loan will decrease with decreasing

principal. Income from the manufacture and sale of gypsum board will enjoy a six-year tax holiday while income from the manufacture and sale of cement retarder will enjoy a four-year tax holiday.

On the fifth year of production, the net income will decrease due to the payment of income tax on the manufacture of cement retarder. The income tax holiday and the payment of interest on the long term loan will end on the sixth year, thus, the net income will remain the same from the seventh to fourteenth year of commercial operation. The net income will increase on the fifteenth year due to the reduction of the depreciation cost.

Year	In US dollars		Net Income/ Gross Revenue
	Gross Revenue	Net Income	
1	8,310,000	882,166	10.6%
2	11,080,000	2,568,179	23.2%
3	13,850,000	4,518,617	32.6%
4	13,850,000	4,813,451	34.8%
5	13,850,000	3,753,800	27.1%
6	13,850,000	4,038,550	29.2%
7	13,850,000	3,861,624	27.9%
15	13,850,000	3,933,144	28.4%

To determine the effect of changes in critical variables on the financial viability of the project, sensitivity analyses were conducted on different scenarios. The three scenarios assumed are the following:

- 1) The project will not be able to produce and sell only at 80 per cent of capacity from years two to 15;
- 2) The export prices are reduced due to stiffer competition and higher freight costs, the export price for gypsum board is reduced by US\$5 per metric ton from US\$200 while that of cement retarder is reduced from US\$11 to US\$7 per metric ton;
- 3) The raw material cost will include 20 per cent tariff duty and 10 per cent VAT on phosphogypsum which comes from LIDE, an export processing zone (not part of Philippine customs territory).

The results of the sensitivity analyses show that the project is highly sensitive to changes in initial investment and operating costs, and least sensitive to changes in selling prices.

The project is still viable if the export prices are reduced due to competition and higher freight costs, with an internal rate of return of 20.20 per cent. In the other two scenarios, the project will have IRR's lower than the 20 per cent hurdle rate. The summary of the results of sensitivity analyses on the different cases is shown below.

	<u>Case 1</u>	<u>Case 2</u>	<u>Case 3</u>
IRR	17.94%	20.20%	19.39%
Payback Period (in years)	6.73	6.37	6.54
NPV at 20% (in thousand US\$)	-1,719.7	173.4	-543.0
Breakeven (% of sales at full capacity)	37.26%	31.72%	32.63%

Currently, the purchase of phosphogypsum from PHILPHOS for the manufacture of gypsum products for domestic sales is subject to 20 per cent tariff duty and 10 per cent VAT. PHILPHOS is located in LIDE, which is an export processing zone, and its sale to Philippine customs territory is subject to duty and VAT. There is, however, an appeal to reconsider this ruling in the case of phosphogypsum which is not utilized at LIDE. If the project is subject to tariff duty and VAT on phosphogypsum, the internal rate of return will decrease from 21.87 per cent to 19.39 per cent.

1.7.5 Financial Cashflow

The cash inflow of the project will stabilize after it has reached full capacity. The additional US\$88.0 thousand cash inflow in year three is due to additional working capital that will be required with the increase in the plant's capacity utilization. On the other hand, cash outflow variation from the fourth to the seventh year of operation is due to financing,

depreciation costs and income tax payments (from year five). The payment of the long term loan will end on the sixth year.

Year	In US dollars			
	Total Cash Inflow	Total Cash Outflow	Surplus (Deficit)	Cumulated Cash Balance*
1	8,639,759	6,977,978	1,661,781	1,661,784
2	11,168,020	9,511,446	1,656,578	3,318,362
3	13,938,020	10,595,430	3,342,590	6,660,952
4	13,850,000	10,312,940	3,537,065	10,198,020
5	13,850,000	11,701,330	2,148,673	12,346,690
6	13,850,000	11,806,650	2,043,347	14,390,040
7	13,850,000	8,429,674	5,420,326	19,810,360
15	13,850,000	8,468,185	5,381,815	63,134,470

* Available for cash dividends to the extent of retained earnings.

Note: Items may not add to total because of rounding.

1.8 CONCLUSION

Based on our analysis of the market, preliminary technical assessment, and the financial projections, the manufacture of cement retarder and gypsum board in the Philippines appears to be a viable project. There is a large demand for the two products due to the construction boom being experienced in the Philippines and in the other ASEAN countries. As an AIJV project, the prices of cement retarder and gypsum board will be relatively lower brought about by the 90 per cent tariff preference extended by participating countries.

The results of the financial projections indicate the viability of the project. The project will have a financial internal rate of return (IRR) of 21.9 per cent. Payback period for the project is six years and one month (including the construction period).

2. PROJECT BACKGROUND AND HISTORY

2.1 PROJECT BACKGROUND

The ASEAN countries have continuously sought to achieve industrial cooperation and economic progress in the region as embodied in the Declaration of ASEAN Concord signed over ten years ago. One program that has been initiated for increased and meaningful industrial and economic cooperation is the ASEAN Industrial Joint Ventures (AIJV) program which conceives of the ASEAN private sector as the primary mover.

Under the program, effective consolidation of markets can be achieved by granting AIJV products preferred access to the markets of participating member countries by way of margin of tariff preference. An AIJV project is participated in by nationals of at least two ASEAN countries with a minimum of 51 per cent ASEAN equity and minimum equity contribution of five per cent from nationals of each participating country. A minimum margin of tariff preference of 90 per cent shall be extended by participating countries to the proposed product within 90 days from the start of its commercial production for a period of four years and can be extended for another period of up to four years.

The United Nations Industrial Development Organization (UNIDO) has been working with the Committee on Industry, Minerals and Energy (COIME) in the identification, preparation, and promotion of AIJV products. Four projects were identified during the COIME National Coordinators meeting held in Kuala Lumpur. One project is the establishment of a manufacturing plant of gypsum products proposed by the Philippines.

It is in this light that UNIDO has engaged the services of SGV and Co. to prepare an investment opportunity study on the manufacture of gypsum products, particularly cement retarder, plaster of paris, and gypsum board. The study involves discussions on the domestic and export markets, technical production aspects, and financial feasibility of the project. The proposed project will utilize the phosphogypsum by-product of the Philippine Phosphate Fertilizer Corp. (PHILPHOS).

The project will avail of incentives from the Philippine Board of Investments. As a non-pioneer enterprise in the Investment Priorities Plan (IPP), the production of cement retarder will enjoy tariff-free importation of equipment and four-year tax holiday. On the other hand, the manufacture of gypsum board is

listed as a pioneer enterprise. It will also enjoy tariff-free importation of equipment and a tax holiday of six years.

2.2 PRODUCT COVERAGE AND DESCRIPTIONS

This opportunity study covered the domestic and ASEAN markets for cement retarder, plaster of paris, and gypsum board. Based on the market analysis, it was decided that the project manufacture and sell only cement retarder and gypsum board, and exclude plaster of paris. The Philippine market for plaster of paris is small (less than 10,000 metric tons), the projected growth rate is low (average of 5.4 per cent per year) and major users are very strict on quality (exporters of ornamental ceramics source their plaster of paris from Germany and France which supply expensive but high quality plaster.

The description of the three major gypsum products are as follows:

- o Cement Retarder - this is an important ingredient in the production of cement. It is added to the clinker to increase the strength and regulate the setting process of cement. Depending on the purity of gypsum and the type of cement to be produced, normally between three to four per cent of retarder is added to the clinker. In this study, the cement retarder used is about 3.5 per cent of total cement produced.

Cement retarder comes in either powder or pelletized form. Interviews with local cement manufacturers indicate that pelletized cement retarder is preferred over powdered cement retarder since the latter causes clogging in equipment.

- o Gypsum Board - this consists of a core of gypsum sandwiched between two layers of paper. Gypsum board is commonly used for interior walls and ceilings of buildings. It is preferred over plywood because it is fire resistant and has dimensional stability. It also has the capability to breath, i.e., gypsum absorbs water vapor at high relative humidities and desorbs it at low relative humidities, thus producing a pleasant in-door climate.

A typical gypsum board has the following specifications:

Dimensions:

Length - 2.4 meters
Width - 1.2 meters
Thickness - 12.0 millimeters

Area : 2.9 square meters
Weight : 20.0 kilograms
Gypsum Content: 5.7 kilograms per square meter or 17 kilograms per panel

- o Plaster of Paris - this is gypsum calcined to its hemihydrate form ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$). It is produced by removing most of the water of crystallization from gypsum by gentle heat and which when mixed with water, may be spread and shaped, and in a few hours, sets to a hard mass. It is mainly used by the ceramics industry as the prime material in creating molds for different types of ceramic products. These molds can ably reproduce thin-walled and intricately detailed ceramics and are usually used 80 to 100 times depending on the type of ceramic produced. Plaster of paris is also used in hospitals for orthopedic purposes and dental clinics for tooth impressions.

Ceramics industry standards on plaster of paris include normal consistency, color, purity, and fineness. Normal consistency is the most important criterion because strength, absorption, hardness and other physical characteristics depend on this factor.

The main raw material in manufacturing the aforementioned products is gypsum, which can either be natural or chemical. Natural gypsum occurs in crystalline mineral of various colors. It can be white, gray, almost black, pink, or brown, depending upon the nature and amount of impurities present. Pure gypsum is snow white. Gypsum is chemically known as "dihydrous calcium sulfate" ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$).

Chemical gypsum or synthetic gypsum is precipitated in various chemical processes. Types of chemical gypsum may be designated by the nature of Ca salt from which the CaSO_4 is derived, e.g., phosphogypsum, fluorogypsum, chlorogypsum, and citrogypsum. In this study, processed gypsum products are manufactured from phosphogypsum which is a by-product of PHILPHOS in the reaction of phosphate rocks and sulfuric acid in the production of

phosphoric acid which is an intermediate product in the manufacture of various fertilizers.

3. MARKET AND PLANT CAPACITY

3.1 DEMAND AND MARKET STUDY

3.1.1 Domestic Market

Interviews with major users indicate that the consumption of processed gypsum products in the Philippines in 1989 is about 226,000 metric tons (see Table 1). Cement retarder comprises 94 per cent of the domestic market while plaster of paris and gypsum board each account for about three per cent.

Table 1
Philippines
Estimated Domestic Consumption
of Gypsum Products
1989

<u>Product</u>	<u>Metric Tons</u>	<u>Per Cent Share</u>
Cement Retarder	212,000	93.8
Plaster of Paris	8,000	3.5
Gypsum Board	<u>6,000</u>	<u>2.7</u>
Total	226,000 =====	100.0 =====

Source: Interviews.

3.1.1.1 Cement Retarder

The consumption of cement retarder has increased from 150,000 metric tons in 1987 to 212,000 metric tons in 1989 (see Table 2) following significant increases in cement production as a result of the construction boom. Based on interviews, the average consumption of cement retarder is 3.5 per cent of cement production.

Table 2
Philippines
Total Cement Production and
Cement Retarder Used
1987 - 1989
(in thousand metric tons)

	<u>Cement Production</u>	<u>Cement Retarder Used</u>
1987	4,272	150
1988	5,449	191
1989	6,050	212

Source: Philippine Cement Manufacturers Corp.

Cement retarder is mainly sourced from importations except for the local production of Gypsum Chemicals, Inc. It has a capacity of 10,000 metric tons of cement retarder, and has planned to expand annual production capacity to about 60,000 metric tons of pelletized cement retarder by April 1990. It utilizes the phosphogypsum by-product of PHILPHOS, and its plant is located in Tolingon, Isabel, Leyte near the PHILPHOS fertilizer plant. The major country sources of cement retarder are Indonesia and Thailand.

At present, there are 17 cement manufacturers in the Philippines (see Table 3). The biggest in terms of capacity is Solid Cement Corp. in Antipolo, Rizal with an annual rated capacity of 632,000 metric tons. The next biggest are Davao Union Cement Corp. (600,000 metric tons), and Northern Cement Corp. and Titan Cement Corp. (each with 480,000 metric tons of annual capacity).

About two-thirds of the country's capacity and total production are accounted for by cement plants in Luzon. In 1989, reported cement production was 6.05 million metric tons, about four million of which was produced by Luzon plants.

Table 3
Philippines
Capacity of Cement Plants and 1989 Production
and Cement Retarder Used
(in thousand metric tons)

<u>Cement Plant</u>	<u>Annual Rated Capacity \a</u>	<u>1989 Production \a</u>	<u>1989 Cement Retarder Used \b</u>
LUZON			
Bacnotan Consolidated Industries Inc.	288	347	11
Northern Cement Corp.	480	509	17
Central Cement Corp.	224	256	8
Republic Cement Co.	456	379	12
Continental Cement Co.	288	108	4
Rizal Cement Co., Inc.	344	449	14
FR Cement Corp.	360	519	16
Solid Cement Corp.	632	634	27
Titan Cement Corp.	480	47	2
Hi-Cement Corp.	372	421	12
Fortune Cement Corp.	<u>360</u>	<u>329</u>	<u>13</u>
Sub-total	4,284	3,998	136
VISAYAS-MINDANAO			
Apo Cement Corp.	156	191	7
Iligan Cement Corp.	476	364	18
Mindanao Portland Cement Corp.	152	180	6
Floro Cement Corp.	404	504	17
Pacific Cement Corp.	180	127	4
Davao Union Cement Corp.	<u>600</u>	<u>686</u>	<u>24</u>
Subtotal	<u>1,968</u>	<u>2,052</u>	<u>76</u>
TOTAL	6,252 =====	6,050 =====	212 ===

Sources: \a Philippine Cement Manufacturers Corporation.
Attainable finishmill capacity is generally higher
than rated capacity.
\b Interviews.

Six cement plants including the two biggest in terms of capacity are members of the Philippine Investment Management Consultants, Inc. (PHINMA) which is involved in the professional management of diversified business enterprises, including cement companies. These cement plants are Bacnotan, Central, Rizal, Solid, Hi-Cement and

Davao Union. Their combined capacity accounts for 39 per cent of the country's total, and their aggregate 1989 production contributed 46 per cent of total production.

3.1.1.2 Plaster of Paris

The 1989 local consumption of plaster of paris in the Philippines is estimated at 8,000 metric tons, as shown in Table 4. The major industry users are ceramics manufacturers including those that produce ornamental ceramics, dinnerware and sanitarywares. They use plaster of paris as molds prior to firing the formed beneficiated clay.

All the plaster of paris used locally are imported, mainly from Germany and France.

Table 4
Philippines
Estimated Domestic Consumption
of Plaster of Paris, 1989

<u>User Industry</u>	<u>Volume (MT)</u>	<u>Per cent Share</u>
Ceramics		
Ornamental Ceramics	4,750	59.4
Sanitaryware	1,700	21.3
Dinnerware	700	8.8
Structural Ceramics	200	2.5
Chalk Manufacture	500	6.2
Artificial Plant Base	100	1.2
Medical/Dental Uses	<u>50</u>	<u>0.6</u>
Total	8,000 =====	100.0 =====

Source: Interviews.

About 4,750 metric tons, equivalent to 59 per cent of the total 1989 estimated consumption of plaster of paris was used as molds in the manufacture of ornamental ceramics. Philippine-made ornamental ceramics are

becoming very competitive in the world market due to the relatively low labor rates and artistic capabilities of workers in designing and molding artware ceramics. There are about 240 manufacturers in the country, 26 of which are exporters.

The next major industry user are manufacturers of sanitary wares, e.g., wash basin, pedestal, water closet, toilet bowl, bidet, which consumed about 1,700 metric tons of plaster of paris in 1989. The biggest user is Sanitary Ware Manufacturing Corp. (Saniwares) which accounts for about 85 to 90 per cent of the country's sanitary wares production.

The dinnerware manufacturers utilized approximately 700 metric tons of plaster in 1989. Porcelana Mariwasa, Inc., Lucky Tableware Factory, Inc. and Royal Porcelaine Corporation are the major dinnerware firms in the country.

Structural ceramics mainly refer to balusters and refractory slabs. The other industry users are chalk manufacturers, artificial plant makers (for base of artificial flowers and plants), and medical and dental clinics.

3.1.1.3 Gypsum Board

Based on interviews, about 300,000 panels or a total of 6,000 metric tons of gypsum board were used in 1989 mainly in the construction of condominium buildings. These panels consumed about 5,000 metric tons of raw gypsum (about 85 per cent of gypsum board by weight is raw gypsum). Architects and contractors recommend gypsum board for ceilings in condominium buildings because gypsum board is a fire retardant, has dimensional stability and absorbs humidity. It is also used for ceilings in office buildings where permanent channels are provided for lighting fixtures.

Gypsum board is gaining popularity despite its relatively higher price compared to plywood. A panel of gypsum board costs about ₱200 to ₱300 compared with ₱175 per panel of plywood.

During the last three years, there has been an upsurge in the construction of condominium buildings fueled by increasing requirements from domestic businessmen and foreign investors including those from Japan, Taiwan and Hong Kong.

During 1989, an estimated 100 high-rise condominium buildings were built in selected areas in Metro Manila including Makati, Pasig - Mandaluyong area, Binondo area and Roxas Boulevard area.

The local distributors of gypsum board obtain their products from the United States, Australia, and, Korea, among others. These brands include Dontar, USG, Goldband, Boral, and Keumkang.

3.1.2 ASEAN Market

Table 5 shows a summary of the net imports or exports of gypsum products among selected ASEAN countries. Thailand, which has abundant reserves of natural gypsum, is a major exporter of gypsum products.

Malaysia and Singapore are net importers of cement retarder, with 1989 volumes of 196,000 metric tons and 27,000 metric tons, respectively. On the other hand, Indonesia and Thailand are net exporters of cement retarder with respective 1989 volumes of 78,000 metric tons and 14,000 metric tons.

Indonesia, Malaysia and Singapore are net importers of plaster of paris. Their net imports in 1989 amounted to 17,000 metric tons for Indonesia, 26,000 metric tons for Malaysia and 14,000 metric tons for Singapore. Thailand registered a net export volume of 25,000 metric tons in 1989.

Trade statistics classify gypsum board under the more general heading SITC 6618-200 "panels, boards, tiles, blocks, and similar articles of vegetable fibre, or straw or of chips, sawdust or other mineral binder." This excludes plywood and other ligneous boards.

Based on trade statistics, Indonesia would not be a major market for gypsum board, with net imports of only 47 metric tons in 1989. Furthermore, it has an abundant supply of wood-based products including plywood which is the main type of panel used in the country. Malaysia and Singapore may be markets for gypsum board with 1989 net imports of 810 metric tons and 3,600 metric tons of panels, respectively.

Table 5
Net Imports or Exports of Gypsum Products
of Selected ASEAN Countries, 1989
(in metric tons)

	<u>Indonesia</u>	<u>Malaysia</u>	<u>Singapore</u>	<u>Thailand</u>
Cement Retarder	78,000E	196,000	27,000	14,000E
Plaster of Paris	17,000	26,000	14,000	25,000E
Panels*	47	810	3,600	6,200E

E - figures are net imports unless indicated by E, net exports.

* Imports of gypsum board is included under SITC 6618-200 with heading of "Panels, boards, tiles, blocks and similar articles of vegetable fibers, or straw or of chips, sawdust or other waste of wood, agglomerated with cement, plaster or other mineral binder" in foreign trade statistics. Excludes plywood and ligneous boards.

Sources of Basic Data: Country Foreign Trade Statistics.

3.1.2.1 Indonesia

The estimated 1989 domestic consumption of cement retarder in Indonesia is 430,000 metric tons. Domestic production is estimated at 508,000 metric tons, importation at 62,000 metric tons and exportation at 140,000 metric tons (see Table

6). Domestic consumption of plaster of paris in 1989 amounted to 17,000 metric tons; all of these were imported.

Table 6
Indonesia
Estimated Apparent Domestic Consumption
of Cement Retarder and Plaster of Paris, 1989
(in thousand metric tons)

	<u>Cement Retarder</u>	<u>Plaster of Paris</u>
Production	508	-
Plus: Imports	62	17
Less: Exports	<u>140</u>	<u>-</u>
Apparent Domestic Consumption	430 ===	17 ==

Sources: Foreign Trade Statistics.
Cement Manufacturers Association
of Indonesia.
Interviews.

The domestic consumption of cement retarder in Indonesia is based on the estimated 1989 cement production of 12.3 million metric tons. About 3.5 per cent of this is cement retarder equivalent to 430,000 metric tons.

Table 7
Indonesia
Cement Production and Cement Retarder Used
1987 - 1989
(in thousand metric tons)

	<u>Cement Production</u>	<u>Cement Retarder Used</u>
1987	11,876	416
1988	12,242	428
1989 - Est.	12,300	430

Source: Association of Indonesian Cement
Manufacturers (ASI).

At present, there are ten cement manufacturers with a total annual production capacity of 17.62 million metric tons. The biggest cement

manufacturer is PT. Indocement Tunggal Prakarsa which operates eight production units. It has an annual production capacity of 7.7 million metric tons which is 44 per cent of the country's total cement production capacity (see Table 8 for production capacities).

Table 8
Indonesia
1988 Annual Production Capacity of Cement Plants

<u>Company</u>	<u>Thousand Metric Tons</u>
PT. Indocement Tunggal Prakarsa	7,700
PT. Semen Padang	2,130
PT. Semen Cibinong	1,500
PT. Semen Gresik	1,500
PT. Semen Tonasa	1,220
PT. Tridaya Manunggal	1,200
PT. Semen Andalas	1,000
PT. Semen Nusantara	750
PT. Semen Baturaja	500
PT. Kupang	120
Total	17,620 =====

Source: Association of Indonesian Cement Manufacturers.

Local cement retarder is produced from the phosphogypsum by-product of PT. Petrokemia Gresik which is the sole domestic manufacturer of phosphatic fertilizer. In 1989, its estimated production is 508,000 metric tons which is 15 per cent more than its rated capacity of 440,000 metric tons of cement retarder.

The total consumption of plaster of paris in 1989 is estimated at around 17,000 metric tons. About 10,000 metric tons or 61 per cent of total plaster of paris consumption is accounted for by the ceramic floor and wall tiles industry (see Table 9). A listing of ceramic producers in Indonesia is shown in Annex 2.

Table 9
Indonesia
Major User Industries of Plaster of Paris
(in metric tons)

<u>User Industry</u>	<u>Volume</u>	<u>Per Cent Share</u>
Ceramic floor and wall tiles	10,000	60.6
Sanitary wares	4,000	24.3
Ceramic roof tiles and bricks	2,000	12.1
Other industries	<u>500</u>	<u>3.0</u>
Total	16,500 =====	100.0 =====

Source: Department of Industry, Indonesia.

3.1.2.2 Malaysia

Domestic consumption of cement retarder in 1989 in Malaysia amounted to about 196,000 metric tons. These were all sourced from importation. Exports were minimal at 40 metric tons (see Table 10).

Domestic consumption of plaster of paris and gypsum board are estimated at 26,500 metric tons and 810 metric tons, respectively. Imports of plaster of paris totalled 27,000 metric tons while exports were 500 metric tons. As for gypsum board, import volume is estimated at 810 metric tons. There is no recorded exports of gypsum board.

It is reported that Wembley Gypsum Product Sdn Bhd has facilities to manufacture plaster of paris and gypsum board. It started production in late 1989. It has an annual rated capacity of 30,000 to 40,000 metric tons of plaster of paris and 45,000 to 50,000 panels of gypsum board (equivalent to about 900 to 1,000 metric tons). Wembley's gypsum raw material is reported to be imported from Thailand.

Table 10
Malaysia
Estimated Apparent Domestic Consumption of
Cement Retarder, Plaster of Paris, and
Gypsum Board, 1989
(in metric tons)

	<u>Cement Retarder</u>	<u>Plaster of Paris</u>	<u>Gypsum Board</u>
Production	-	*	*
Plus: Imports	196,000	27,000	810
Less: Exports	<u>40</u>	<u>500</u>	<u>-</u>
Apparent Domestic Consumption	195,960 =====	26,500 =====	810 ===

* Not significant.

Sources: Foreign Trade Statistics.
Interviews.

The estimated consumption of cement retarder in Malaysia is based on the country's cement production. This has increased by 19 per cent in 1988 and 25 per cent in 1989. Based on a 3.5 per cent content of cement retarder in portland cement, the cement retarder utilized increased from 112,140 metric tons in 1987 to 167,090 metric tons in 1989. (See Table 11.) The balance of about 28,900 metric tons from 1989 net imports and usage would probably be inventory.

Table 11
Malaysia
Total Cement Production and
Cement Retarder Used
1987 - 1989
(in metric tons)

	<u>Cement Production</u>	<u>Cement Retarder Used</u>
1987	3,204,000	112,140
1988	3,828,000	133,980
1989	4,774,000	167,090

Source: Interviews.

There are a total of nine cement plants in Malaysia, six integrated plants and three grinding plants. Associated Pan Malaysia Cement Sdn Bhd has the biggest capacity of about two million metric tons. Table 12 shows these cement plants and their annual capacities.

Table 12
Malaysia
Cement Manufacturers and Annual Capacities
(in thousand metric tons)

<u>Cement Manufacturer</u>	<u>Annual Capacity</u>
Integrated Plants:	
Associated Pan Malaysia Cement Sdn Bhd	2,100
Kedah Cement Sdn Bhd	1,500
Parak Hanjoong Simen Sdn Bhd	1,200
Tasek Cement Bhd	1,200
Cement Industries of Malaysia Bhd	1,000
Malaya Industrial & Mining Corpn Bhd	60
Grinding Plants:	
Cement Industries Sabah Sdn Bhd	500
Cement Manufacturers Sarawak Bhd	450
Malaya Industrial & Mining Corpn Bhd	<u>120</u>
Total	8,130 =====

Source: Cement & Concrete Association.

Consumption of plaster of paris is mainly used as molds in the manufacture of sanitary wares, floor and wall tiles, decorative ornamental ceramics and dinnerware. The upsurge in consumption of these ceramic products is the result of increases in building and residential construction (note significant increases in cement production of 25 per cent in 1989 and in condominium buildings of 46 per cent in 1989 [see Table 13]).

Based on a survey on the construction of office space and condominiums in and around Kuala Lumpur by the Malaysian Central Bank, the

potential market for gypsum board for 1989 is about 40,700 panels or 810 metric tons. Interviews indicate that around 10 per cent of office buildings constructed in 1989 used gypsum board while in condominiums, about 112,000 square meters or 80 per cent of the total condominium area used gypsum boards. This is equivalent to about 2,100 panels of gypsum board in office buildings and 38,600 panels in condominiums. Plywood and other types of panels such as fiberglass boards, accoustical boards, and other fiber boards are also being used. The following table shows the built-up area of condominiums and office spaces from 1987 to 1990 and the estimated demand for gypsum board.

Table 13
Malaysia
Potential Demand for Gypsum Board
1987 - 1990

	Office space		Condominium			Estimated Demand				
	No. of Projects	Area in sq.meters	No. of Projects	No. of Units	Area in sq.meters	10% of Office	80% of Condominium	(Sq.meters)	Total (Panels)	(Metric Tons)
1987	10	248,620	6	1,143	175,975	24,862	140,780	165,642	57,100	1,140
1988	3	28,485	4	936	95,771	2,849	76,617	79,466	27,400	550
1989	3	59,967	7	1,069	139,904	5,997	111,923	117,920	40,700	810
1990	-	-	8	2,212	223,622	-	178,898	178,898	61,700	1,200

Sources of Basic Data: Bank Negara Annual Report, 1988.

3.1.2.3 Singapore

In Singapore, the 1989 apparent consumption of gypsum products may be estimated based on the net importation volumes since there is no reported local production of these products. The country imported about 29,300 metric tons of cement retarder in 1989 and exported around 2,500 metric tons, resulting in a net importation volume of 26,800 metric tons which is used entirely by the cement industry. Similarly, an import volume of 21,310 metric tons of plaster of paris was

reported in 1989 and an export volume of 7,600 metric tons, thus, a net importation volume of 13,710 metric tons. For gypsum board, the apparent consumption is estimated at 3,600 metric tons of panels.

Table 14
Singapore
Estimated Apparent Domestic Consumption of
Cement Retarder, Plaster of Paris, and
Gypsum Board, 1989
(in metric tons)

	<u>Cement Retarder</u>	<u>Plaster of Paris</u>	<u>Gypsum Board</u>
Imports	29,300	21,310	5,800
Less: Exports	<u>2,500</u>	<u>7,600</u>	<u>2,200</u>
Apparent Domestic Consumption	26,800 =====	13,710 =====	3,600 =====

Source: Foreign Trade Statistics, Singapore.

3.1.2.4 Thailand

The 1989 apparent consumption of gypsum products in Thailand are 436,000 metric tons of cement retarder, 23,000 metric tons of plaster of paris, and 114,800 metric tons of gypsum board (see Table 15). All three products are locally manufactured. Cement retarder imports are negligible while imports of plaster of paris and gypsum board amounted to 2,100 metric tons and 400 metric tons, respectively. On the other hand, exports totalled 14,000 metric tons of cement retarder, 27,100 metric tons of plaster of paris, and 6,600 metric tons of gypsum board.

Thailand has an abundant reserve of natural gypsum. Known reserves amount to 36 million metric tons.

Table 15
Thailand
Estimated Apparent Domestic Consumption of
Cement Retarder, Plaster of Paris, and
Gypsum Board, 1989
(in metric tons)

	<u>Cement Retarder</u>	<u>Plaster of Paris</u>	<u>Gypsum Board</u>
Production	450,000	48,000	121,000
Plus: Imports	-	2,100	400
Less: Exports	<u>14,000</u>	<u>27,100</u>	<u>6,600</u>
Apparent Domestic Consumption	436,000 =====	23,000 =====	114,800 =====

Sources: Foreign Trade Statistics.
Interviews.

The estimated volume of cement retarder consumed for 1989 is 436,000 metric tons. This is based on the 1989 domestic production of cement in Thailand which is reported to be about 12.5 million metric tons.

Table 16
Thailand
Cement Production and Cement Retarder Used
1987 - 1989
(in thousand metric tons)

	<u>Cement Production</u>	<u>Cement Retarder Used</u>
1987	9,850	345
1988	11,514	403
1989 - Est.	12,460	436

Source: Thailand Economic Indicators, 1989.

The 1989 apparent consumption of plaster of paris in Thailand is estimated at 23,000 metric tons. This is based on an estimated production of 48,000 metric tons and a net export volume of about 25,000 metric tons. Plaster of paris is used as molds in the manufacture of ceramic products and sanitarywares, casting splints, and for interior decoration.

The domestic production of gypsum board in 1989 is about 17.5 million sq.m. which is equivalent to 121,000 metric tons. In the same year, Thailand imported around 400 metric tons and exported 6,600 metric tons. The 1989 apparent consumption is then estimated at 114,800 metric tons.

The estimated 1988 and 1989 domestic production of gypsum products are presented in the following table.

Table 17
Thailand
Estimated Domestic Production of Gypsum Products

	<u>1988</u>	<u>1989</u>
Gypsum Board	69,000-103,000 MT \a	103,000-138,000 MT \b
Cement Retarder	340,000 MT	450,000 MT
Plaster of Paris	40,000 MT	48,000 MT \c

\a Equivalent to 3.4 to 5.2 million panels or 10 to 15 million square meters of gypsum board.

\b Equivalent to 5.2 to 6.9 million panels or 15 to 20 million square meters of gypsum board.

\c Estimated.

Source: Interviews.

There are eight major manufacturers of gypsum products in Thailand. One company, the Thai Gypsum Product Co., Ltd., produces all three products, namely, cement retarder, gypsum board, and plaster of paris. As shown in Table 18, Thai Gypsum Product Co., Ltd. has an Australian equity of 14.7 per cent and accounts for at least 10 per cent of the market for gypsum products.

Table 18
Thailand
Major Manufacturers of Gypsum Products, Market Shares and
Foreign Tie-ups

	<u>Foreign Tie-up</u>	<u>Estimated Market Share</u>
Gypsum Board:		
Siam-Fibre Cement Co., Ltd.	None	70-80%
Thai Gypsum Product Co., Ltd.	Australian 14.7%	10-20
Cement Retarder:		
Thai Gypsum Product Co., Ltd.	Australian 14.7%	10%
The Siam City Cement Co., Ltd.	None	10%
The Siam Cement Co., Ltd.	None	8%
Thai Gypsum Co., Ltd.	None	8%
Plaster of Paris:		
Thai Gypsum Product Co., Ltd.	Australian 14.7%	n.a.
M. Thai Industrial Co., Ltd.	None	n.a.
Asia Plaster Co., Ltd.	None	n.a.
Siam Gypsum Plaster Ltd., Part.	None	n.a.

n.a. - Not available.

Source: Interviews.

As indicated earlier in sub-section 3.1.2 on the ASEAN Market, Thailand is a net exporter of the different gypsum products. The major country markets of cement retarder include Japan, Taiwan, Indonesia, and Malaysia. Export volume in 1989, however, have decreased by at least 279 per cent from 1988 to 1989 (see Table 19).

Table 19
Thailand
Exportation of Cement Retarder by Country of Destination
1987-1989
(Volume in metric tons, value in US\$000)

Country	1987		1988		1989-Est.	
	Volume	Value	Volume	Value	Volume	Value
Japan	180,400	1,674	2,552,076	25,516	14,057	135
Taiwan	79,120	915	428,214	4,477	31	9
Indonesia	47,200	388	179,040	1,720	-	-
Malaysia	-	-	163,674	1,626	51	14
Others	5,001	42	499,104	4,796	-	-
	<u>311,721</u>	<u>3,019</u>	<u>3,833,108</u>	<u>38,135</u>	<u>14,139</u>	<u>158</u>
	=====	=====	=====	=====	=====	=====

Source: Foreign Trade Statistics, Thailand.

The two leading country markets of Thailand's plaster of paris are Singapore and Malaysia, accounting for at least 75 per cent of the country's export volume from 1987 to 1989.

Table 20
Thailand
Exportation of Plaster of Paris by Country of Destination
1987-1989
(Volume in metric tons, value in US\$000)

Country	1987		1988		1989-Est.	
	Volume	Value	Volume	Value	Volume	Value
Singapore	8,406	694	9,281	810	11,295	1,046
Malaysia	2,471	204	6,329	496	9,336	744
Japan	1,296	103	2,884	249	4,162	372
Indonesia	617	55	1,087	101	1,172	101
Others	372	34	988	100	1,102	113
Total	<u>13,162</u>	<u>1,090</u>	<u>20,569</u>	<u>1,756</u>	<u>27,067</u>	<u>2,376</u>
	=====	=====	=====	=====	=====	=====

Source: Foreign Trade Statistics, Thailand.

As in the case of plaster of paris, majority of Thailand's panels (including gypsum board) were supplied to Malaysia and Singapore. There has been a decline, however, in the exportation of Thailand from 1987 to 1989. In Malaysia, the export volume decreased from 9,930 metric tons in 1987 to 3,946

metric tons in 1989 while in Singapore, it decreased from almost 17,000 metric tons in 1987 to 1,128 metric tons in 1989.

Table 21
Thailand
Exportation of Panels* by Country of Destination
(Including Gypsum Board)
1987-1989
(Volume in metric tons, value in US\$000)

Country	1987		1988		1989-Est.	
	Volume	Value	Volume	Value	Volume	Value
Malaysia	9,930	1,084	6,692	712	3,946	423
Singapore	16,948	2,104	1,679	249	1,128	218
Taiwan	1,030	105	651	106	170	34
Hong Kong	1,617	162	120	24	231	48
Others	3,763	467	229	41	1,087	74
Total	33,288	3,922	9,371	1,132	6,562	797
	=====	=====	=====	=====	=====	=====

* Imports of gypsum board is included under SITC 6618-200 with heading of "Panels, boards, tiles, blocks and similar articles of vegetable fibers, or straw or of chips, sawdust or other waste of wood, agglomerated with cement, plaster or other mineral binder" in foreign trade statistics. Excludes plywood and ligneous boards.

Source: Foreign Trade Statistics, Thailand.

3.1.3 Projected Demand

The demand for cement retarder in the Philippines is projected to reach 480,000 metric tons in 1993, and 1.7 million metric tons in year 2006. This is based on interviews and the projected 1993 supply of cement as indicated by the Philippine Cement Manufacturers Corporation (PHILCEMCOR). From 1993 to year 2006, demand is projected to grow at an average rate of 10.9 per cent per year. As for selected countries in the ASEAN region, the demand for cement retarder is expected to reach 796,000 metric tons in 1993 and 1.5 million metric tons by year 2006 (see Table 22).

Plaster of paris requirement in the Philippines is estimated to grow at five per cent per year while in the ASEAN region, demand is projected to increase at seven per cent annually.

A total of 83,400 metric tons of plaster of paris will be required by both the Philippine and ASEAN markets in 1993, and about 189,700 metric tons in 2006.

The average annual growth rate of gypsum board is 10.9 per cent in the local market and almost seven per cent in the export market. The demand for gypsum board will increase to 36,900 metric tons in the Philippines and 12,700 metric tons in selected countries in the ASEAN market by year 2006.

Table 22
Projected Demand for Gypsum Products
1993- 2006
(in metric tons)

Cement Retarder				Plaster of Paris				Gypsum Board			
Year	Philippine	Selected ASEAN*	Total	Year	Philippine	Selected ASEAN*	Total	Year	Philippine	Selected ASEAN**	Total
1993	480,000	795,600	1,275,600	1993	9,700	73,700	83,400	1993	10,700	5,660	16,380
1994	528,000	836,000	1,364,000	1994	10,200	78,500	88,700	1994	11,700	6,000	17,700
1995	580,800	878,300	1,459,100	1995	10,700	83,700	94,400	1995	12,900	6,400	19,300
2000	935,400	1,125,300	2,060,700	2000	13,700	115,600	129,300	2000	20,800	8,700	29,500
2005	1,506,400	1,442,000	2,948,400	2005	17,500	160,400	177,900	2005	33,500	12,000	45,500
2006	1,657,100	1,515,400	3,172,500	2006	18,300	171,300	189,700	2006	36,900	12,700	49,600
Ave. Annual Growth	10.9%	5.5%	7.9%		5.4%	7.3%	7.1%		10.9%	6.9%	9.7%

* Indonesia, Malaysia, and Singapore.

** Malaysia and Singapore.

Source: Interviews.

3.1.3.1 Selected ASEAN Countries

Based on interviews with major users in selected ASEAN countries, demand for cement retarder is projected to grow by an annual average rate of 5.4 per cent in both Indonesia and Malaysia, and 7.3 per cent in Singapore. By year 2006, a total of 1.5 million metric tons will be required by these three countries.

Table 23
Selected ASEAN Countries
Projected Demand for Cement Retarder
1993 - 2006
(in metric tons)

<u>Year</u>	<u>Indonesia</u>	<u>Malaysia</u>	<u>Singapore</u>	<u>Total</u>
1993	522,700	238,200	34,700	795,600
1994	548,800	250,100	37,100	836,000
1995	576,200	262,600	39,500	878,300
2000	735,400	335,200	54,700	1,125,300
2005	938,600	427,800	75,600	1,442,000
2006	985,600	449,100	80,700	1,515,400
Ave. Annual Growth	5.4%	5.4%	7.3%	5.5%

Source: Interviews.

As for plaster of paris, the selected country markets also include Indonesia, Malaysia, and Singapore. Demand is indicated to grow at 7.3 per cent per year in the ASEAN market.

Table 24
Selected ASEAN Countries
Projected Demand for Plaster of Paris
1993 - 2006
(in metric tons)

<u>Year</u>	<u>Indonesia</u>	<u>Malaysia</u>	<u>Singapore</u>	<u>Total</u>
1993	23,600	32,200	17,900	73,700
1994	25,600	33,800	19,100	78,500
1995	27,700	35,500	20,500	83,700
2000	41,700	45,300	28,600	115,600
2005	62,700	57,800	39,900	160,400
2006	68,000	60,700	42,600	171,300
Ave. Annual Growth	9.2%	5.4%	7.5%	7.3%

Source: Interviews.

The demand for gypsum board is projected to increase by an average rate of 5.7 per cent in Malaysia and 7.2 per cent in Singapore. Total requirement by year 2006 is estimated at 12,700 metric tons.

Table 25
Selected ASEAN Countries
Projected Demand for Gypsum Board
1993 - 2006
(in metric tons)

<u>Year</u>	<u>Malaysia</u>	<u>Singapore</u>	<u>Total</u>
1993	980	4,700	5,680
1994	1,000	5,000	6,000
1995	1,100	5,300	6,400
2000	1,400	7,300	8,700
2005	1,800	10,200	12,000
2006	1,900	10,800	12,700
Ave. Annual Growth	5.7%	7.2%	6.9%

Source: Interviews.

3.1.4 Prices and Tariff

Table 26 presents the average prices of cement retarder and gypsum board in selected ASEAN countries. Thailand offers cement retarder and gypsum board at a low price due to its natural reserves of gypsum.

Table 26
Prices of Cement Retarder and Gypsum Board
(in US\$)

<u>Country</u>	<u>Cement Retarder (Value/MT)</u>	<u>Gypsum Board (Value/panel)</u>
Philippines	24.90-39.60	9.20-17.10
Indonesia	20.60-41.00	6.60- 7.60
Malaysia	23.60-25.60	7.40- 8.90
Singapore	32.60-35.50	5.30- 6.60
Thailand*	10.23	6.05

* Wholesale prices.

Sources: Interviews
Foreign Trade Statistics.

The tariff rates of cement retarder in selected ASEAN countries range from two to 20 per cent while for gypsum board, the tariff rates are within a higher range of five to 40 per cent (see Table 27).

Table 27
Tariff Rates of Cement Retarder and Gypsum Board
(in per cent)

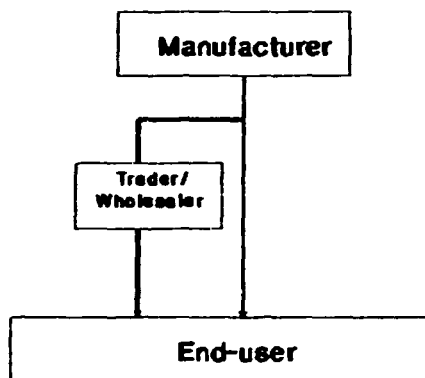
<u>Country</u>	<u>Cement Retarder</u>	<u>Gypsum Board</u>
Philippines	20	40
Indonesia	5	20
Malaysia	2	30
Singapore	5	5
Thailand	15	40

Sources: Interviews
Customs and Tariff Code of ASEAN countries.

3.1.5 Distribution Network

Seventy-five per cent of the gypsum products of the plant is intended for the local market while 25 per cent is for the export market. Gypsum board will be sold to traders or wholesalers while cement retarder will be sold directly to cement manufacturers or through traders. Figure 1 shows the distribution network of cement retarder and gypsum board in the ASEAN region.

Figure 1
Distribution Network of Cement Retarder and
Gypsum Board in ASEAN Countries



3.2 SALES AND MARKETING

3.2.1 Sales Forecast and Market Penetration

During the first year of operations, the project plans to supply about 50 to 55 per cent of unfilled domestic demand for cement retarder (see Table 28). This unfilled demand is the estimated 1993 total domestic demand of 480,000 metric tons less domestic production of the lone cement retarder manufacturer estimated at 60,000 metric tons. By the second year and third years of operations, the project would cover about 60 to 75 per cent of the unfilled demand in the domestic market.

The ASEAN country markets for cement retarder are Indonesia, Malaysia, and Singapore. Although Indonesia has been a net exporter of cement retarder, increasing domestic demand would limit its exports. Furthermore, domestic supply of gypsum is constrained by the production

capacity of the country's lone phosphatic fertilizer plant, PT Petrokemia Gresik.

For the first year of operations, the project intends to target about 20 to 25 per cent of unfilled demand of the selected ASEAN country markets. In the second and third years, export sales would cover about 25 to 30 per cent of unfilled demand. As indicated earlier in sub-section 3.1.2.4, Thailand's exports of cement retarder to ASEAN countries have drastically decreased from 1988 to 1989. The project then could cover at least 20 per cent of the three countries' unfilled demand assuming such trend continues.

Table 28
Domestic and Export Market Penetration
of Cement Retarder
1993-1995
(in metric tons)

	<u>1993</u>	<u>1994</u>	<u>1995</u>
Demand	480,000	528,000	580,800
Domestic Production	60,000	60,000	60,000
Unfilled Demand	420,000	468,000	520,800
Target Market Penetration (% of Unfilled Demand)	50-55	60-65	70-75
Project's Domestic Sales	225,000	300,000	375,000
ASEAN Market			
Unfilled Demand			
Malaysia	238,200	250,100	262,600
Singapore	34,700	37,100	39,500
Indonesia*	72,700	98,800	126,200
Total	345,600	386,100	428,300
Target Market Penetration (% of Unfilled Demand)	20-25	25-30	25-30
Project's Export Sales	75,000	100,000	125,000

* Less domestic production of 450,000 metric tons of cement retarder.

Source: Interviews.

For gypsum board, the project is targeting to cover about 30 to 35 per cent of unfilled domestic demand during its first year of operations (see Table 29). In the succeeding years, domestic sales would be about 40 to 50 per cent of unfilled domestic demand for gypsum board.

The project plans to export mainly to the Singapore market and exclude Malaysia which has just started producing its own gypsum boards. Exports to Singapore would be about 25 to 30 per cent of unfilled demand for gypsum board during the project's first year of operations, and about 30 to 40 per cent in the succeeding two years. The project could cover 25 to 40 per cent of Singapore's unfilled demand since supply of gypsum board from Thailand have continuously decreased from 1987 to 1989 (refer to sub-section 3.1.2.4 on Thailand).

Table 29
Domestic and Export Market Penetration of Gypsum Board
1993-1995
(in metric tons)

	<u>1993</u>	<u>1994</u>	<u>1995</u>
Philippine Market			
Demand	10,700	11,700	12,900
Domestic Production	-	-	-
Unfilled Demand	10,700	11,700	12,090
Target Market Penetration (% of Unfilled Demand)	30-35	40-45	45-50
Project's Domestic Sales	3,600	4,800	6,000
ASEAN Market			
Unfilled Demand			
Singapore	4,700	5,000	5,300
Target Market Penetration (% of Unfilled Demand)	25-30	30-35	35-40
Project's Export Sales	1,200	1,600	2,000

Source: Interviews.

3.2.2 Marketing

In this study, cement retarder is priced at US\$25.00 per metric ton ex-plant for the domestic market, and US\$11.00 for the export market. As for the gypsum board, the price is US\$9.00 per panel or US\$450.00 per metric ton (one metric ton is equivalent to 50 panels of gypsum board) for the domestic market, and US\$4.00 per panel or US\$200.00 per metric ton for the export market (see Table 30.)

Table 30
Proposed Ex-Factory Prices of Cement Retarder and Gypsum Board
for Domestic and Export Markets
(in US\$)

	<u>Cement Retarder</u>	<u>Gypsum Board</u>
Domestic Market	25.00/MT	9.00/panel or 450.00/MT
Export Market	11.00/MT	4.00/panel or 200.00/MT

Due to the AIJV incentive of a maximum of 90 per cent tariff preference, minimal tariff rates of less than one per cent are imposed on cement retarder and gypsum board in Indonesia, Malaysia, and Singapore. This makes the project more competitive pricewise in the ASEAN market.

The FOB prices of cement retarder in Indonesia, Malaysia, and Singapore, and gypsum board in Singapore, were derived based on the prevailing wholesale prices in the respective countries (see Tables 31 to 33).

The project's FOB prices for cement retarder and gypsum board are competitive with the derived FOB prices.

Table 31
Indonesia
Distribution Cost Build-Up of Cement Retarder
(in US\$)

	<u>Cost</u>
a. Current Indicated Selling Price	20.60-41.00
b. Dealer's markup - $\{1-[1/(1+r)]\} \times a$	1.87- 3.73
c. Landed Cost - (a-b)	18.73-37.27
d. Value-added tax - $[c/(1+v+d)] \times v$	1.56- 3.11
e. Tariff - $[c/(1+v+t+d)] \times t$.08- .15
f. Other import duties - $[c/(1+v+t+d)] \times d$	1.55- 3.09
g. CIF Value (c-d-e-f)	15.54-30.92
h. Insurance and freight *	10.00
i. Derived FOB Price - (g-h)	5.54-20.92
Project's Price (FOB Isabel, Leyte)	11.00

- Notes: 1. r: 10% dealer's markup
 2. v: 10% value-added tax
 3. t: .5% (90% margin of preference of existing tariff rate of 5%)
 4. d: other import duties at 10%

* Calculated based on the FOB and CIF prices of gypsum as indicated in the foreign trade statistics (1986-1988).

Table 32
Malaysia
Distribution Cost Build-Up of Cement Retarder
(in US\$)

	<u>Cost</u>
a. Current Indicated Selling Price	23.60-25.60
b. Dealer's markup - $\{1-[1/(1+r)]\} \times a$	2.14- 2.33
c. Landed Cost - (a-b)	21.46-23.27
d. Tariff - $[c/(1+t+d)] \times t$.04
e. Other import duties - $[c/(1+t+d)] \times d$	1.95- 2.11
f. CIF Value (c-d-e)	19.47-21.12
g. Insurance and freight *	10.00
h. Derived FOB Price - (f-g)	9.47-11.12
Project's Price (FOB Isabel, Leyte)	11.00

- Notes: 1. r: 10% dealer's markup
 2. t: .2% (90% margin of preference of existing tariff rate of 2%)
 3. d: other import duties at 10%

* Calculated based on the FOB and CIF prices of gypsum as indicated in the foreign trade statistics (1986-1988).

Table 33
Singapore
Distribution Cost Build-Up of Cement Retarder
and Gypsum Board
(in US\$)

	<u>Cement Retarder</u>	<u>Gypsum Board</u> *
a. Current Indicated Selling Price	32.60-35.50	5.30-6.60
b. Dealer's markup - $\{1-[1/(1+r)]\} \times a$	2.96- 3.23	1.06-1.32
c. Landed Cost - (a-b)	29.64-32.27	4.24-5.28
d. Tariff - $[c/(1+t+d)] \times t$.13- .15	.02
e. Other import duties - $[c/(1+t+d)] \times d$	2.68- 2.92	.38- .48
f. CIF Value (c-d-e)	26.83-29.20	3.84-4.78
g. Insurance and freight **	10.00	.20
h. Derived FOB Price - (f-g)	16.83-19.20	3.64-4.58
 Project's Price (FOB Isabel, Leyte)	 11.00	 4.00

- Notes: 1. r: 10% dealer's markup for cement retarder and 25% for gypsum board
 2. t: .5% (90% margin of preference of existing tariff rate of 5%)
 3. d: other import duties at 10%

* Selling price of gypsum board per panel.

** Calculated based on the FOB and CIF prices of gypsum as indicated in the foreign trade statistics (1986-1988).

3.2.3 Production and Plant Capacity Utilization

The proposed plant will have an annual capacity of 500,000 metric tons of cement retarder and 8,000 metric tons of gypsum board. During the first year of operations, the plant will utilize only 60 per cent of its capacity, producing 300,000 metric tons of cement retarder and 4,800 metric tons of gypsum board (see Table 34). In the second year, production will be 80 per cent of capacity. By the third year, the plant will be operating at full capacity.

Domestic sales of both cement retarder and gypsum board will be about 75 per cent of total production.

Table 34
Domestic and Export Sales of Cement Retarder and Gypsum Board
(in metric tons)

<u>Sales</u>	<u>Projected Unit Sales</u>	
	<u>Cement Retarder</u>	<u>Gypsum Board</u>
1993 (60% Utilization)		
Domestic	225,000	3,600
Export	<u>75,000</u>	<u>1,200</u>
Total	300,000	4,800
1994 (80% Utilization)		
Domestic	300,000	4,800
Export	<u>100,000</u>	<u>1,600</u>
Total	400,000	6,480
1995 (100% Utilization)		
Domestic	375,000	6,000
Export	<u>125,000</u>	<u>2,000</u>
Total	500,000	8,000

4. MATERIAL INPUTS

4.1 BASIC MATERIALS

The major raw materials used in the manufacture of gypsum board include phosphogypsum, additives (i.e., foam agent, accelerator, retarder, starch, dispersant agent), and liners on both sides of the board. On the other hand, the major raw materials needed in the manufacture of cement retarder are phosphogypsum and quicklime. Phosphogypsum is obtained as by-product in the manufacture of phosphatic fertilizer of Philippine Phosphate Fertilizer Corporation (PHILPHOS).

At full capacity, the total raw material cost is estimated at US\$3,347.2 thousand --- US\$55.8 thousand for the manufacture of gypsum board and US\$3,291.4 thousand for cement retarder.

The price of phosphogypsum is indicated by PHILPHOS at US\$7.00 per metric ton. The price of phosphogypsum used for the manufacture of gypsum products for the domestic market may be subject to 20 per cent tariff duty and 10 per cent VAT since PHILPHOS is located within the Leyte Industrial Development Estate (LIDE) which is an export processing zone. The project site in Tolingon, Isabel is outside of LIDE and Customs Law requires imposition of duty and VAT on products entering Philippine territory. There is, however, an appeal with the Board of Investments to exempt phosphogypsum from tariff and VAT since this is not of economic value at LIDE.

The raw material requirements per metric ton of gypsum board and cement retarder are presented in Table 35.

Table 35
Raw Material Requirements for the
Manufacture of Gypsum Board and Cement Retarder

	Unit Volume Requirement per MT of <u>Product</u>	Unit Cost per MT (\$)	Raw Material Cost at Full Capacity (\$)
<u>Gypsum Board</u>			
Phosphogypsum	0.8265 MT	7.000	46,284
Liners			
face	-	0.500*	4,000
back	-	0.400*	3,200
Additives	-	0.292*	2,336

			55,820

<u>Cement Retarder</u>			
Phosphogypsum	0.8550 MT	7.000	2,992,500
Quicklime	0.0100 MT	59.780	298,900

			3,291,400

			3,347,220
			=====

* costs of raw materials per metric ton of gypsum board produced based on quotations of Salzgitter.

Annex 3 presents the detailed raw material requirements for the manufacture of gypsum board and cement retarder.

4.2 UTILITY AND ENERGY REQUIREMENTS

Utility and energy requirements in the manufacture of gypsum board and cement retarder include electricity and fuel oil. Electricity requirement at full capacity is estimated at US\$536.2 thousand. Electricity cost is estimated at an average rate of ₱0.9493 or US\$0.0417 per kilowatt-hour based on the current Leyte Grid electric rate. Water will be sourced from a deep well and pumped to serve requirements of the project. Electricity consumption of the pump is incorporated in the utility costs.

At full capacity, the estimated cost of fuel oil is about US\$1,235.7 thousand. The assumed cost of fuel oil is US\$0.157 per liter (CIF, Leyte) based on the estimate obtained from Pilipinas Shell, Inc. The utility and energy requirements per metric ton of gypsum board and cement retarder are shown in Table 36.

Table 36
Utility and Energy Requirements
per Metric Ton of Gypsum Products

	<u>Gypsum Board</u>	<u>Cement Retarder</u>
Electricity		
Power kw-hr	43.50	15.00
Water kg	536.50	1,500.00
kw-hr equivalent	3.56	9.95
	-----	-----
Total (in kw-hr)	47.06	24.95
Energy		
Fuel oil li	29.50	15.30

5. PLANT LOCATION

The proposed site for the project is Tolingon, Isabel, Leyte near the PHILPHOS complex which is the source of phosphogypsum raw material. It is outside the Leyte Industrial Development Estate (LIDE) which is an export processing zone. If the plant is located in LIDE, sale to Philippine customs territory would be subject to tariff duty and VAT. Cost of land in Tolingon is estimated at US\$2.20 (P50) per square meter.

An alternative site is in Luzon where the plant can be situated near the market. The project, however, will have to contend with problems of power supply (outages and price of electricity) and higher land costs.

6. PLANT ENGINEERING

6.1 LAYOUT AND PHYSICAL COVERAGE OF PROJECT

The total land area for the project is 15,000 square meters. The building space requirement, including the factory, finished goods warehouse, raw materials and spare parts warehouse, and administrative building, will occupy 12,500 square meters. The remaining 2,500 square meters is allocated for the water and fuel tanks.

6.2 TECHNOLOGY AND EQUIPMENT

6.2.1 Production Process

The manufacture of both gypsum board and cement retarder requires the dewatering and calcination of phosphogypsum. The dewatering and purification processes are described below (see Figure 2):

o Dewatering

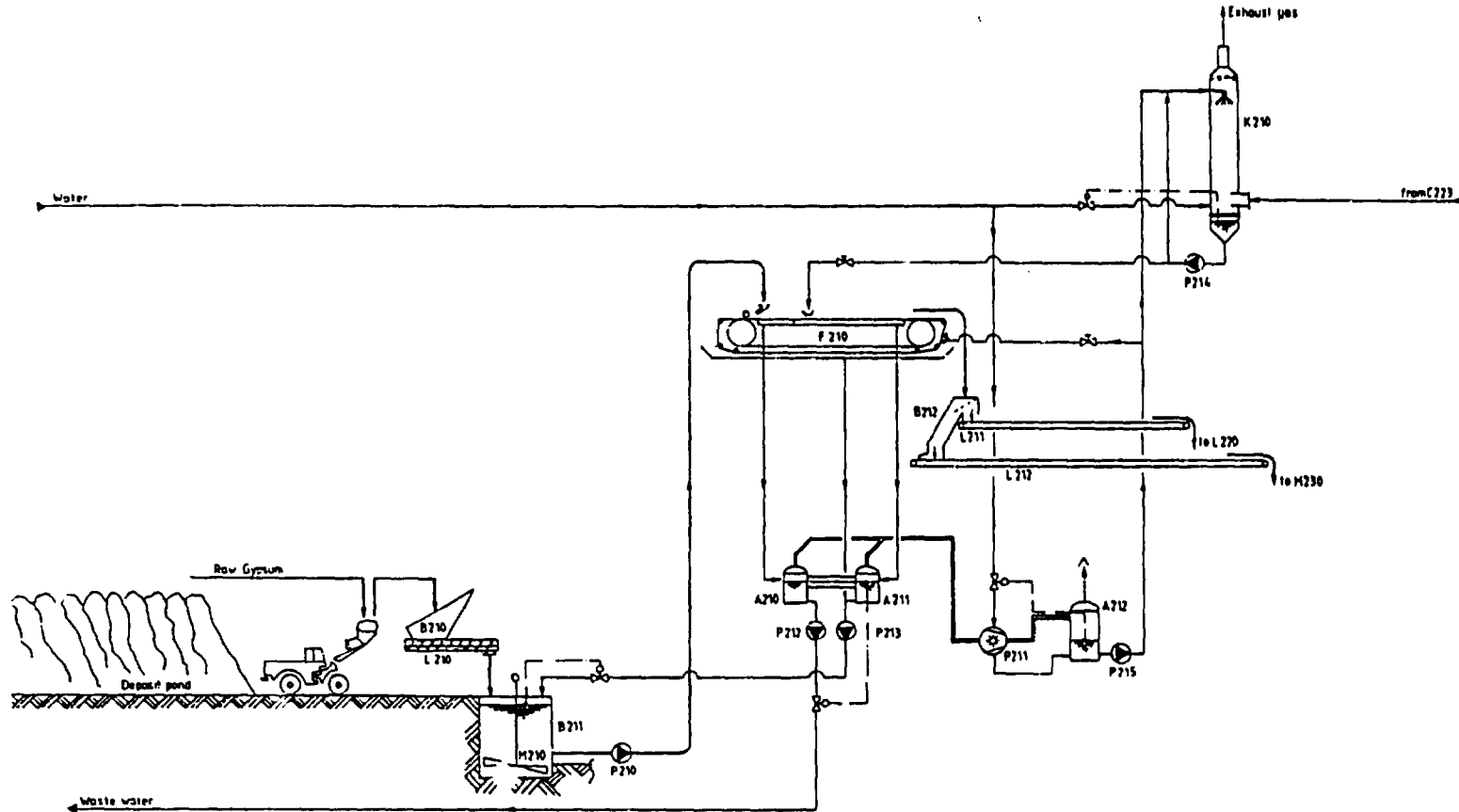
Phosphogypsum delivered from the pond by means of a shovel loader is charged into the feeding hopper. The gypsum is fed via a dosing conveyor to the storage tank where it is suspended. The slurry is washed and dewatered on the vacuum filter to remove as much water-soluble impurities as possible. For washing, warm process water from the wet scrubber is used.

By means of the by-pass distributor, the amount of gypsum to be calcined is determined. This is directed to the calcination section while the excess is transported direct to the granulation section by a belt conveyor. The ratio of the calcined and uncalcined gypsum depends on the formation of granules, granule strength, raw gypsum properties, and the requirements of the cement industry.

o Calcination

From the vacuum filter and by-pass distributor, the dewatered and washed gypsum is fed at a constant rate into the drier by means of belt conveyor and gypsum dosing feeder. The gypsum is dried by the hot gases from the hot gas generator and

- 53 -
 Figure 2
 Dewatering and Slurry Preparation



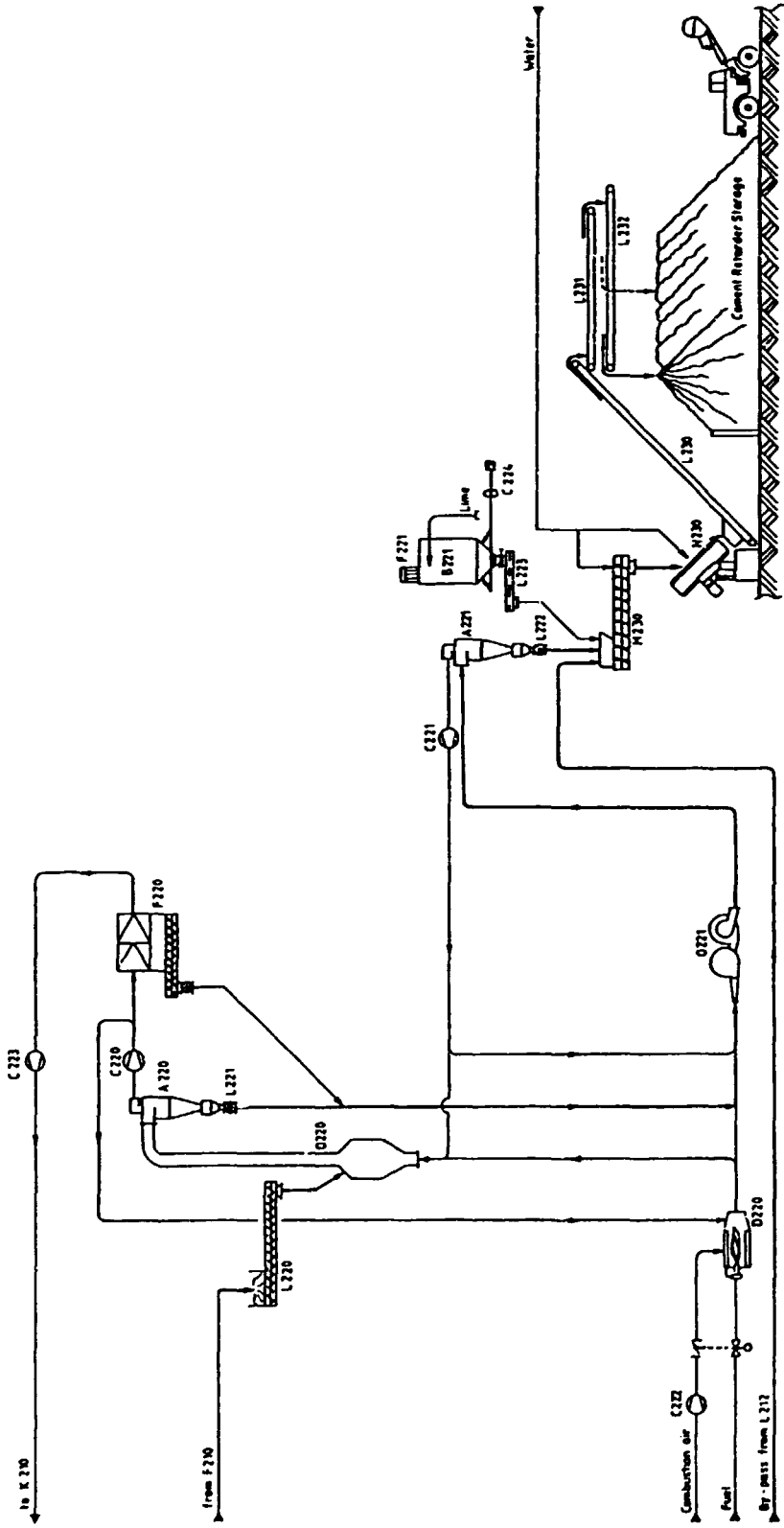
A210 Filtrate Separator	B710 Feeding Hopper	P210 Gypsum Pump
A211 Filtrate Separator	B711 Storage Tank	P211 Vacuum Pump
A212 Demister	B712 By-pass Distributor	P212 Filtrate Pump
		P213 Filtrate Pump
	F210 Vacuum Filter	P214 Warm Water Pump
		P215 Filtercloth Washing Pump
	K210 Gas Scrubber	
	L210 Screw Conveyor	
	L211 Ball Conveyor	
	L212 Ball Conveyor	
	M210 Autator	

Technische Zeichnung
 Blatt 09 B7
 293 533 / 1
 Salzgitte Industriebau GmbH

Scale	0 10 20 30 40 50
Technical Information	
Cement Rotator Plant (By-pass System)	
Section 210	
Dewatering and Slurry Preparation	
Flowsheet	
293 533 / 1	

calciners, and separated in the cyclone/filter. The dry gypsum is charged into the calciners, and calcined to hemihydrate. After passing the calciners, the calcined gypsum is separated in the cyclone and directed to the granulation section and the gypsum board plant. (See Figure 3.)

Figure 3
Calcination and Granulation Processes

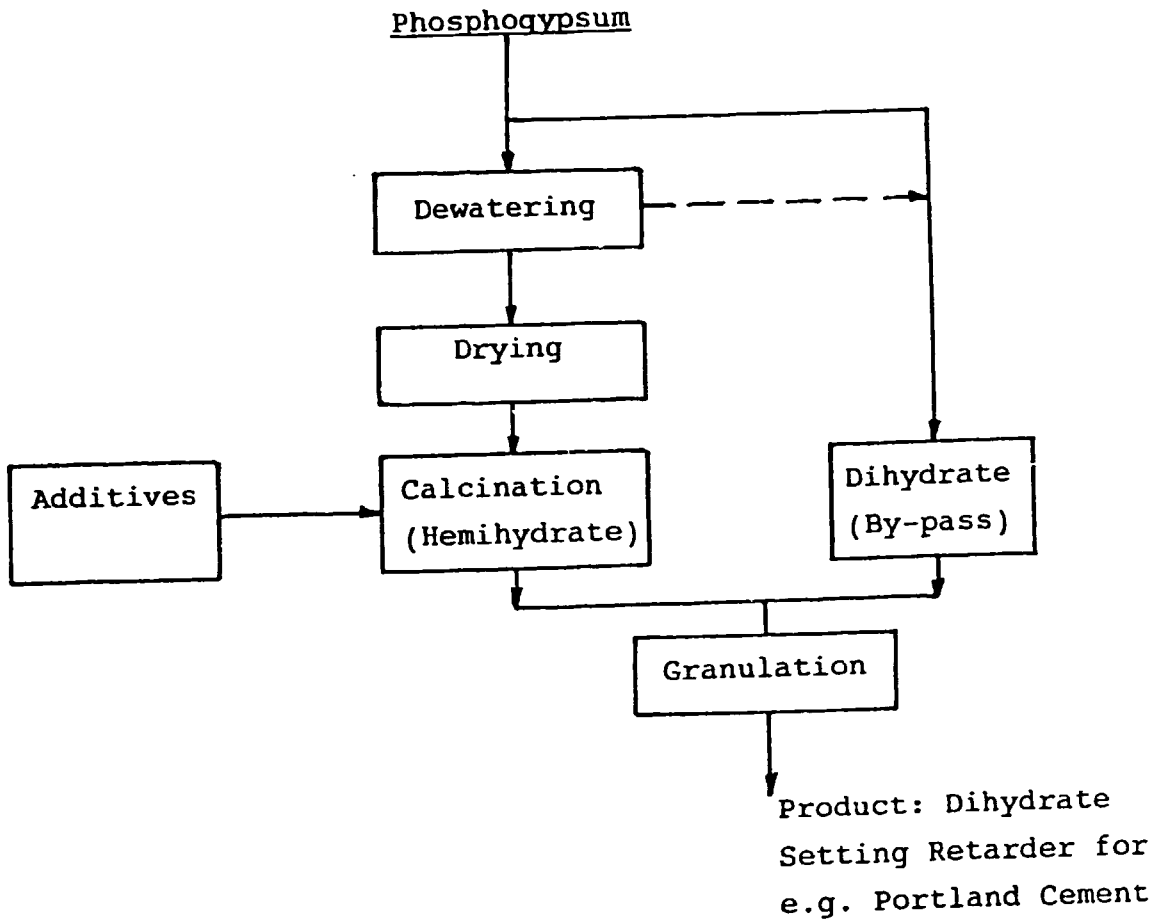


Code	Description	Code	Description	Code	Description	Code	Description
A 220	Cyclone Separator (Drying)	D 220	Hops Generator	M 230	Mixer	L 230	Ball Conveyor
A 221	Cyclone Separator (Calcination)	F 220	Filter	M 231	Granulator	L 231	Ball Conveyor
B 221	Lime Bin	F 221	Sieve Filter	O 221	Orter	L 232	Ball Conveyor
C 220	Fan (Drying)	L 220	Grain Dusting Feeder	O 222	Orter		
C 221	Fan (Calcination)	L 221	Air Lock				
C 222	Combustion Air Fan	L 222	Air Lock				
C 223	Exhaust Gas Fan	L 223	Lime Feeder				
L 224	Air Blowing Device						

Technical Information		Project	
Design	293535	Client	Salzgitter Industriebau GmbH
Scale	1:1	Sheet No.	1
Material	Steel	Revision	
Manufacturer		Date	
Installation		Location	
Operation		Remarks	

In the manufacture of cement retarder, the following processes are performed after the dewatering and calcination processes. (See Figure 4.)

Figure 4
Process Flow Diagram for the
Manufacture of Cement Retarder



Calcined gypsum separated in the cyclone and the purified by-pass gypsum from the belt conveyor are directed to the mixer. After adding quicklime and mixing, the gypsum is discharged onto the pan granulator. The amount of quicklime depends on the remaining impurities inherent in the gypsum to be converted. Granulation takes place by spraying water into the granulator until the granules show the desired size. Then they are transported via belt conveyors to the

product storage where they fall onto the stock-pile. The total transportation time of granules from the granulator to storage has to be adjusted to the setting time in order to obtain sufficient initial strength before depositing in the store.

In order to achieve the storage and transport properties desired by the cement industry, the gypsum is granulated on a pan granulator after adding water. Variable granulation conditions allow uniform granules to be produced, whilst the necessary granule strengths can be adjusted by the reaction conditions in the granulator and by the transport time to the granule storage.

For the manufacture of gypsum board, the following four steps are undertaken (see Figure 5):

o Raw materials handling and dosing

Calcined gypsum is taken from the intermediate silo and volumetrically measured by a dosing device.

Dry additives, as required, are also volumetrically measured by respective dosing devices. All the feeds are discharged into a collecting screw conveyor. Via screw conveyor, the raw materials are premixed and fed into the mixer where water and foam are added. Foaming agent is measured via variable pump and mixed with water in a stationary mixer/foam generator.

The mixer prepares a homogeneous slurry which is continuously discharged onto the paper line.

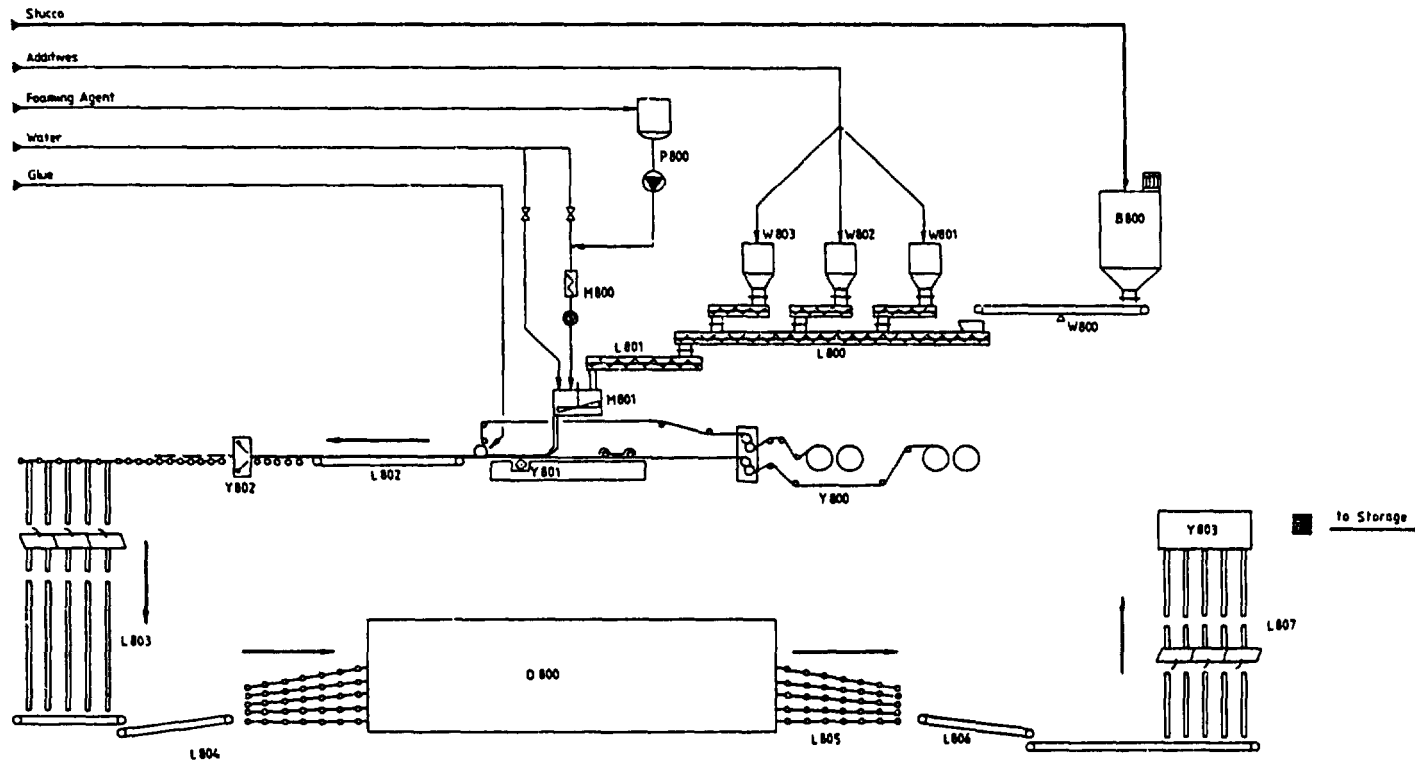
o Board line

Both the upper and the lower paper linings are taken from coils in the paper feeding and tensioning device.

After entering the forming station the lower paper line is scored and folded. The scoring unit can be adjusted to the different board thicknesses.

Figure 5

Process Flow Diagram for the Manufacture of Gypsum Board



- | | | | |
|-------------------|---------------------------|----------------------------|--------------------------------|
| B 800 Stucco Silo | L 800 Collecting Conveyor | H 800 Foam Mixer/Generator | Y 800 Paper Storage/Tensioning |
| | L 801 Mixing Conveyor | H 801 Mixer | Y 801 Board Forming Station |
| | L 802 Setting Conveyor | O 800 Drier | Y 802 Board Cutting Section |
| | L 803 Transfer Section | | Y 803 Board Finishing/Stacking |
| | L 804 Loading Conveyor | P 800 Foam Agent Dosing | |
| | L 805 Unloading Section | | |
| | L 806 Belt Conveyor | W 800 Stucco Dosing | |
| | L 807 Transfer Table | W 801 Additive Dosing | |
| | | W 802 Additive Dosing | |
| | | W 803 Additive Dosing | |

0 10 20 30 40 Meter		A 21
Name Production of Plasterboards		No.
Location Floursheet		Date
277516		1/10
Salzitter Industriebau GmbH		

The slurry from the mixer flows in and then the upper paper line is added via a roller, which forms a smooth board line.

An adhesive is sprayed onto the paper edges for glueing both paper lines together.

On the setting belt conveyor, the gypsum is allowed to set. After setting, boards of preset lengths are cut off from the continuous line by a cutting saw.

A transfer section turns the boards so that the visible side is upwards. The boards are arranged pairwise and then transferred to the drier feeder.

o Drying

A tipple conveyor distributes the boards to the different decks of the multi-storey drier. The drier is designed having two temperature and recirculating zones, both are individually temperature controlled by wet bulb temperature control devices. Chain conveyors, one for each deck, transport the boards through the drier. At the outlet an unloading section places the boards in line again.

o Boards finishing and stacking

After drying, the boards pass through inspection where off-spec boards are rejected. Via belt conveyor, the boards enter a transfer table.

Off-spec boards are rejected and stacked, whereas the spec boards are booked pairwise together, the visible face inside. In the finishing section, the boards are trimmed to the accurate length and finally stacked and bundled for storage or transport.

6.2.2 EQUIPMENT

The major equipment needed for the project are the mixer, granulator, drier, and calciner among others (see Annexes 4 and 5). The gypsum board plant has an annual capacity of 8,000 metric tons while the cement retarder plant has an annual capacity of 500,000 metric tons.

The total cost of all production and auxiliary equipment is estimated at US\$22.0 million with BOI incentives. The total cost of office equipment is estimated at US\$8.1 thousand while the total cost of transport equipment is about US\$103 thousand. The list of the office and transport equipment are presented in Annex 6.

6.3 CIVIL ENGINEERING WORKS

The estimated cost of site preparation amount to US\$164.8 thousand. This consists of land clearing and civil works such as drainage, connection for electricity, and construction of service roads. Total cost of all structures and civil engineering (plant, administrative building, warehouses, and a small wharf) is estimated at US\$1.7 million.

7. PLANT ORGANIZATION AND OVERHEAD COST

7.1 ORGANIZATION

The organization is composed of three major departments - the finance and administrative group, the marketing group, and the production/plant group. Each department is headed by a manager. Overall management will be handled by the general manager.

Aside from the finance manager, the chief accountant, cashier, supply officer, and personnel and administration supervisor are included in the finance and administrative department. The export and marketing supervisor, local sales supervisor, and salesmen report to the marketing manager. Plant operations would include the supervisors and foremen to oversee the overall production of the gypsum products.

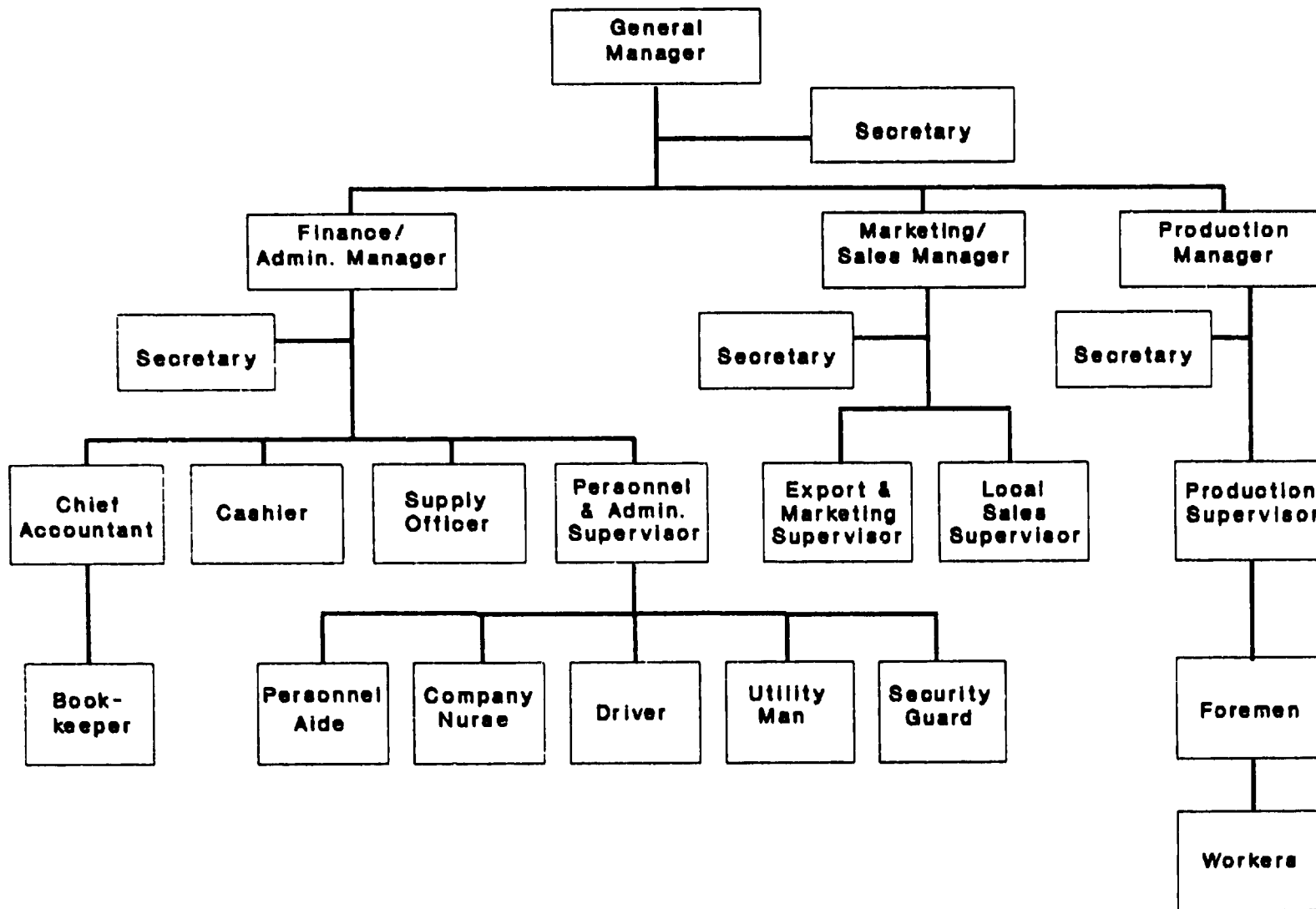
7.2 OVERHEAD COSTS

Total overhead costs amount to US\$424,810. About 64 per cent of overhead costs is accounted for by factory overhead, including property tax, insurance, and indirect labor. This is estimated at US\$273,670. The other components are administrative overhead, US\$12,640 and marketing overhead, US\$138,500. Administrative overhead includes telephone and communication costs, patents and licenses, office supplies, and power and water utility costs, among others, while marketing overhead is estimated at one per cent of gross revenues.

Table 37
Estimated Overhead Costs at Full Capacity

<u>Overhead</u>	<u>Value</u>	<u>%</u>
Administrative	12,640	3.0
Factory	273,670	64.4
Marketing	<u>138,500</u>	<u>32.6</u>
Total	424,810 =====	100.0 =====

Figure 6
Organizational Chart



8. MANPOWER

8.1 LABOR

The project will employ a total of 64 workers. Of this number, 50 are classified as direct labor and 14 as indirect labor. The direct labor force consists of 20 skilled workers and 30 unskilled workers. Total annual salaries, including benefits of 25 per cent of basic salaries, of direct labor personnel is US\$126,740. For indirect labor personnel, salaries amount to US\$34,550. See Annex 7 for details of labor costs.

8.2 STAFF

Aside from the plant personnel, the project will employ 17 administrative officers and staff and nine marketing staff. Their estimated salaries plus benefits of 25 per cent is about US\$129,510.

9. PROJECT IMPLEMENTATION

9.1 IMPLEMENTATION SCHEDULE

The first two years of the implementation timetable is the preproduction phase, followed by commercial production. Preproduction activities are shown in Figure 7.

During the first quarter of the pre-operating period, the final feasibility study along with the necessary preparation of engineering specifications will be made.

Site preparation is expected to start on the second quarter. This is expected to last for three months. The construction of buildings, and other civil works are expected to begin on the third quarter. About seventy-five per cent of the buildings (plant and warehouses) and civil works is expected to be finished by the end of the first year.

The construction of the administration building and wharf is expected to be finished by the first quarter of the second year. The production and auxiliary equipment are also expected to be delivered at this period. Installation of equipment is expected to last until the end of the third quarter (second year).

The recruitment and training of production and maintenance personnel and the procurement of the raw materials for test runs are expected to be done at the latter part of the third quarter. Trial runs and start of operation will begin on the fourth quarter of the second year. Normal operations will follow.

9.2 COST ESTIMATES

The total preproduction expense is estimated at US\$929.1 thousand. The preproduction expenses include organization and preoperating expenses, property tax, and interest on long term loans during the preproduction period. Trial production and manpower training cost covers raw materials (including wastage), utility and energy requirements, as well as allowances for trainees and trainers. Organization cost covers three-month salary of three managers and other expenses. (See Table 38.)

Table 38
Preproduction Expenses
(US dollars)

	<u>Amount</u>
Project feasibility study and preparation of engineering specifications	30,000
Trial runs and manpower training	50,000
Organizational expenses	15,000
Property taxes	2,500
Capitalized interest	831,622

Total	929,122
	=====

10. FINANCIAL AND ECONOMIC EVALUATION

10.1 TOTAL INITIAL INVESTMENT COST

Total investment requirement for the project is estimated at US\$24.9 million with BOI incentives (tariff-free importation of equipment). The biggest investment will be production machinery and equipment, which is US\$22.0 million or almost 88 per cent of total investment. (See Table 39.)

About 91.6 per cent of the total initial investment is foreign currency cost component, mainly production machinery and equipment, and auxiliary and service facilities.

Table 39
Total Initial Investment
(in thousand US dollars)

	<u>Amount</u>
Land	33.0
Site preparation and development	164.8
Building, wharf and civil works	1,685.7
Auxiliary and service facilities	6.5
Plant machineries and equipment	22,006.2
Transport and office equipment	111.1

Total fixed investment costs	24,007.4*

Preproduction capital costs	929.1

Total initial investment costs	24,936.5
	=====

* Figures do not add up to total due to rounding.

10.2 PROJECT FINANCING

Financing for the project will come from a combination of loan and equity investments to be made during the preoperating period.

10.2.1 Loans

Foreign loan will cover about 63.3 per cent of the foreign cost component of the project. This is assumed to have a term of seven years with a two-year grace period on principal and interest of 11.5 per cent per annum. The first disbursement will be on the second year of the preoperating period.

10.2.2. Equity

Equity contributions will finance about 42 per cent of the total initial investment. It is assumed that 60 per cent of equity contributions will come from local proponents. Foreign sources will invest up to 40 per cent in equity for the project. This would mainly come from nationals of ASEAN participating countries which might be Malaysia and Singapore.

Table 40 shows the schedule of financing for the project.

Table 40
Sources of Financing
(in thousand US dollars)

	<u>Amount</u>	<u>Per Cent</u>
Foreign Loan	14,463.0	58.0
Equity		
Foreign	4,189.2	16.8
Local	6,284.3	25.2
Sub-total	10,473.5	42.0
Total	24,936.5	100.0

10.3 PRODUCTION COSTS

Annual production costs at full capacity is estimated at US\$9.3 million. As shown in Table 41, the largest cost component is raw material which accounts for about 35.9 per cent of total production costs. The cost of the major raw material, phosphogypsum, excludes 20 per cent tariff duty and 10 per cent VAT.

Depreciation of fixed assets is assumed to begin on the first year of commercial operation. It has been estimated at US\$1,582.2 thousand per annum.

Income from the manufacture and sale of gypsum board will enjoy a six-year tax holiday while income from the manufacture and sale of cement retarder will

enjoy a four-year holiday with BOI incentives. Corporate tax rate is 35 per cent.

Table 41
Standard Production Costs
at Full Capacity
(in thousand US dollars)

	<u>Amount</u>
Factory Costs	
Raw Materials	3,347.2
Utilities	536.2
Energy (fuel oil)	1,235.7
Direct Labor	126.7
Repairs and Maintenance	220.1
Spare Parts	330.1
Factory Overhead	273.7

Total Factory Costs	6,069.7

Administration Overhead	93.7
Sales and Distribution Costs	187.0
Financial Costs	1,398.8
Depreciation	1,582.2

Total Production Costs	9,331.4
	=====

10.4 COMMERCIAL PROFITABILITY

All financial computations have been based on assumptions discussed earlier and those presented in Annex 10. The financial projections use constant 1990 prices. Any increase in cost is assumed to be compensated for by a corresponding increase in prices.

The results of the financial projections indicate the viability of the project. The project will have a financial internal rate of return (IRR) of 21.9 per cent. Payback period for the project is six years and one month (including the construction period).

10.4.1 Financial Indicators

Table 42 shows a summary of the financial indicators of the project.

Table 42
Selected Financial Indicators

Internal Rate of Return	21.87%
Payback Period (in years)	6.06
Net Present Value (at 20%)	US\$1,674,444.00
Breakeven * (% of sales at full capacity)	29.81%

* Excluding financing.

In the first year of production (1993), the net income is about US\$882.2 thousand or 10.6 per cent of the gross revenue. The net income will continue to increase up to the fourth year of production. At full capacity (1995), the net income will reach US\$4.5 million or 32.6 per cent of the gross revenue. These high net income/gross revenue ratios are caused by the decreasing financing costs (interests) and the income tax holiday. Interest on the long term loan will decrease with the decreasing principal. The manufacture of cement retarder is assumed to enjoy a four-year tax holiday while the manufacture of gypsum boards is assumed to enjoy a six-year tax holiday.

On the fifth year of production, net income will decrease due to the payment of income tax on the manufacture of cement retarder. The income tax holiday and the payment of interest on the long term loan will end on the sixth year, thus the net income will remain the same from the seventh to fourteenth year of commercial operation. The net income will increase on the fifteenth year due to the reduction of the depreciation cost. (See Table 43.)

Table 43
Income Statement Highlights
(in US dollars)

<u>Year</u>	<u>Gross Revenue</u>	<u>Net Income</u>	<u>Net Income/ Gross Revenue</u>
1	8,310,000.0	882,166.0	10.6%
2	11,080,000.0	2,568,179.0	23.2%
3	13,850,000.0	4,518,617.0	32.6%
4	13,850,000.0	4,813,451.0	34.8%
5	13,850,000.0	3,753,800.0	27.1%
6	13,850,000.0	4,038,550.0	29.2%
7	13,850,000.0	3,861,624.0	27.9%
8	13,850,000.0	3,861,624.0	27.9%
9	13,850,000.0	3,861,624.0	27.9%
10	13,850,000.0	3,861,624.0	27.9%
11	13,850,000.0	3,861,624.0	27.9%
12	13,850,000.0	3,861,624.0	27.9%
13	13,850,000.0	3,861,624.0	27.9%
14	13,850,000.0	3,861,624.0	27.9%
15	13,850,000.0	3,933,144.0	28.4%

10.4.2 Sensitivity Analyses

To determine the effect of changes in critical variables on the financial viability of the project, sensitivity analyses were conducted on different scenarios. The scenarios used in evaluating the sensitivity of the project to unfavorable events or circumstances were:

Case 1:

Assuming that the project will not be able to sell its targetted volume, and is able to produce and sell at 80 per cent of capacity from the second to the fifteenth year.

Case 2:

Reduction in the export prices due to stiffer competition and higher freight costs. The domestic prices of gypsum board and cement retarder will remain the same. The export prices used compared with the base case are as follows (in US dollars per metric ton):

	Export Price	
	Base Case	Case 2
Gypsum Board*	200	195
Cement Retarder	11	7

* These are equivalent to US\$4.00 (base case) and US\$3.90 (case 2) per panel.

Case 3:

Assuming the raw material cost will include 20 per cent tariff duty and 10 per cent VAT on phosphogypsum which comes from LIDE, an export processing zone outside of Philippine customs territory.

As shown in Table 44, the project will still be viable under the second scenario. The internal rate of return will be at 20.20 per cent. In the other two scenarios, the project will have IRR's lower than the 20 per cent hurdle rate.

Table 44
Summary of Sensitivity Analyses

	Case 1	Case 2	Case 3
IRR	17.94%	20.20%	19.39%
Payback Period (in years)	6.73	6.37	6.54
NPV at 20% (in thousand US\$)	-1,719.7	173.4	-543.0
Breakeven (% of sales at full capacity)	37.26%	31.72%	32.63%

The biggest drop in the internal rate of return occurs with the scenario on the decrease in production at full capacity, where the IRR is only 17.94 per cent.

The inclusion of 20 per cent tariff duty and 10 per cent VAT on phosphogypsum resulted in a lower IRR of 19.39 per cent.

Currently, the purchase of phosphogypsum from PHILPHOS for the manufacture of gypsum products for domestic sales is set to 20

per cent tariff duty and 10 per cent VAT. PHILPHOS is located in LIDE, which is an export processing zone, and its sales to Philippine customs territory is subject to duty and VAT. There is, however, an appeal to reconsider this ruling in the case of phosphogypsum which is not utilized at LIDE. If the project is subject to tariff duty and VAT on phosphogypsum, the internal rate of return will decrease from 21.87 per cent and 19.39 per cent.

10.5 FINANCIAL CASHFLOW

The cashflow summary for the fifteen-year period of the project is presented in Table 45 below. The cash inflow of the project will stabilize after it has reached full capacity. The additional US\$88.0 thousand cash inflow in year three is due to the additional working capital requirement brought about by the increase in the plant's capacity utilization. On the other hand, cash outflow variation from the fourth to the seventh year of operation is due to financing, depreciation costs and income tax payments (from year five). The payment of the long term loan will end on the sixth year.

Table 45
Financial Cashflow
(in US dollars)

Year	Total Cash Inflow	Total Cash Outflow	Surplus (Deficit)	Cumulated Cash Balance*
1	8,639,759	6,977,978	1,661,781	1,661,784
2	11,168,020	9,511,446	1,656,578	3,318,362
3	13,938,020	10,595,430	3,342,590	6,660,952
4	13,850,000	10,312,940	3,537,065	10,198,020
5	13,850,000	11,701,330	2,148,673	12,346,690
6	13,850,000	11,806,650	2,043,347	14,390,040
7	13,850,000	8,429,674	5,420,326	19,810,360
8	13,850,000	8,429,674	5,420,326	25,230,690
9	13,850,000	8,429,674	5,420,326	30,651,020
10	13,850,000	8,429,674	5,420,326	36,071,340
11	13,850,000	8,429,674	5,420,326	41,491,670
12	13,850,000	8,429,674	5,420,326	46,912,000
13	13,850,000	8,429,674	5,420,326	52,332,330
14	13,850,000	8,429,674	5,420,326	57,752,660
15	13,850,000	8,468,185	5,381,815	63,134,470

* Available for cash dividends to the extent of retained earnings.

Note: Items may not add to total because of rounding.

ANNEXES

LIST OF RESPONDENTS

1. Erlenstadt/Riancho
Salzgitter Industriebau GmbH
Salzgitter, Germany
2. Motoo Takada
C. Itoh & Co. (Inorganic Chemical Section No.1)
Tokyo, Japan
3. Thomas J. O'Brien
Finance Manager
PT. Semen Cibinong
Indonesia
4. Yus Ilyas
Procurement Manager
PT. Semen Cibinong
Indonesia
5. Johnny Sevilla
Finance Director
PT. Keramik Indonesia America
Indonesia
6. Encik Harun
Marketing Executive
Wembley Gypsum Products
Kuala Lumpur, Malaysia
7. Mr. Louie Garcia
President & General Manager
Gypsum Chemicals, Inc.
Tolingon, Isabel, Leyte
8. Mr. Fauscino Almendra
International Marketing Officer
Philippine Phosphate Fertilizer Corp. (PHILPHOS)
Makati, Metro Manila
9. Mr. Florencio Dimaculangan
Management Services Manager
Philippine Phosphate Fertilizer Corp. (PHILPHOS)
Makati, Metro Manila
10. Arch. Leonardo Viado
W.V. Coscolluela & Associates Architects
Makati, Metro Manila

11. Mr. Benjie Ferrer
R & D Supervisor
Sanitary Wares Manufacturing Corporation (Saniwares)
Las Piñas, Metro Manila
12. Mr. Teofilo Enriquez
Ceramika Enzon
Taguig, Metro Manila
13. Ms. Cristy Pojas
Carmelite Enterprises
Quezon City, Metro Manila
14. Mr. Joselito Valencia
Purchasing Officer
Rizal/Solid Cement
Makati, Metro Manila
15. Mr. Cesar Ynares
Chief Quality Assurance
Rizal Cement Plant
Binangonan, Rizal
16. Mr. Ed Hernandez
Plant Engineer
Rizal Cement Plant
Binangonan, Rizal
17. Mr. Benny Oblena
Purchasing Head
PHINMA
Makati, Metro Manila

INDONESIAN SANITARY WARE, CERAMIC TILE, CERAMIC TILE,
CERAMIC ROOF-TILE AND BRICK PRODUCERS AND THEIR
PRODUCTION CAPACITIES, 1988

Sanitary Ware Producers and their Production Capacities, 1988

Firm	Location	Production Capacity (Unit/year)
PT. S'JRYA TOTO INDONESIA	West Java	810,000
PT. INDO AMERICAN CERAMIC	West Java	650,000
PT. SORENTO NUSANTARA	Lampung	350,000
PT. SERINCO JAYA MARMER INDUSTRIES	West Java	240,000
PT. PINDA ANEKA GROUP KERAMIK	East Java	91,482
PT. INASETO INDONESIA	Central Java	8,572
PT. SARANA PURNA CIPTA	East Java	3,450
TOTAL		2,153,504

Ceramic Tile Producers and their Production Capacities, 1988

Firm	Location	Production Capacity (Unit/year)
PT. SERINCO JAYA MARMER INDUSTRIES	Jakarta	18,000
PT. ARTISTIKA INTERNAS	Jakarta	240
PT. UNION CERAMIC UTAMA	Jakarta	1,500
PT. DANTO INDONESIA TILE	West Java	863
PT. GUNUNG RAHARJO	West Java	720
PT. CIKARANG INDAH	West Java	1,500
PT. TERRA COTTA INDONESIA	West Java	111
PT. SERPIH MAS	West Java	500
PT. KERAMIK PANGRANGO PERMAI	West Java	600
PT. INDUSTRI KERAMIK ANGSA DAYA (IKAD)	West Java	2,445
PT. UBIN KIMAS MUTIARA	East Java	2,000
PT. JATISUMA TILE FACTORY	East Java	250
PT. METROPOLE MEGAH	East Java	1,900
PT. ASIA VICTORY INDUSTRY	East Java	1,761
PT. KUDA LAUT MAS	East Java	270
PT. JATISUMA INDAH KERAMIK	East Java	-
PT. KERAMIK INDONESIA ASSOSIASI (KIA)	South Sumatra	1,880
PT. KARYA KALINDAH	West Kalimantan	1,800
PT. SANGGAR KURNIA ALAM	Jakarta	100
PT. PERUSDA SARA BAGUNGAN	East Java	582
PT. KERAMIK DIAMOND INDAH	East Java	1,200
PT. SINAR PULUNG	Batam Island	320
TOTAL		38,542

Producers of Ceramic Roof-Tiles and Bricks, 1988

Firm	Location	Production Capacity (Unit/year)
CV. ABADI	West Java	24,000
PT. LANTAI MAS KERAMIK	West Java	9,600
PT. SUPER BATA	West Java	22,600
PT. SUMBER TANAH MAS	West Java	33,000
PT. GUNUNG RAHARJO	West Java	12,000
PT. CIKARANG INDAH	West Java	7,500
PT. DJAGAT KILAT		18,000
PT. PERUSDA SARANA BANGUNAN	East Java	4,800
PT. BATU BATAM NUSANTARA	Batam Island	10,400
PT. ABU BATTERY	East Kalimantan	1,750
PT. SARANA BUANA	West Sumatra	6,400
PT. FADIL GENTENG SUPER JATIWANGI	West Java	15,600
PT. PERUSAHAAN GENTENG BULELENG	Lampung	451
CV. SARI BUANA	West Sumatra	18,150
TOTAL		184,251

MATERIALS REQUIREMENT

Required Raw Materials and Utilities for Gypsum Board

1.	Phosphogypsum	:	5.7	kg/m ²
2.	Ground dihydrate	:	0 - 15	g/m ²
3.	Foam agent	:	2	g/m ²
4.	Accelerator	:	5 - 30	g/m ²
5.	Retarder	:	0 - 15	g/m ²
6.	Starch	:	40 - 60	g/m ²
7.	Dispersant agent	:	5 - 20	g/m ²
8.	Glue	:	5 - 8	g/m ²
9.	Paper lining	:	540 - 590	g/m ²
10.	Water	:	3.7 - 4.1	kg/m ²
11.	Thermal energy (Drier)	:	2000 - 2900	kcal/m ²
12.	Electricity	:	0.3	kWh/m ²

Required Raw Materials and Utilities for Cement Retarder

1.	Phosphogypsum	:	855	kg/MT
2.	Quicklime	:	10	kg/MT
3.	Water	:	1,500	kg/MT
4.	Thermal energy	:	1,500,000	kcal/MT
5.	Electricity	:	15	kWh/MT

GYPSUM BOARD EQUIPMENT SPECIFICATIONS

Stucco Silo

Steel or concrete silo for storage of stucco, with pneumatic filling and fluidization and filter.

Collecting Conveyor

Screw conveyor with four (five) inlets for receiving and premixing of the dry additives with the stucco.

Mixing Conveyor

Screw conveyor for premixing and feeding of the dry material into mixer.

Setting Conveyor

Special belt conveyor for smooth transport of the board line during setting of the stucco, with variable drive.

Transfer Section

Conveyor arrangement for transfer of the boards from the forming line to the drier, with turntable and device to arrange the boards pairwise.

Loading Conveyor

Tipple conveyor for automatic distribution of the boards to the individual storeys of the drier.

Unloading Section

Roller conveyors designed as accelerator conveyors for discharge of the individual drier decks.

Belt Conveyor

For transport of the boards to the transfer table.

Transfer Table

Conveyor arrangement for correct placing of the boards with provisions for rejection of off-spec boards, and booking of spec boards face to face.

Foam Mixer and Generator

In-line mixer for foam agent and water, followed by an agitator to generate a continuous foam flow.

Drier

Multi-storey drier for evaporation of the surplus moisture from the board. The drier may be direct or indirect heated.

Foam Agent Dosing

Foam agent surge tank with precision dosing pump.

Stucco Dosing

Weight-belt-feeder for constant and continuous feeding of stucco.

Additive Dosing

Special dosing screw conveyors for accurate dosing of the additives (starch, accelerator, retarder as required) with feeding hoppers.

Paper Storage and Tensioning

Paper coil stands with guiding and tensioning devices.

Board Forming Station

A forming table with scoring unit for the bottom paper line, vibrating roll for spreading of the gypsum mix, and forming roller for continuous board production.

Board Cutting Section

A cutting knife to cut boards of a preset length from the continuous line, with accelerating roller conveyor.

Board Finishing and Stacking

A machine arrangement for exact alignment of the board pairs (as received from transfer table), precision saw cutting to final length, and stacking and bundling of the finished boards.

Electrical and Control Equipment

Complete including all monitoring and interlocking systems, central control panel etc.

CEMENT RETARDER EQUIPMENT SPECIFICATIONS

Filtrate Separator

Steel vessels to collect the filtrates from vacuum filter.

Demister

Steel vessel designed as receiver for sealing water/air flow from vacuum pump and exhaustor for air.

Feeding Hopper

Steel bin for charging of raw gypsum.

Storage Tank

Acid resistant concrete tank for slurring of raw gypsum.

By-pass Distributor

Steel bin for collecting of the filter cake (from vacuum filter) and distribution to calcination/granulation.

Vacuum Filter

Continuous vacuum belt filter for dewatering and washing of the raw phosphogypsum.

Gas Scrubber

Condenser scrubber for dedusting and cooling of exhaust gases and generation of hot water for washing of the gypsum cake.

Screw Conveyor

Dosing screw conveyor with variable drive for controlled feeding of the raw gypsum.

Belt Conveyor

Troughed belt conveyor for transport of purified gypsum cake to calcination.

Belt Conveyor

Troughed belt conveyor for transport of purified gypsum cake to granulation.

Agitator

Low speed agitator for slurring of gypsum with water.

Gypsum Pump

Diaphragm pump with variable drive for controlled feeding of the gypsum slurry onto the belt filter.

Vacuum Pump

Water ring pump to provide the vacuum for the vacuum filter.

Filtrate Pumps

Centrifugal pumps for discharge of the filtrates from filtrate separator.

Warm Water Pump

Centrifugal pump for recirculation of wash water in scrubber.

Filter Cloth Washing Pump

Centrifugal pump for filter cloth cleaning and transfer of make-up water to gas scrubber.

Cyclone Separator (Drying)

High efficiency cyclone for precipitation of dried gypsum.

Cyclone Separator (Calcination)

High efficiency cyclone for precipitation of calcined gypsum.

Lime Bin

Steel silo for storage of quick lime (slaked lime).

Fan (Drying)

Radial fan for establishment of a hot gas flow through the drying loop.

Fan (Calcination)

Radial fan for establishment of a hot gas flow through the calcining loop.

Combustion Air Fan

Radial fan for supply of fresh air to the hot gas generator.

Exhaust Gas Fan

Radial fan for exhaust gas extraction (from drying loop) and transfer to scrubbing (gas scrubber).

Air Bulking Device

Rotary piston fan for fluidization of lime.

Hot Gas Generator

Gas or oil burner with combustion chamber and secondary gas mixing chamber for generation of the energy required for calcination.

Filter

Bag filter for dedusting of the exhaust gases prior to scrubbing.

Silo Filter

Pocket filter, designed as silo filter, for dedusting of transport and fluidizing air.

Gypsum Dosing Feeder

Special airlock design for continuous and controlled feeding of the filter cake into the drying loop.

Airlock

Standard airlocks (rotary valves).

Lime Feeder

Dosing screw conveyor with variable drive for dosing of lime into mixer.

Belt Conveyor

Troughed belt conveyor (inclined), conveying speed designed to allow the fresh granules harden, with feeding hopper. For transport of granules to storage.

Belt Conveyor

Troughed belt conveyor, for transport of granules to storage.

Belt Conveyor

Troughed belt conveyor with movable scraper for distribution of the granules within the storage area.

Mixer

Double shaft pin mixer for mixing of calcined gypsum with washed gypsum, lime and water.

Granulator

Pan granulator with anti-dust hood and venting fan, for production of gypsum granules.

Drier

Flash drier for drying of gypsum filter cake.

Calcinator

Cyclone type pneumatic calcinator (two stages) for calcination of gypsum.

Electrical and Control Equipment

Complete Installation including all monitoring and interlocking systems, central and local control panel etc.

ANNEX 6

LIST OF OFFICE EQUIPMENT AND TRANSPORT

DESCRIPTION	TOTAL COST (in US\$)
Adding machines	352
Airconditioner	1,055
Calculator	40
Computer	1,758
Conference table	352
Filing cabinet	211
Office tables	1,758
Office chairs	879
Refrigerator	440
Typewriter (electric)	659
Typewriter (manual)	132
Visitors chair	44
Other office accessories	440

Total Office Equipment	8,120
	=====
Shovel Loader	63,000
Asian Utility Vehicle (AUV)	40,000

Total Transport	103,000
	=====

Annual Labor Requirements and Costs at Full Capacity
(Costs in US\$)

	No. of Employees	Monthly Compensation	Annual Labor Cost (US\$)
	-----	-----	-----
A. PRODUCTION			
Direct Labor			
Skilled	20	200	54,396
Unskilled	30	175	72,346
	-----	-----	-----
Sub-total	50	375	126,742
	-----	-----	-----
Indirect Labor			
Production Manager	1	660	9,890
Secretary	1	110	1,648
Production Supervisor	2	220	5,934
Foremen	4	130	7,912
Maintenance Men	2	110	3,297
Utility Men	4	100	5,868
	-----	-----	-----
Sub-total	14	1,330	34,549
	-----	-----	-----
B. ADMINISTRATIVE			
General Manager	1	1,300	19,780
Executive Secretary	1	180	2,637
Finance/Admin. Manager	1	880	13,187
Secretary	1	150	2,308
Chief Accountant	1	660	7,912
Bookkeeper	1	180	2,637
Cashier	1	180	2,637
Supply Officer	1	260	3,956
Personnel/Admin. Manager	1	660	9,890
Personnel Aide	2	180	5,275
Company Nurse	1	180	2,645
Driver	2	120	3,297
Utility Man	1	100	1,459
Security Guard	2	120	3,429
	-----	-----	-----
Sub-total	17	5,150	81,049
	-----	-----	-----

C. MARKETING

Marketing/Sales Manager	1	880	13,187
Secretary	1	150	2,308
Export & Marketing	1	440	6,593
Local Sales Supervisor	1	440	6,593
Salesmen	5	260	19,780
	-----	-----	-----
Sub-total	9	2,169	48,462
	-----	-----	-----
TOTAL	90	9,024	290,802
	=====	=====	=====

FINANCIAL STATEMENTS



CONFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA

Gypsum Products
May, 1990
Base Case, With BOI Incentives

2 year(s) of construction, 15 years of production
currency conversion rates:
fixed assets: 24936480.00 91.610 % foreign
current assets: 0.00 0.000 % foreign
total assets: 24936480.00 91.610 % foreign

Source of funds during construction phase

equity & grants: 10473480.00 39.998 % foreign
foreign loans : 14463000.00
local loans : 0.00
total funds : 24936480.00 74.799 % foreign

Cashflow from operations

Year:	1	3	8
operating costs:	4182363.00	6350338.00	6350338.00
depreciation :	1582226.00	1582226.00	1558703.00
interest :	1663245.00	1398820.00	0.00
production costs	7427834.00	9331383.00	7909040.00
thereof foreign	42.26 %	30.81 %	18.64 %
total sales :	8310000.00	13850000.00	13850000.00
gross income :	882166.00	4518617.00	5940960.00
net income :	882166.00	4518617.00	3861624.00
cash balance :	1661782.00	3342590.00	5420326.00
net cashflow :	3325027.00	7305187.00	5420326.00

Net Present Value at: 20.00 % = 1674444.00
Internal Rate of Return: 21.87 %
Return on equity1: 28.31 %
Return on equity2: 26.74 %

Index of Schedules produced by CONFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance



----- CONFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Net Income Statement in US Dollars

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	8310000.000	11080000.000	13850000.000	13850000.000	13850000.000
Less: variable costs, incl. sales tax	3251962.000	4335949.000	5419936.000	5419936.000	5419936.000
Variable margin	5058039.000	6744052.000	8430064.000	8430064.000	8430064.000
As % of total sales	60.867	60.867	60.867	60.867	60.867
Non-variable costs, incl. depreciation	2512628.000	2512628.000	2512628.000	2512628.000	2512627.000
Operational margin	2545411.000	4231424.000	5917437.000	5917436.000	5917437.000
As % of total sales	30.631	38.190	42.725	42.725	42.725
Cost of finance	1663245.000	1663245.000	1398820.000	1103985.000	775244.700
Gross profit	882166.000	2568179.000	4518617.000	4813451.000	5142192.000
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	882166.000	2568179.000	4518617.000	4813451.000	5142192.000
Tax	0.000	0.000	0.000	0.000	1388392.000
Net profit	882166.000	2568179.000	4518617.000	4813451.000	3753800.000
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	882166.000	2568179.000	4518617.000	4813451.000	3753800.000
Accumulated undistributed profit	882166.000	3450345.000	7968962.000	12782410.000	16536210.000
Gross profit, % of total sales	10.616	23.179	32.625	34.754	37.128
Net profit, % of total sales	10.616	23.179	32.625	34.754	27.103
ROE, Net profit, % of equity	8.423	24.521	43.143	45.358	35.841
ROI, Net profit+interest, % of invest.	10.219	16.857	23.392	23.392	17.904

Gypsum Products --- May, 1990



----- COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Net Income Statement in US Dollars

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	13850000.000	13850000.000	13850000.000	13850000.000	13850000.000
Less: variable costs, incl. sales tax.	5419936.000	5419936.000	5419936.000	5419936.000	5419936.000
Variable margin	8430064.000	8430064.000	8430064.000	8430064.000	8430064.000
As % of total sales	60.867	60.867	60.867	60.867	60.867
Non-variable costs, incl. depreciation	2489105.000	2489104.000	2489104.000	2489104.000	2489104.000
Operational margin	5940960.000	5940960.000	5940960.000	5940960.000	5940960.000
As % of total sales	42.895	42.895	42.895	42.895	42.895
Cost of finance	408699.100	0.000	0.000	0.000	0.000
Gross profit	5532261.000	5940960.000	5940960.000	5940960.000	5940960.000
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	5532261.000	5940960.000	5940960.000	5940960.000	5940960.000
Tax	1493710.000	2079336.000	2079336.000	2079336.000	2079336.000
Net profit	4038550.000	3861624.000	3861624.000	3861624.000	3861624.000
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	4038550.000	3861624.000	3861624.000	3861624.000	3861624.000
Accumulated undistributed profit . . .	20574760.000	24436390.000	28298010.000	32159640.000	36021260.000
Gross profit, % of total sales	39.944	42.895	42.895	42.895	42.895
Net profit, % of total sales	29.159	27.882	27.882	27.882	27.882
ROE, Net profit, % of equity	38.560	36.870	36.870	36.870	36.870
ROI, Net profit+interest, % of invest.	17.581	15.265	15.265	15.265	15.265

Gypsum Products --- May, 1990



COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Net Income Statement in US Dollars

Year	2003	2004	2005	2006	2007
Total sales, incl. sales tax	13850000.000	13850000.000	13850000.000	13850000.000	13850000.000
Less: variable costs, incl. sales tax.	5419936.000	5419936.000	5419936.000	5419936.000	5419936.000
Variable margin	8430064.000	8430064.000	8430064.000	8430064.000	8430064.000
As % of total sales	60.867	60.867	60.867	60.867	60.867
Non-variable costs, incl. depreciation	2489104.000	2489104.000	2489104.000	2489104.000	2379073.000
Operational margin	5940960.000	5940960.000	5940960.000	5940960.000	6050991.000
As % of total sales	42.895	42.895	42.895	42.895	43.689
Cost of finance	0.000	0.000	0.000	0.000	0.000
Gross profit	5940960.000	5940950.000	5940960.000	5940960.000	6050991.000
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	5940960.000	5940960.000	5940960.000	5940960.000	6050991.000
Tax	2079336.000	2079336.000	2079336.000	2079336.000	2117847.000
Net profit	3861624.000	3861624.000	3861624.000	3861624.000	3933144.000
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	3861624.000	3861624.000	3861624.000	3861624.000	3933144.000
Accumulated undistributed profit	39882880.000	43744510.000	47606130.000	51467760.000	55400900.000
Gross profit, % of total sales	42.895	42.895	42.895	42.895	43.689
Net profit, % of total sales	27.882	27.882	27.882	27.882	28.398
ROE, Net profit, % of equity	36.870	36.870	36.870	36.870	37.553
ROI, Net profit+interest, % of invest.	15.265	15.265	15.265	15.265	15.548

Gypsum Products --- May, 1990



----- COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Cashflow Tables, construction in US Dollars

Year	1991	1992
Total cash inflow . .	1442309.000	23494170.000
Financial resources .	1442309.000	23494170.000
Sales, net of tax . .	0.000	0.000
Total cash outflow . .	1442308.000	23494170.000
Total assets	1442308.000	22662550.000
Operating costs . . .	0.000	0.000
Cost of finance . . .	0.000	831622.500
Repayment	0.000	0.000
Corporate tax	0.000	0.000
Dividends paid	0.000	0.000
Surplus (deficit) .	0.750	2.000
Cumulated cash balance	0.750	2.750
Inflow, local	1442309.000	4841980.000
Outflow, local	1442308.000	649826.900
Surplus (deficit) .	0.750	4192153.000
Inflow, foreign . . .	0.000	18652190.000
Outflow, foreign . . .	0.000	22844340.000
Surplus (deficit) .	0.000	-4192152.000
Net cashflow	-1442308.000	-22662550.000
Cumulated net cashflow	-1442308.000	-24104850.000

Gypsum Products --- May, 1990



COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA

Cashflow tables, production in US Dollars

Year	1993	1994	1995	1996	1997	1998
Total cash inflow . .	8639759.000	11168020.000	13938920.000	13850000.000	13850000.000	13850000.000
Financial resources .	329759.300	88023.940	88023.970	0.000	0.000	0.000
Sales, net of tax . .	8310000.000	11080000.000	13850000.000	13850000.000	13850000.000	13850000.000
Total cash outflow . .	6977978.000	9511446.000	10595430.000	10312940.000	11701330.000	11806650.000
Total assets	1132371.000	282498.600	282498.700	0.000	0.000	0.000
Operating costs . . .	4182362.000	5266350.000	6350338.000	6350338.000	6350338.000	6350338.000
Cost of finance . . .	1663245.000	1663245.000	1398620.000	1103985.000	775244.700	408699.100
Repayment	0.000	2299352.000	2563778.000	2858612.000	3187353.000	3553906.000
Corporate tax	0.000	0.000	0.000	0.000	1388392.000	1493710.000
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit) .	1661781.000	1656578.000	3342590.000	3537065.000	2148673.000	2043347.000
Cumulated cash balance	1661784.000	3318362.000	6660952.000	10198020.000	12346690.000	14390040.000
Inflow, local	7574760.000	9748024.000	12163020.000	12075000.000	12075000.000	12075000.000
Outflow, local	5314733.000	5548849.000	6632837.000	6350338.000	7738730.000	7644049.000
Surplus (deficit) .	2260027.000	4199176.000	5530188.000	5724662.000	4336270.000	4230952.000
Inflow, foreign . . .	1065000.000	1420000.000	1775000.000	1775000.000	1775000.000	1775000.000
Outflow, foreign . . .	1663245.000	3962597.000	3962597.000	3962597.000	3962597.000	3962605.000
Surplus (deficit) .	-598245.000	-2542597.000	-2187597.000	-2187597.000	-2187597.000	-2187605.000
Net cashflow	3325026.000	5619175.000	7305187.000	7499662.000	6111270.000	6005952.000
Cumulated net cashflow	-20779830.000	-15160650.000	-7855466.000	-355804.000	5755466.000	11761420.000

Gypsum Products --- May, 1990



COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA

Cashflow tables, production in US Dollars

Year	1999	2000	2001	2002	2003	2004
Total cash inflow . .	13850000.000	13850000.000	13850000.000	13850000.000	13850000.000	13850000.000
Financial resources .	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax . .	13850000.000	13850000.000	13850000.000	13850000.000	13850000.000	13850000.000
Total cash outflow . .	8429674.000	8429674.000	8429674.000	8429674.000	8429674.000	8429674.000
Total assets	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs . . .	6350338.000	6350338.000	6350338.000	6350338.000	6350338.000	6350338.000
Cost of finance . . .	0.000	0.000	0.000	0.000	0.000	0.000
Repayment	0.000	0.000	0.000	0.000	0.000	0.000
Corporate tax	2079336.000	2079336.000	2079336.000	2079336.000	2079336.000	2079336.000
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit) .	5420326.000	5420326.000	5420326.000	5420326.000	5420326.000	5420326.000
Cumulated cash balance	19810360.000	25230690.000	30651020.000	36071340.000	41491670.000	46912000.000
Inflow, local	12075000.000	12075000.000	12075000.000	12075000.000	12075000.000	12075000.000
Outflow, local	8429674.000	8429674.000	8429674.000	8429674.000	8429674.000	8429674.000
Surplus (deficit) .	3645326.000	3645326.000	3645326.000	3645326.000	3645326.000	3645326.000
Inflow, foreign	1775000.000	1775000.000	1775000.000	1775000.000	1775000.000	1775000.000
Outflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit) .	1775000.000	1775000.000	1775000.000	1775000.000	1775000.000	1775000.000
Net cashflow	5420326.000	5420326.000	5420326.000	5420326.000	5420326.000	5420326.000
Cumulated net cashflow	17181740.000	22602070.000	28022400.000	33442720.000	38863050.000	44283380.000

Gypsum Products --- May, 1990



COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Cashflow tables, production in US Dollars

Year	2005	2006	2007
Total cash inflow . .	13850000.000	13850000.000	13850000.000
Financial resources .	0.000	0.000	0.000
Sales, net of tax . .	13850000.000	13850000.000	13850000.000
Total cash outflow . .	8429674.000	8429674.000	8468185.000
Total assets	0.000	0.000	0.000
Operating costs . . .	6350338.000	6350338.000	6350338.000
Cost of finance . . .	0.000	0.000	0.000
Repayment	0.000	0.000	0.000
Corporate tax	2079336.000	2079336.000	2117847.000
Dividends paid	0.000	0.000	0.000
Surplus (deficit) .	5420326.000	5420326.000	5381815.000
Cumulated cash balance	52332330.000	57752660.000	63134470.000
Inflow, local	12075000.000	12075000.000	12075000.000
Outflow, local	8429674.000	8429674.000	8468185.000
Surplus (deficit) .	3645326.000	3645326.000	3606815.000
Inflow, foreign . . .	1775000.000	1775000.000	1775000.000
Outflow, foreign . . .	0.000	0.000	0.000
Surplus (deficit) .	1775000.000	1775000.000	1775000.000
Net cashflow	5420326.000	5420326.000	5381815.000
Cumulated net cashflow	49703700.000	55124030.000	60505850.000

Gypsum Products --- May, 1990



Cashflow Discounting:

a) Equity paid versus Net income flow:		
Net present value	3976379.00	at 20.00 %
Internal Rate of Return (IRRE1) ..	28.31 %	
b) Net Worth versus Net cash return:		
Net present value	3649312.00	at 20.00 %
Internal Rate of Return (IRRE2) ..	26.74 %	
c) Internal Rate of Return on total investment:		
Net present value	1674444.00	at 20.00 %
Internal Rate of Return (IRR) ..	21.87 %	
Net Worth = Equity paid plus reserves		



----- COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Projected Balance Sheets, construction in US Dollars

Year	1991	1992
Total assets	1442309.000	24936480.000
Fixed assets, net of depreciation	0.000	1442308.000
Construction in progress	1442308.000	23494170.000
Current assets	0.000	0.000
Cash, bank	0.000	0.000
Cash surplus, finance available .	0.750	4.000
Loss carried forward	0.000	0.000
Loss	0.000	0.000
Total liabilities	1442309.000	24936480.000
Equity capital	1442309.000	10473480.000
Reserves, retained profit	0.000	0.000
Profit	0.000	0.000
Long and medium term debt	0.000	14463000.000
Current liabilities	0.000	0.000
Bank overdraft, finance required.	0.000	0.000
Total debt	0.000	14463000.000
Equity, % of liabilities	100.000	42.001

Gypsum Products --- May, 1990



----- COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Projected Balance Sheets, Production in US Dollars

Year	1993	1994	1995	1996	1997
Total assets	26148400.000	26505260.000	28548120.000	30502960.000	31069410.000
Fixed assets, net of depreciation	23354250.000	21772030.000	20189800.000	18607570.000	17025350.000
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	1050760.000	1330553.000	1610347.000	1610347.000	1610347.000
Cash, bank	81610.960	84316.300	87021.660	87021.660	87021.660
Cash surplus, finance available	1661782.000	3318360.000	6660950.000	10198020.000	12346690.000
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	26148400.000	26505260.000	28548120.000	30502960.000	31069410.000
Equity capital	10473480.000	10473480.000	10473480.000	10473480.000	10473480.000
Reserves, retained profit	0.000	882166.000	3450345.000	7968962.000	12782410.000
Profit	882166.000	2568179.000	4518617.000	4813451.000	3753800.000
Long and medium term debt	14463000.000	12163650.000	9599870.000	6741258.000	3553906.000
Current liabilities	329759.300	417783.300	505807.300	505807.300	505807.300
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	14792760.000	12581430.000	10105680.000	7247065.000	4059713.000
Equity, % of liabilities	40.054	39.515	36.687	34.336	33.710

Gypsum Products --- May, 1990

----- COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Projected Balance Sheets, Production in US Dollars

Year	1998	1999	2000	2001	2002
Total assets	31554050.000	35415680.000	39277300.000	43138920.000	47000550.000
Fixed assets, net of depreciation	15466650.000	13907940.000	12349240.000	10790540.000	9231838.000
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	1610347.000	1610347.000	1610347.000	1610347.000	1610347.000
Cash, bank	87021.660	87021.660	87021.660	87021.660	87021.660
Cash surplus, finance available	14390040.000	19810360.000	25230690.000	30651020.000	36071340.000
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	31554050.000	35415680.000	39277300.000	43138920.000	47000550.000
Equity capital	10473480.000	10473480.000	10473480.000	10473480.000	10473480.000
Reserves, retained profit	16536210.000	20574760.000	24436390.000	28298010.000	32159640.000
Profit	4038550.000	3861624.000	3861624.000	3861624.000	3861624.000
Long and medium term debt	-0.500	-0.500	-0.500	-0.500	-0.500
Current liabilities	505807.300	505807.300	505807.300	505807.300	505807.300
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	505806.800	505806.800	505806.800	505806.800	505806.800



CONFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA

Projected Balance Sheets, Production in US Dollars

Year	2003	2004	2005	2006	2007
Total assets	50862170.000	54723800.000	58585420.000	62447040.000	66380190.000
Fixed assets, net of depreciation	7673136.000	5114433.000	4555731.000	2997028.000	1548357.000
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	1610347.000	1610347.000	1610347.000	1610347.000	1610347.000
Cash, bank	87021.660	87021.660	87021.660	87021.660	87021.660
Cash surplus, finance available	41491670.000	46912000.000	52332320.000	57752650.000	63134460.000
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	50862170.000	54723800.000	58585420.000	62447040.000	66380190.000
Equity capital	10473480.000	10473480.000	10473480.000	10473480.000	10473480.000
Reserves, retained profit	36021260.000	39882880.000	43744510.000	47606130.000	51467760.000
Profit	3861624.000	3861624.000	3861624.000	3861624.000	3933144.000
Long and medium term debt	-0.500	-0.500	-0.500	-0.500	-0.500
Current liabilities	505807.300	505807.300	505807.300	505807.300	505807.300
Bank overdraft, finance required	0.000	0.000	0.000	0.000	0.000
Total debt	505806.800	505806.800	505806.800	505806.800	505806.800
Equity, % of liabilities	20.592	19.139	17.877	16.772	15.778

Gypsum Products --- May, 1990



SENSITIVITY ANALYSES

COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA

Gypsum Products
May, 1990
Case 1, Dec. Prod. at Full Cap. by 20%

2 year(s) of construction, 15 years of production

currency conversion rates:

foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: US Dollars

Total initial investment during construction phase

fixed assets:	24936480.00	91.610 % foreign
current assets:	0.00	0.000 % foreign
total assets:	24936480.00	91.610 % foreign

Source of funds during construction phase

equity & grants:	10473480.00	39.998 % foreign
foreign loans :	14463000.00	
local loans :	0.00	
total funds :	24936480.00	74.799 % foreign

Cashflow from operations

Year:	1	3	8
operating costs:	4182363.00	5266350.00	5266350.00
depreciation :	1582226.00	1582226.00	1558703.00
interest :	1663245.00	1398820.00	0.00
production costs	7427834.00	8247396.00	8825052.00
thereof foreign	42.26 %	34.85 %	21.80 %
total sales :	9310000.00	11080000.00	11080000.00
gross income :	882166.00	2832604.00	4254948.00
net income :	882166.00	2832604.00	2765716.00
cash balance :	1661782.00	1851052.00	4324418.06
net cashflow :	3325027.00	5813650.00	4324418.00

Net Present Value at: 20.00 % = -1719730.00

Internal Rate of Return: 17.94 %

Return on equity1: 21.16 %

Return on equity2: 20.50 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance



----- COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA -----

Gypsum Products
May, 1990
Case 2, Dec. in Export Prices

2 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: ₱ Dollars

Total initial investment during construction phase

fixed assets:	24936480.00	91.610 % foreign
current assets:	0.00	0.000 % foreign
total assets:	24936480.00	91.610 % foreign

Source of funds during construction phase

equity & grants:	10473480.00	39.998 % foreign
foreign loans :	14463000.00	
local loans :	0.00	
total funds :	24936480.00	74.799 % foreign

Cashflow from operations

Year:	1	3	8
operating costs:	4182363.00	6350338.00	6350338.00
depreciation :	1582226.00	1582226.00	1558703.00
interest :	1663245.00	1398820.00	0.00
production costs	7427834.00	9331383.00	7909040.00
thereof foreign	42.26 %	30.81 %	18.64 %
total sales :	8004000.00	13340000.00	13340000.00
gross income :	576166.00	4008617.00	5430960.00
net income :	576166.00	4008617.00	3530124.00
cash balance :	1355782.00	2832590.00	5088826.00
net cshflow :	3019027.00	6795187.00	5088826.00

Net Present Value at: 20.00 % = 173416.00
Internal Rate of Return: 20.20 %
Return on equity1: 25.21 %
Return on equity2: 23.94 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance



COMFAR 2.1 - SYCIP, GORRES, VELAYO & CO., MANILA

Gypsum Products
May, 1990
Case 3, Increase in Production Costs

2 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: US Dollars

Total initial investment during construction phase

fixed assets:	24936480.00	91.610 % foreign
current assets:	0.00	0.000 % foreign
total assets:	24936480.00	91.610 % foreign

Source of funds during construction phase

equity & grants:	10473480.00	39.998 % foreign
foreign loans :	14463000.00	
local loans :	0.00	
total funds :	24936480.00	74.799 % foreign

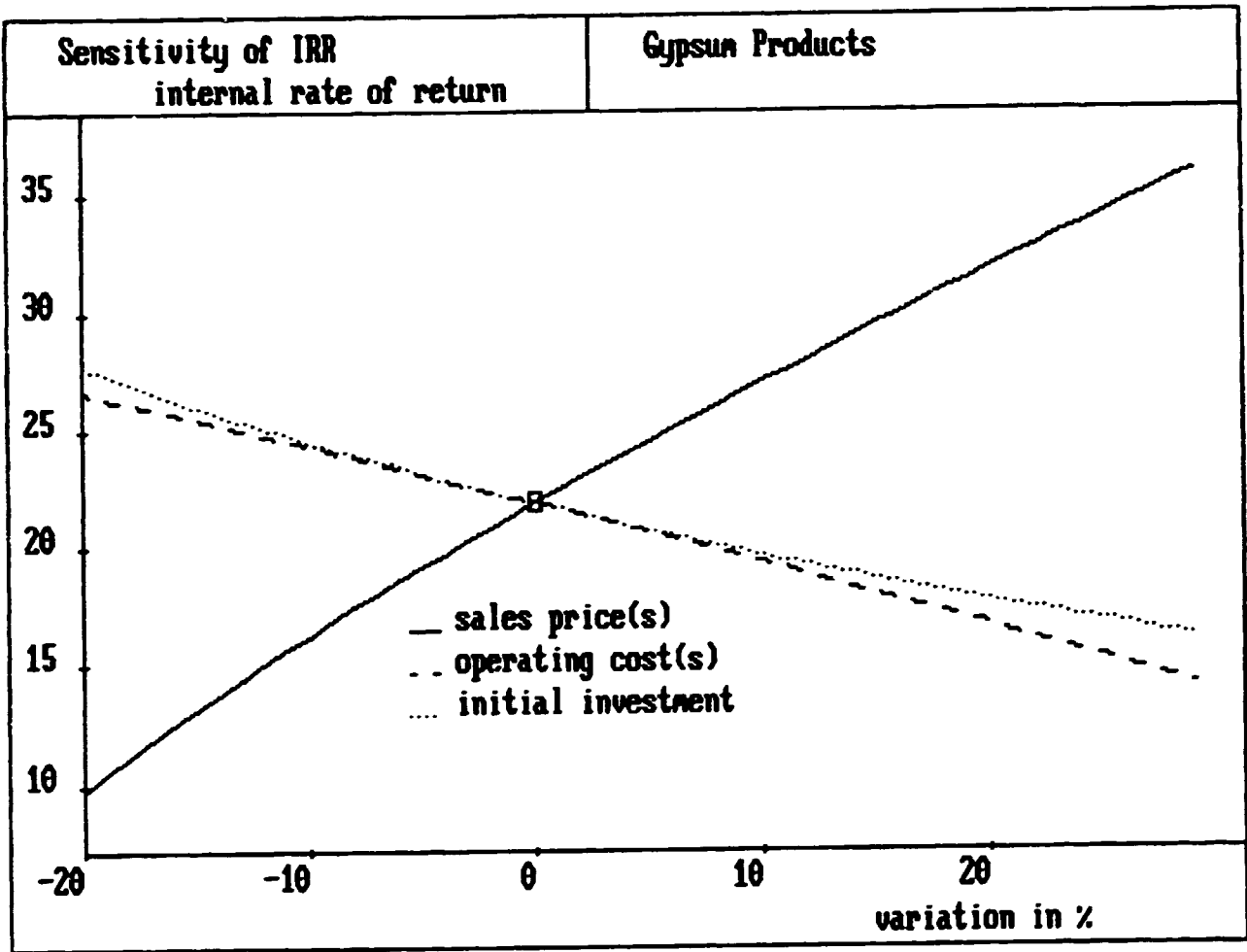
Cashflow from operations

Year:	1	3	8
operating costs:	4819948.00	7079646.00	7079646.00
depreciation :	1582226.00	1582226.00	1558703.00
interest :	1663245.00	1398820.00	0.60
production costs	7865419.00	10060690.00	8638348.00
thereof foreign	39.91 %	28.57 %	17.07 %
total sales :	8310000.00	13850000.00	13850000.00
gross income :	444581.00	3789308.00	5211652.00
net income :	444581.00	3789308.00	3387574.00
cash balance :	1151265.00	2588972.00	4946276.00
net cashflow :	2814510.00	6551569.00	4946276.00

Net Present Value at: 20.00 % = -543010.00
Internal Rate of Return: 19.39 %
Return on equity1: 23.87 %
Return on equity2: 22.61 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance



NOTES AND ASSUMPTIONS USED IN THE
FINANCIAL PROJECTIONS

The financial projections for the project are computed using the UNIDO Computer Model for Feasibility Analysis and Reporting (COMFAR) software. The currency used for both local and foreign components is the US dollar. The project is assumed to be registered with the Philippine Board of Investments with pioneer status for the manufacture of gypsum board and non-pioneer status for the manufacture of cement retarder.

INCOME STATEMENT

Sales

o Sales Volume

The sales volume during the fifteen-year projection period are as follows:

	<u>Domestic</u>	<u>Foreign</u>
Gypsum Board (panels)		
1993	180,000	60,000
1994	240,000	80,000
1995-2007	300,000	100,000
Cement Retarder (metric tons)		
1993	225,000	75,000
1994	300,000	100,000
1995-2007	375,000	125,000

o Selling Price

The selling prices for gypsum board and cement retarder are shown below:

	<u>(In US Dollars)</u>	
	<u>Domestic</u>	<u>Foreign</u>
Gypsum Board (per panel)	9.00	4.00
Cement Retarder (per metric ton)	25.00	11.00

Variable Costs

o Raw Materials

The major raw materials required for the manufacture of gypsum board and cement retarder are phosphogypsum, liners (face and back), additives, and quicklime. The cost of raw materials are assumed as follows:

<u>Year</u>	<u>(In US Dollars)</u>		<u>Total</u>
	<u>Gypsum Board</u>	<u>Cement Retarder</u>	
1993	33,492	1,974,840	2,008,332
1994	44,656	2,633,120	2,677,776
1995-2007	55,820	3,291,400	3,347,220

The assumed price of phosphogypsum is US\$7.00 per metric ton which excludes the tariff rate (20%) and Value-Added Tax (VAT). The price of quicklime is assumed at US\$59.78 per metric ton.

Based on quotations from Salzgitter, the value of the liners and additives per metric ton of gypsum are as follows:

<u>(In US Dollars)</u>	
Liners	
face	0.500
back	0.400
Additives	0.292

o Utilities

The utility requirement for the manufacture of gypsum board and cement retarder are shown in the next page:

	<u>Gypsum Board (per sq.m.)</u>	<u>Cement Retarder (per MT)</u>
Power (in kw-hr)	0.3	15.0
Water (in kg)	3.7	1,500.0

The plant will have its own water pump, thus water consumption will be in terms of kilowatt-hours. At full capacity, the utility requirements for the manufacture of gypsum board is about US\$15,700, while that for cement retarder, is about US\$520,500.

o Energy

The energy requirement of the project is in the form of fuel oil. The cost of energy requirements for the manufacture of gypsum board and cement retarder are US\$37,080 and US\$1,198,616, respectively. The assumed cost of fuel oil per liter is US\$0.157 (CIF, Leyte) based on the the estimate obtained from Pilipinas Shell, Inc.

o Direct Labor

The project will employ 50 direct laborers (20 skilled, and 30 unskilled workers). The plant will operate on two 12-hour shifts. The total salaries including benefits of direct workers amount to US\$126,742 at full capacity.

o Factory Overhead

Salaries plus 25 per cent benefits of 14 indirect workers amount to US\$34,549.

Fixed Costs

o Repair and Maintenance

Repairs and maintenance is assumed to be one per cent of total cost of production and auxiliary equipment. This amounts to US\$220,062.

o Spare Parts

The cost of spare parts is assumed to be 1.5 per cent of the total costs of production and auxiliary equipment. This is about US\$330,093.

o Factory Overhead

Included in this account are insurance, real property tax, and other miscellaneous expenses. The variable factory overhead cost is about US\$264,045, as shown below:

Item	Assumption	Amount (in US dollar)
Direct Labor	refer to Annex 7	34,549
		34,549
Total Fixed Factory Overhead		34,549
Insurance	1% of building (plant) and equipment cost	235,886
Property Tax	2% of land cost	527
Miscellaneous	3% of total factory overhead cost	2,710
		239,123
Total Variable Factory Overhead		239,123
Total Factory Overhead		273,672

Seventy-five per cent of the land cost is charged to the factory overhead, the remaining 25 per cent is charged to administration overhead.

o Administrative Overhead and Labor

Total administrative expenses are estimated at US\$93,689. Salaries plus 25 per cent benefits amount to US\$81,049 while administrative overhead is US\$12,640. Refer to Annex 7 for details.

o Depreciation

Depreciation of fixed assets will begin on the first year of actual production. It has been estimated at US\$1,582,226 per annum. The classification of fixed assets and their estimated life are shown below:

<u>Fixed Asset</u>	<u>Estimated Life (No. of Years)</u>
Building	20
Plant machinery and equipment	15
Auxiliary and service facilities	5
Incorporated fixed assets:	
Transportation equipment	5
Office equipment	5

o Cost of Financing

About sixty per cent of the total project cost will be financed by foreign loans. Foreign loans will bear 11.5 per cent interest to be paid in seven years with two-year grace period. The foreign loans will finance 67 per cent of the production and auxiliary equipment costs.

o Taxes

The manufacture of gypsum board is assumed to enjoy a six-year tax holiday while the manufacture of cement retarder is assumed to enjoy a four-year holiday with BOI incentives. Corporate tax rate is 35 per cent.

BALANCE SHEET AND CASHFLOW STATEMENTS

Cash in Bank

The minimum cash requirement for the project is equivalent to 30 days' cash.

Accounts Receivable

Export sales are assumed to be sold at Letter of Credit basis. Local sales are assumed to be collectible within 30 days.