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WALLBOARD FROM GYPSUM AND FIBER

## FOREWORD

This brochure is one of a series of reports resulting from overseas technical inquiries on factory or commercial establishments, operation, management, and engineering. The report is designed to provide only a general picture of the factors that must be considered in establishing and operating a factory of this type. In most cases, plans for actual installations will require expert engineering and financial advice in order to meet specific local conditions.

Mention of the name of any firm, product, or process in this report is not to be considered a recommendation or an endorsement by the Agency for International Development, but merely a citation that is typical in its field.

* * * * * * * * * *

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* * * * * * * * * *

For further information and assistance, contact should be made with the local Productivity Center, Industrial Institute, Servicio, or United States Operations Mission.

Code Number
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## ACKNOWLEDGMENT

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# TABLE OF CONTENTS


| | Page |
|---|---|
| Introduction | 1 |
| General Assumptions | 1 |
| Product Specifications | 2 |
| Manufacturing Unit | 2 |
| Production Capacity | 3 |
| Manufacturing Operations | 3 |
| Direct Materials | 7 |
| Supplies | 8 |
| Direct Labor | 8 |
| Indirect Labor | 8 |
| Production Tools and Equipment | 9 |
| Other Tools and Equipment | 10 |
| Furniture and Fixtures | 11 |
| Plant Layout | 11 |
| Plant Site | 12 |
| Building | 12 |
| Power | 12 |
| Water | 12 |
| Fuel | 13 |
| Truck | 13 |
| Depreciation | 13 |
| Manufacturing Overhead | 14 |
| Manufacturing Costs | 14 |

| | Page |
|---|---|
| Fixed Assets | 15 |
| Working Capital | 15 |
| Capital Requirements | 15 |
| Sales Revenue | 16 |
| Recapitulation of Costs, Sales and Profit | 16 |
| Budget Control | 17 |
| Budget Control Accounts | 17 |
| Purchase Requisition | 18 |
| Voucher Check | 19 |
| Engineers | 20 |
| Training | 21 |
| Safety | 22 |
| Other Considerations | 23 |
| Materials and Supplies | 23 |
| Market Factors | 23 |
| Export Markets | 24 |
| Marketing Problems | 24 |
| Economic Factors | 25 |
| Personnel | 25 |
| Laws and Regulations | 25 |
| Financial Factors | 26 |
| Financial Requirements of the Project | 26 |
| Short Term Bank Credits | 26 |
| Financial Plan | 26 |
| Bibliography | 27 |
| Plant Layout | 28 |

# WALLBOARD FROM GYPSUM AND FIBER

## INTRODUCTION

The purpose of this report is to present basic information for establishing a manufacturing plant, in a foreign country, to produce wallboard from gypsum and coconut husk fibers.

## GENERAL ASSUMPTIONS

In order to make realistic estimates in this report, certain assumptions are made. These are:

1. The costs of the building and general facilities are based on United States prices.

2. Material costs are based on sizes and specifications of materials used in the United States.

3. Labor costs are based on the average for the industry as recently published by the United States Bureau of Labor Statistics.

4. Adequate power and water are available at the plant site.

5. Adequate transportation facilities are available at the plant site.

6. The plant operates three eight hour shifts per day, 300 days per year.

7. No special provision, except unforeseen expense, is made for the training of new personnel. It is assumed that learner's rates are paid in such cases.

8. The following items cannot be estimated realistically:

   A. Land value.
   B. Distribution and selling costs.
   C. In-freight and out-freight.
   D. Administrative costs.
   E. Taxes.

   While general estimates will be made of each of these items, for the purpose of completing cost estimates, adjustment should be made in accordance with actual local costs.

   In fact, all cost estimates contained in this report should be adjusted to conform to local conditions.

9. Columns are provided in the tables included in this report to facilitate the conversion of cost figures to conform with local costs.

## PRODUCT SPECIFICATIONS

All information and figures contained in this report are based on the production of four foot by eight foot by 3/8 inch wallboard. Other lengths may be produced.

Gypsum board compares very favorably with masonite board as far as durability is concerned. However, masonite board is more resilient and will bend to a greater degree without breaking. Gypsum board compares favorably with transite board.

## MANUFACTURING UNIT

The manufacturing unit for gypsum wallboard is 1,000 square feet.

## PRODUCTION CAPACITY

The annual production capacity of this plant is 22,000,000 square feet of gypsum wallboard.

## MANUFACTURING OPERATIONS

### Gypsum Rock

Gypsum rock is received from the quarry crushed to approximately three inches and under in size and is placed in outside storage at the plant. Where excessive precipitation occurs the storage area should be covered.

The crushed gypsum rock is conveyed from storage and passed through the hammer mill which further reduces the size to one-half inch or less. It then passes through the rock dryer and on into the roll mill where it is pulverized and conveyed to intermediate storage called the raw bin. The flow of pulverized material from the roll mill to intermediate raw bin storage is continuous.

From the intermediate raw bin storage the pulverized gypsum is moved by screw conveyor to the kettle calciner. The time required for calcination will depend on the firing process, the heat maintained and the composition of the gypsum. The average time from the beginning of one batch to the beginning of the next batch is estimated at two hours minimum. The average temperature is 380 degrees Fahrenheit. The powder is kept constantly agitated in order to maintain a uniform

degree of dehydration. Approximately 15 per cent of water by weight is removed.

When the temperature has risen to a point that indicates the desired dehydration has been accomplished, the discharge gates are open and the hot powder is dumped into the hot pit. The time required for dumping is about two minutes. The powder moves freely at this stage and is moved promptly to stucco storage. The cooling takes place in the elevator and conveyor system.

## Fibers

About 300 pounds of coconut husk fibers are processed for each ton of board. The fibers pass through a hammer mill into the pulper and beater and are pumped from there into the agitator storage tank and controlled at uniform consistency. The optimum fiber length for coconut husk fibers is .09 inches.

## Mixing

From the pulper and beater the metering pump delivers the prepared and washed fiber to the mixing tank in correct proportion for mixing with calcined gypsum or stucco. At the mixing tank stucco, fiber pulp, starch and foam produced from rosin soap, ground block, and water are added and thoroughly mixed ready for the board machine.

## Board Machine

The mix is then placed on the face paper which has been mechanically scored and is carried to the forming rolls where a back paper with

paste on the edges is adhered to the edges of the folded over face paper, as it is carried between the forming rolls and onto the setting belt.

The edge forming is completed at the beginning of the setting belt. This belt and the subsequent live line roll section are of sufficient lengths to fully set before the stream of board arrives at the knife which cuts the board to desired lengths.

Dryer

Beyond the knife the board is inverted and transferred to the dryer by mechanical means.

The drying time will vary considerably depending upon the type of material and rate of evaporation. The dryer design can provide drying rates from 50 minutes to one hour and 30 minutes, depending upon the production required. Slow drying is desirable where permissible. The slower the board is dried, within practical limits, the higher the quality of the board produced.

Finishing and Packaging

For the production of this plant the finishing and packaging processes can be handled by hand without automatic machinery. It would probably be advisable for convenient storage and handling to trim the boards to exact length and tape them in bundles of two boards face to face.

Potassium sulphate is generally used to control the setting of gypsum wallboard. The amount required depends on the speed at which the board travels to obtain a specified production capacity.

Another method of controlling the setting of gypsum wallboard is to to add ground block. This is accomplished by making a large block from the gypsum and grinding the block into a powder form. The powdered or finely ground gypsum is then added at the mixing tank to control the setting.

At the speed the board will travel to produce 22,000,000 square feet of board in this plant, it is recommended that ground block be used, since the cost would be less and a better quality of board would be produced if potassium sulphate were not used.

* * * * * * * * * *

## DIRECT MATERIALS

There are many fiber materials that may be used for the production of gypsum wallboard, such as wood fiber, sawdust, straw, reed, and bagasse.

For the purpose of this report, fibers from coconut husks are used. Usually about 20 per cent of fibrous materials are added to gypsum for the production of gypsum wallboard which is approximately the amount shown in this report.

Coconut husk fiber usually has some tannins or other coloring matter which might stain the wallboard. Forest Products Laboratory of Madison, Wisconsin, advises that tannins and other coloring matter which might stain the wallboard can be removed from coconut fiber by extracting with hot water. This should be done in the preparation of the fiber.

The principal direct materials consist of the following items:

| Item | Number Required | Unit Cost | Annual Cost Estimated | Annual Cost Actual |
|---|---|---|---|---|
| Gypsum | 14,000 tons | $ 3 | $ 42,000 | _____ |
| Coconut fibers | 2,500 tons | 4 | 10,000 | _____ |
| Starch | 88 tons | 120 | 10,560 | _____ |
| Paper | 1,200 tons | 100 | 120,000 | _____ |
| Chemicals and soap | | | 4,500 | _____ |
| Tape and packaging materials | | | 2,940 | _____ |
| TOTAL | | | $ 190,000 | _____ |

## SUPPLIES

| Item | Annual Cost Estimated | Annual Cost Actual |
|---|---|---|
| Lubricants and hand tools | $ 200 | _____ |
| Maintenance materials and parts | 5,000 | _____ |
| Office supplies | 200 | _____ |
| Gas, oil, and repairs for truck | 600 | _____ |
| TOTAL | $ 6,000 | _____ |

## DIRECT LABOR

| Occupation | Number Required | Hourly Rate | Annual Cost Estimated | Annual Cost Actual |
|---|---|---|---|---|
| Skilled operators | 6 | $ 2.00 | $ 28,800 | _____ |
| Semi-skilled operators | 9 | 1.75 | 37,800 | _____ |
| Unskilled labor | 12 | 1.50 | 43,200 | _____ |
| TOTAL | 27 | | $ 109,800 | _____ |

## INDIRECT LABOR

| Occupation | Number Required | Salary | Annual Cost Estimated | Annual Cost Actual |
|---|---|---|---|---|
| Manager | 1 | $12,000 | $ 12,000 | _____ |
| Supervisors | 3 | 8,000 | 24,000 | _____ |
| Bookkeeper | 1 | 6,000 | 6,000 | _____ |
| Secretary | 1 | 4,000 | 4,000 | _____ |
| Maintenance | 2 | 6,000 | 12,000 | _____ |
| Truck driver | 1 | 3,600 | 3,600 | _____ |
| TOTAL | 9 | | $ 61,600 | _____ |

## PRODUCTION TOOLS AND EQUIPMENT

Gypsum wallboard plants are usually designed and installed on a turn-key basis for a specified annual production capacity and for the use of specific fibers. The following lists indicate the principal items required, together with approximate current costs.

| Item | Unit Cost | Cost Estimated | Cost Actual |
|---|---|---|---|
| **COCONUT FIBER** | | | |
| Hammer mill | $ 4,028 | $ 4,028 | _____ |
| Pulper and beater | 6,976 | 6,976 | _____ |
| Vertical drip proof motor 25 horsepower | 735 | 735 | _____ |
| Steel frame for pulper and beater | 510 | 510 | _____ |
| Stand for vertical motor | 550 | 550 | _____ |
| Flow box with gate | 214 | 214 | _____ |
| Stock tank 12 feet by 8 feet | 2,689 | 2,689 | _____ |
| Rapid circulator and agitator | 1,487 | 1,487 | _____ |
| Splash proof motor 5 horsepower 1800 revolutions per minute | 265 | 265 | _____ |
| Centrifugal stock pump with 10 horsepower motor | 958 | 958 | _____ |
| Pump variable speed drive | 588 | 588 | _____ |
| TOTAL FIBER PROCESSING | | $ 19,000 | _____ |
| **GYPSUM** | | | |
| Crusher and feeder first stage | $ 1,500 | $ 9,500 | _____ |
| Crusher and feeder second stage | 5,200 | 5,200 | _____ |

PRODUCTION TOOLS AND EQUIPMENT (Continued)

| Item | Unit Cost | Cost Estimated | Cost Actual |
|---|---|---|---|
| GYPSUM (Continued) | | | |
| Screens | $ 3,000 | $ 3,000 | _____ |
| Rock dryer | 16,000 | 16,000 | _____ |
| Pulverizer and auxiliaries | 23,000 | 23,000 | _____ |
| Kettle calciner complete | 30,000 | 30,000 | _____ |
| Hot storage | 11,000 | 11,000 | _____ |
| Elevators, conveyors, motors and attachment | 22,000 | 22,000 | _____ |
| Mixing equipment | 23,000 | 23,000 | _____ |
| Wallboard machine complete | 200,000 | 200,000 | _____ |
| Dryer with heating equipment | 250,000 | 250,000 | _____ |
| Plant equipment including lift truck and pallets | 40,000 | 40,000 | _____ |
| Boiler 400 horsepower including auxiliaries, accessories, fitting and installation | 97,000 | 97,000 | _____ |
| Starters, valves, piping, spare parts, and engineering | | 100,300 | _____ |
| TOTAL GYPSUM AND WALLBOARD EQUIPMENT | | $ 830,000 | _____ |
| TOTAL COST OF PRODUCTION TOOLS AND EQUIPMENT | | $ 849,000 | _____ |

Manufacturers of the above production tools and equipment have not been designated due to the many sources of supply available. Names of suppliers may be obtained from trade journals.

## OTHER TOOLS AND EQUIPMENT

| Item | Cost Estimated | Cost Actual |
|---|---|---|
| Welding equipment | $ 500 | _____ |
| Compressor | 1,000 | _____ |
| Maintenance tools and equipment | 4,500 | _____ |
| TOTAL | $ 6,000 | _____ |

## FURNITURE AND FIXTURES

| Item | Number Required | Unit Cost | Cost Estimated | Cost Actual |
|---|---|---|---|---|
| Desks and chairs | 3 | $125 | $ 375 | _____ |
| File cabinets | 3 | 75 | 225 | _____ |
| Typewriter | 1 | 150 | 150 | _____ |
| Adding Machine | 1 | 150 | 150 | _____ |
| TOTAL | | | $ 900 | _____ |

## PLANT LAYOUT

A plant layout of machinery and equipment indicating the flow of work is shown on the last page of this report.

## PLANT SITE

In order to provide for complete storage space and for future expansion, a plant site of about two acres will be required. The plant site should be located at a gypsum mine if possible in order to eliminate transportation costs. The cost of the plant site is estimated at about $2,000.

## BUILDING

A one-story building 70 feet wide by 400 feet long will be required or about 28,000 square feet of floor space. The end of the building where the preparation and mixing of materials takes place should be about twice the height as the rest of the building. As previously stated where precipitation is excessive the storage space for gypsum should be covered. The cost of a building, including a boiler, plumbing, and heating is estimated at about $140,000.

## POWER

It is assumed that a dependable supply of electric power will be available from public power service lines. The total connected load will be about 500 horsepower. The annual cost of power is estimated at $15,000.

## WATER

About 5,000,000 gallons of water is required. The cost of water for all purposes including production, sanitation, and fire protection is estimated at $1,000.

## FUEL

The cost of fuel for all purposes is estimated at $6,000. Consideration should be given to the use of suitable local fuel in determining the design of boiler to be purchased.

## TRUCK

A five-ton truck will be required for pick-up and delivery purposes. The cost of the truck is estimated at $4,000.

The cost of the truck driver is included in indirect labor and the cost of gas, oil, and repairs for the truck is included in supplies.

## DEPRECIATION

| Item | Estimated Cost | Years Life | Annual Cost Estimated | Annual Cost Actual |
|---|---|---|---|---|
| Building | $ 200,000 | 20 | $ 10,000 | _____ |
| Production tools and equipment | 849,000 | 15 | 56,600 | _____ |
| Other tools and equipment | 6,000 | 10 | 600 | _____ |
| Furniture and fixtures | 900 | 10 | 90 | _____ |
| Truck | 4,000 | 4 | 1,000 | _____ |
| TOTAL | | | $ 68,290 | _____ |

## MANUFACTURING OVERHEAD

| Item | Annual Cost Estimated | Annual Cost Actual |
|---|---|---|
| Depreciation | $ 68,290 | _____ |
| Indirect labor | 61,600 | _____ |
| Power | 15,000 | _____ |
| Water | 1,000 | _____ |
| Fuel | 6,000 | _____ |
| Supplies | 6,000 | _____ |
| TOTAL | $ 157,890 | _____ |

## MANUFACTURING COSTS

| Item | Annual Cost Estimated | Annual Cost Actual |
|---|---|---|
| Direct materials | $ 190,000 | _____ |
| Direct labor | 109,800 | _____ |
| Manufacturing overhead | 157,890 | _____ |
| TOTAL | $ 457,690 | _____ |

## FIXED ASSETS

| Item | Cost Estimated | Cost Actual |
|---|---|---|
| Land | $ 2,000 | _____ |
| Building | 140,000 | _____ |
| Production tools and equipment | 849,000 | _____ |
| Other tools and equipment | 6,000 | _____ |
| Furniture and fixtures | 900 | _____ |
| Truck | 4,000 | _____ |
| TOTAL | $1,001,900 | _____ |

## WORKING CAPITAL

| Item | Time | Annual Cost Estimated | Annual Cost Actual |
|---|---|---|---|
| Direct materials | 30 days | $ 15,833 | _____ |
| Direct labor | 30 days | 9,150 | _____ |
| Manufacturing overhead | 30 days | 13,157 | _____ |
| Reserve for sales collection | 30 days | 66,000 | _____ |
| TOTAL | | $ 104,140 | _____ |

## CAPITAL REQUIREMENTS

| Item | Cost Estimated | Cost Actual |
|---|---|---|
| Fixed assets | $1,001,900 | _____ |
| Working capital | 104,140 | _____ |
| TOTAL | $1,106,040 | _____ |

## SALES REVENUE

The average selling price of a good grade of gypsum wallboard such as should be produced in this plant is $36.00 per 1,000 square feet.

The estimated annual production of the plant is 22,000,000 square feet of wallboard.

Based on these figures the annual revenue for this plant would amount to about $792,000.

## RECAPITULATION OF COSTS, SALES AND PROFIT

| Item | | Annual Estimated | Annual Actual |
|---|---|---|---|
| Direct materials | $ 190,000 | | _____ |
| Direct labor | 109,800 | | _____ |
| Manufacturing overhead | 157,890 | | _____ |
| Total manufacturing costs | | $ 457,690 | _____ |
| Interest on loans | $ 33,000 | | _____ |
| Insurance | 1,300 | | _____ |
| Legal | 1,200 | | _____ |
| Auditing | 2,400 | | _____ |
| Unforeseen expense | 46,410 | | _____ |
| Total administrative costs | | $ 84,310 | _____ |
| Sales commissions | | 24,000 | _____ |
| Freight-out, travel, bad debts, discounts and allowances | | 6,000 | _____ |
| Profit before taxes | | 220,000 | _____ |
| Annual gross sales | | $ 792,000 | _____ |

## BUDGET CONTROL:

A requisition form designed to provide accurate records of procurement and indicate the purpose of procurement with the least amount of time and effort is shown on the following page.

This form has an account number for each type of the various expenditures which the manager will review in detail, monthly or oftener, in order to control his expenses. Some items, such as power and water, are usually under contract and are easily checked by reference to monthly bills. For simplification, items (marked with an asterisk below) are omitted from the purchase requisition. Variations in the labor costs are easily reviewed by examination of the payroll vouchers. The simplified type of control thus provided makes certain that the manager can control expenditures promptly.

Following the requisition form, a sample voucher check is shown. Voucher checks should be used for the payment of all expenditures and the appropriate book account number placed on each voucher.

At the end of each month the manager will receive a statement of all expenditures broken down by budget accounts. If the expenditures exceed the budgeted monthly allowances of any of the accounts, the bookkeeper will furnish the manager with a break-down of all expenditures relative to the budgeted accounts exceeded. All these supporting data can be secured by reference to the purchase requisitions and the check vouchers. This reference will enable the manager to determine what caused the over-expenditure and take corrective action.

If at any time during each month it becomes apparent that expenditures will exceed any of the budget accounts, the bookkeeper will bring this to the attention of the manager for his information and action.

### BUDGET CONTROL ACCOUNTS:

| Account Number | | Monthly Expense | Monthly Budget | Annual Budget | Actual |
|---|---|---|---|---|---|
| 10 | Administrative | $_____ | $ 3,158 | $ 37,900 | $_____ |
| 20 | Sales | _____ | 2,500 | 30,000 | _____ |
| 30 | Direct Materials | _____ | 15,833 | 190,000 | _____ |
| 40 | Supplies | _____ | 500 | 6,000 | _____ |
| 51 | Power* | _____ | 1,250 | 15,000 | _____ |
| 52 | Water* | _____ | 83 | 1,000 | _____ |
| 53 | Fuel | _____ | 500 | 6,000 | _____ |
| 60 | Unforeseen Expense (Reserve Account) | _____ | 3,865 | 46,410 | _____ |
| 71 | Direct Labor* | _____ | 9,150 | 109,800 | _____ |
| 72 | Indirect Labor* | _____ | 5,133 | 61,600 | _____ |
| 80 | Depreciation (Reserve Account) | _____ | 5,691 | 68,290 | _____ |

| PURCHASE REQUISITION | COMPANY NAME | DATE |
|---|---|---|

- ☐ 10 AIMINISTRATION
- ☐ 20 SALES
- ☐ 30 MATERIALS
- ☐ 40 SUPPLIES
- ☐ 50 UTILITIES
- ☐ 60 UNFORESEEN EXPENSE

INDICATE BELOW THE USE OF MATERIALS

- ☐ DIRECT MATERIALS
- ☐ MAINTENANCE MATERIALS
- ☐ MAINTENANCE SERVICES
- ☐ OPERATING SUPPLIES

| | PLEASE ORDER THESE MATERIALS OR SERVICES | DELIVERY WANTED | | |
|---|---|---|---|---|
| QUANTITY | DESCRIPTION | UNIT | TOTAL | |
| | | | | |
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|---|---|---|---|
| QUOTES FROM | | REQUISITIONED BY | |
| QUOTES FROM | | APPROVED BY | |
| QUOTES FROM | | ORDER NO. | ORDER DATE |

R. W. MITCHELL MANUFACTURING COMPANY

1422 BOSWORTH STREET, S. E.

65-22
514

ANYWHERE, U. S. A._____19____ No. 10000

PAY _____ DOLLARS $ _____

TO THE ORDER OF

R. W. MITCHELL MANUFACTURING COMPANY

TO FIRST NATIONAL BANK
ANYWHERE, U. S. A.

BY SAMPLE CHECK

VICE PRESIDENT

ACCOUNT NUMBER

Sample voucher check to be used for the payment of all expenditures in connection with Budget Control.

R. W. MITCHELL MANUFACTURING COMPANY

## ENGINEERS:

The services of professional engineers are desirable in the design of this plant, even though the proposed plant is small.

A correct design is one which provides the greatest economy in the investment of funds and establishes the basis of operation that will be most profitable in the beginning and will also be capable of expansion without expensive alteration.

The addresses of professional engineers who specialize in industrial design, some of whom may be willing to undertake such work on low cost projects overseas, can be secured by reference to the published cards in various engineering magazines. They may also be reached through their national organizations, one of which is the

National Society of Professional Engineers
2029 K Street, Northwest,
Washington 6, D. C.

Manufacturers of industrial equipment employ engineers familiar with the design and installation of their specialized products. These manufacturers are usually willing to give prospective customers the benefit of technical advice by those engineers in determining the suitability of their equipment in any proposed project.

The equipment manufacturers also know, and can recommend, professional engineers in private practice, who are willing and able to provide appropriate consulting services.

## TRAINING:

Manufacturing an inferior quality of product during the training period could create sales resistance that might be difficult to cope with later. To avoid such possibilities, the quality of the product should be maintained at all times, including the training period.

In some areas skilled operators may be available locally. In other areas all the operators may have to be trained.

If skilled operators are not available, adequate training would be assured by using one or more of the following methods:

A. If the plant is designed and installed by a competent engineering firm, the contract should be negotiated, if possible, on a turn-key basis. On this basis the contractor agrees to operate the plant and produce the quality and quantity of the product stated in the contract for an agreed period of time. Such a contract would assure adequate personnel training, since full quantity and quality could not be produced with an untrained organization.

B. The engineering firm that designs and installs the plant can usually make training arrangements to have key personnel placed, for training purposes, in a foreign industry that produces the same type of product. This would provide training for the key personnel while the plant is being installed.

C. If neither of the above methods is possible, then qualified and experienced individuals should be employed for the key positions, either permanently or temporarily, to perform the key operations and assist in training the organization, even if they must be secured outside the country.

D. The manager should have years of successful experience in this type of business and be fully qualified in all phases of management, including the training of employees.

## SAFETY:

There is always danger of accident and injury in any industrial plant. Because of this, the manager should take specific action to bring to the attention of each employee the importance of safety precautions and intelligent first aid.

Practically all machines have safety appliances, and the manager should see that these are in good working condition and that the operators are making full use of them.

In addition to constant watchfulness to make sure that all practicable safety precautions are taken, first aid supplies should be readily available. One complete first aid kit should be maintained near the manager's office, and others at appropriate places throughout the plant. Some of the employees should be trained to provide first aid service.

The use of accident posters in the plant have proved to be of value in reducing accidents. It is recommended that such posters be used, and that some direct special action be taken by the manager, at least once each month, to bring to the attention of all personnel the importance of safety precautions.

A fire brigade should be established and each member trained as to his responsibility in case of fire. Fire drills should be conducted periodically.

It is recommended that the employees be encouraged to offer suggestions or recommendations relative to prevention of accidents, removal of fire hazards and maintaining general interest in all safety factors.

## OTHER CONSIDERATIONS

There are other important subjects, shown below, that should be fully investigated and considered. Information on these subjects is usually available from such sources as banks, government agencies, exporters and importers, wholesalers, retailers, transportation companies and manufacturers.

## MATERIALS AND SUPPLIES

1. Are all materials and supplies available locally?
2. Is the local material market competitive?
3. Is satisfactory delivery of local materials assured at reasonable prices?
4. What materials and supplies must be imported?
5. Are they available in world markets at competitive prices?
6. Would prompt delivery of imported materials and supplies be assured so that large inventories would not be required?

## MARKET FACTORS

1. Is there already a demand for the product?
   - A. Who are the principal consumers?
   - B. Who are possible new consumers?

2. How is demand for the product now satisfied?
   - A. By local production? If so, what is the volume of annual production?
   - B. What percentage of consumption is filled by local production?
   - C. By imports? If so, what is the volume of annual imports?
   - D. What percentage of consumption is met by imports?
   - E. From what areas are imports derived?

3. What is the estimated annual increase in local consumption over the next five years?
   - A. How were such estimates made?
   - B. By reference to official figures on population growth, family budgets, imports, etc.?
   - C. By consultation with trade or industry, ministries, associations, bankers, commercial houses, wholesalers, retailers, industrial consumers, etc.?

4. If the product is already being manufactured, can the existing and estimated future local market absorb production of the new plant without price-cutting or other dislocations?

5. Would the estimated sales price and quality of the new product make it competitive with an imported equivalent?
   A. After adjusting cost to local conditions, is the estimated sales price of the product so high that tariff protection is necessary to protect it from imports?

## EXPORT MARKETS:

1. Could the product compete in export markets on the basis of price, quality and dependability of supply?
2. Can export markets for the product be developed?
3. If so, in what areas and in what annual volume?
4. What procedures would be necessary to develop export markets?
5. What would it cost?

## MARKETING PROBLEMS:

1. In calculating costs of the product, has adequate allowance been made for the expense of a sales department, advertising and promotion that might be required?

2. Do consumer prejudices against locally manufactured products exist?
   A. If so, why?
   B. Would they apply to the new product?
   C. If so, how could they be overcome and what would it cost to do so?

3. Do marketing and distribution facilities for the product exist?
   A. If not, can they be set up?
   B. What would it cost to do so?

4. Will the product be sold to:
   A. Wholesalers?
   B. Retailers?
   C. Direct to consumer?
   D. Other industries?
   E. Government?

## ECONOMIC FACTORS:

1. How much foreign exchange (and in what currency) is required to import machinery, equipment and supplies:
   - A. How much foreign exchange (and in what currency) is required for annual interest payments and amortization of any loans contracted to import machinery and equipment, or for payment of royalties and technical services?
   - B. How much foreign exchange (and in what currency) is required for annual import of raw materials and supplies?
   - C. What are estimated annual foreign exchange earnings and in what currencies?
   - D. Has careful consideration been given to the possibility of depreciation in the foreign exchange value of the local currency?
   - E. Has careful consideration been given to the possibility of import controls, or restrictions on availabilities of foreign exchange necessary to operate the business?
   - F. What benefits would the new business bring to the economy in the use of local raw materials: in employment and in technology?
   - G. Do dependable facilities exist for transportation, power, fuel, water and sewage?
     - (1) If not, can existing deficiencies be eliminated satisfactorily?
     - (2) What would be the cost to do so?

## PERSONNEL:

1. Is there an adequate labor supply near the plant location?
   - A. If not, how can the problem be solved?

2. Can the problem of training competent management and supervisory personnel be solved?
   - A. Also, the training of skilled labor?
   - B. Is technical advice available in the locality?
   - C. If not, where can it be obtained and what will it cost?

## LAWS AND REGULATIONS:

1. Do existing labor laws, government regulations, laws and taxes favor establishment of new business?
   - A. If not, can existing obstacles be removed?
   - B. If so, how and when?

## FINANCIAL FACTORS:

1. Technical advice on selection of machinery and equipment.
   A. In selecting the machinery and equipment for the new plant, have reputable and competent engineers and technicians been consulted?
   B. Have they been asked for advice on the most suitable types of machinery and equipment for the process and locality?
   C. Have they carefully compared costs of various suppliers?
   D. Credit terms offered purchasers?

## FINANCIAL REQUIREMENTS OF THE PROJECT:

1. In estimating the cost of the project, has careful consideration been given to:
   A. The effect on costs of delays in construction schedules?
   B. In delivery and installation of machinery and equipment?
   C. In import of essential raw materials and supplies?

2. In calculating cash flow and working capital requirements, has careful consideration been given to:
   A. Maintaining adequate inventories of raw materials?
   B. Supplies and spare parts?
   C. Seasonal fluctuations in the business?
   D. The time required to liquidate credit sales to customers and bad debts?
   E. The period necessary to get the plant into production?
   F. Cash required to amortize its principle loans?

3. If the economy is in a period of inflation, has full allowance been made for the influence of rising prices and wages on the cost of the project and on working capital requirements?

## SHORT TERM BANK CREDITS:

1. Has it been possible to make arrangements with local banks to finance short-time working capital requirements of the business?

## FINANCIAL PLAN:

1. Has a definite plan to finance the project been worked out?
   A. Is sufficient capital available locally?
   B. If not, what is the plan to obtain the required capital?

# BIBLIOGRAPHY

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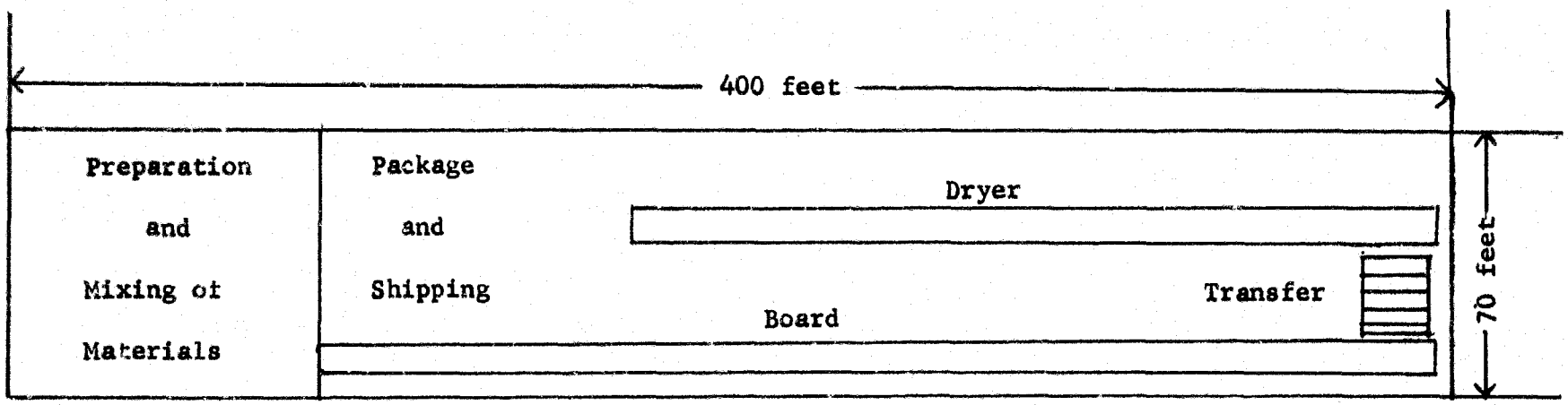
New York 36, New York

## PERIODICALS

The United States Gypsum Company of Chicago, Illinois, prepares pamphlets periodically on the subject of the use of gypsum for all purpoees.

Copies of these pamphlets may be secured gratis through a written request to be placed on their regular mailing list.

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