PLANT REQUIREMENTS FOR MANUFACTURE OF ASPHALT FLOOR TILE

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
COMMUNICATIONS RESOURCES DIVISION
Washington 25, D. C.

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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The original report was prepared in 1958 by the Gidley Research Institute, Fairhaven, Massachusetts, for the technical aids program through the facilities of the Office of Technical Services, U.S. Department of Commerce.

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A S P H A L T F L O O R T I L E

INTRODUCTION

The purpose of this report is to present basic information for establishing a manufacturing plant in a foreign country to produce asphalt floor tile.

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 eight hours a day, five days a week, fifty weeks a year.

7. No special provision 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

The plant described in this report is designed to produce standard asphalt floor tile, nine inches by nine inches by one-eighth inch thick. Other sizes and other products may be produced in this plant but for the purposes of this report only the nine-inch floor tile will be considered.

PRODUCTION CAPACITY

The capacity of this plant is 1,500,000 asphalt floor tiles per year which is equivalent to 750 per hour or 6,000 a day.

MANUFACTURING UNIT

The manufacturing unit of this plant is one floor tile nine inches by nine inches by one-eighth inch. Other sizes can be produced with the necessary change in the molds.

MANUFACTURING OPERATIONS

The steps in the manufacturing of asphalt tile may be listed and described as follows:

1. Raw materials receiving and storing -- The materials are all relatively stable and easily handled. They are not subject to breakage nor spoilage under normal conditions. The quantity received amounts to 1-3/4 tons per day. No special problem is presented.

2. Weighing and compounding -- The small size of the plant makes it advisable to prepare the mixture in batches by weighing or measuring the required amount of each of the ingredients.

3. Mixing -- The weighed or measured ingredients are then combined and mixed in the order determined by the formula used. The mixing is done in a small steam jacketed mixer under the supervision of an expert operator.

4. Sheeting -- In this step of the manufacturing process the combined ingredients are passed between rubber rolls to form a flat sheet. The rolls are chilled to cause the plastic mixture to become firm.

5. Calendering -- This is a smoothing operation which is carried out by passing the sheet between metal rolls with very smooth surfaces.

6. Cutting to size -- The smooth sheets are then cut by automatic machinery to make the proper size for finished tiles.

7. Packing and shipping -- The finished tiles are packed in cartons of 48 tiles each, ready for shipping.

Laboratory control is associated with all these steps including a periodical check on the quality of the final product. This is a relatively small part of the operation if only a few types of tiles are manufactured.

Auxiliary steps:

A large U.S.A. plant will have a complete laboratory under a Chief Chemist to control the product through all its work stages and to periodically check the final product.

However, a small overseas operation can, in the beginning, dispense with these overly elaborate controls by concentrating its production on a few types of tiles and/or employ the services of a consulting chemist to furnish the formulas and technical assistance. A simplified laboratory or control set-up overseas would consist of the following items:

1. Small internal closed mixer about 1 kilo capacity.
2. Small sheeting mill - two-roll mill with rolls about 3" to 6" in diameter x 8" to 16" long.
3. Ring and ball melting point apparatus.
4. Weighing scales accurate to 1/100 gram about 500 gram capacity.
5. Indentation test device.
6. Simple dead-weight plastometer.
7. Thermometers, melting point glassware and Baume Gauges.
8. Bend test device.

DIRECT MATERIALS

Item	Annual Requirements	Unit Cost	Annual Cost Estimated	Annual Cost Actual
Resin (asphalt)	82 tons	$ 400	$ 32,800	_____
Fibre	182	20	3,640	_____
Filler	150	10	1,500	_____
Carbon black	3	150	450	_____
Gel	10	360	3,600	_____
Plasticizer	10	400	4,000	_____
Cartons	18,750 (cartons)		3,250	_____
TOTAL	437 tons		$ 49,240	_____

Specific examples of raw materials by above classes:

Resins

For black and dark brown and dark maroon colors - blown or oxidized asphalt, polymerized mixtures of cracked products of crude petroleum, gilsonite, mineral rubber, dark para coumarone - indene resins, air-blown bituminous petroleum residue, plasticized gilsonite, hard resinous pitch.

NOTE: The resin used should ordinarily be selected to have a melting point of about 85° to 110° Centigrade, if used as the sole resin, or a balanced combination of higher melting point resin (for example, gilsonite melting at 290° Fahrenheit) and a lower melting

point material (for example, a resinous pitch or cumar resin of 70° Centigrade melting point). The two resins may be initially blended in arithmetic proportions as a starting point and then adjusted by experience to produce a good working material and a good final product.

For example: 100 parts of 140° Centigrade resin and 100 parts of 60° Centigrade resin or for light tans, blue, green, yellows and pastels, use light colored cumar-indene resins.

Fibre

The principal and most effective fibre used is asbestos fibres. However, to reduce costs (with, of course, commensurate loss of water- and flame-resistance), certain overseas firms have diluted the asbestos fibres with locally available fibres such as cotton linters, ground hard wood sawdust and other cellulosic fibres. This report is not based on the use of such fibres and it is not recommended that they be used.

Fillers

The principal fillers used are cheap calcium carbonates (dry-ground whiting, ground limestone and chalk). Other common fillers are cheap clay, ground talc, marble dust and ground pyrophyllites. Other specifically available local fillers (normally higher in price) may actually be cheaper, if the usually employed fillers must be imported

(thus adding costs of freight, brokerage, packaging, insurance; and costs and possible scarcity of hard currency exchange). Suitable alternate fillers (if locally available) which have been successfully employed are aluminum silicates, barium sulfate (which has the objection of being heavy), magnesium carbonate, kaolin, aluminum sulfate, infusorial or diatomaceous earths and pumice.

Pigment (Coloring)

In black stocks channel carbon black may be used. In red tiles, the red iron oxides are probably most used and most inexpensive. However, for especially bright and attractive reds, organic colors supplied by large chemical colorists are superior. For browns and tans, the most available pigments are ferric carbonates and oxides (brown ochre, brown iron oxide). For greens, the chromic oxides. For white, titanium dioxide sparingly used or zinc sulfides (lithopones) are recommended. For yellows, lead chromates, cadmium sulfides, zinc chromates and yellow ferric oxides may usually be easily obtained at reasonable prices. For more brilliant and attractive shades and greater tone variety, the organic coloring pigments of E. I. du Pont and other producers are recommended, when available at a reasonable delivered price overseas.

Gel

This component is simply an incompatible plasticizer (sometimes referred to as a "physical plasticizer" or as a "non-solubilizing

plasticizer"). The principal materials of this class are blown, oxidized, aerated or chlorinated vegetable oils. Most common examples are blown castor oil, soya bean oil, linseed oil or rapeseed oil. Overseas firms have successfully used aerated oils expressed from almost all types of seeds locally available. In any case, it is important that the aeration, chlorination or oxidization be carried out to a point where the oil is thoroughly and uniformly converted to a heavy body gel. This process may be accomplished by simple aeration under pressure, but usually better and more rapid results are obtained with the concurrent use of an oxidizing catalyst. Other so-called gels which have been employed are the so-called factices or "vulcanized" vegetable oils.

Plasticizer

This normally means a true compatible plasticizer which tends to dissolve the resin used (also referred to occasionally as chemical plasticizer). Examples are vegetable pitches, dialkylphthalates, aromatic hydrocarbons, turpentine (use sparingly!), ketones, coal tar solvents. To a more limited extent (and usually as additives or modifiers to the main plasticizer), the following materials have been used: terpene solvents, chlorinated hydrocarbons, solvent petroleum naphtha, esters, aromatic alcohols and some drying oils. One of the most common vegetable type pitches is heavily bodied cottonseed pitch.

PLANT LAYOUT

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

PLANT SITE

To provide for eventual expansion the plant site should have an area of one-half acre.

The cost of the land is estimated at $500.

BUILDING

A one-story building will be required about 50 feet wide by 100 feet long, or about 5,000 square feet. The building may be constructed of any suitable local material.

The cost of the building is estimated at about $3.70 per square foot or $18,500.

POWER

It is assumed that a dependable supply of electric power will be available from public power service lines. The total connected load is about 94 kilowatts. On this basis the annual cost of power is estimated at $1,880.

WATER

The water requirement is estimated at 1,000,000 gallons annually. The annual cost of water is estimated at $300.

FUEL

The fuel requirements for this plant are estimated at approximately 3,000 gallons of oil for heating and calender operation.

The estimated annual cost of fuel is $300.

TRUCK

No truck, owned and operated by the company, is considered necessary for this plant. Local builders will pick up any tiles they buy at the factory. Deliveries to dealers and out of town purchasers will be made by public transportation systems. Good highway facilities will be necessary because the combined shipments in and out are estimated at 80 tons per month.

* * * * * * * * * * *

PRODUCTION TOOLS AND EQUIPMENT

Description	Cost Estimated	Cost Actual
Internal mixer	$ 10,300	_____
Sheeting mill	10,000	_____
Calender	20,000	_____
Cutting press	2,500	_____
Compounding equipment	600	_____
TOTAL	$ 43,400	_____

NOTES: Equipment list explanation.

1. The internal mixer in a large U.S.A. factory would be, preferably, a large Banbury, but the cost and productivity would not be economically sound overseas in most areas. Therefore, the above internal mixer is intended to mean a small, sturdily-built mixer (preferably jacketed for external application of steam) with a rugged steel internal arm or rotor, usually Z-shaped.
2. Sheeting mill - This is a standard two-roll rubber or plastic mill with cast iron chilled rolls or steel rolls (hardened); the steel rolls are to be preferred. The size of these rolls will be from 14" to 20" in diameter and from 40" to about 50" long. The rolls rotate at the same speed -- even friction ratio. This mill will require about a 50 horsepower motor.

3. The calender recommended here is a standard steel or cast iron three-roll (or three-bowl) calender. The calender should have rolls approximately 40" long. Calender rolls should be cored for application of steam and cold water, as the occasion demands. Roll surfaces should be ground and polished and free of imperfections.

4. The cutting press is a small model 42" automatic tile cutter and will produce 500 tiles per hour with an experienced operator. Such a unit should be capable of accurately cutting tiles from 4" to 24" square or inch intervals.

5. Compounding equipment - This will consist of one heavy weighing scale (floor type) of up to 200 pounds capacity and a smaller, more accurate, scale for weighing colors, which will be of about ten pounds capacity. Various metal containers, benches and bins are included.

OTHER TOOLS AND EQUIPMENT

Description	Cost Estimated	Cost Actual
Laboratory equipment	$ 2,500	_____

Laboratory equipment - explanation

1. 3" x 8" or 4" x 9" two-roll mill with motor. This is very desirable for control tests, new test formulations, and matching colors.

2. Accessory equipment and hand tools. A dead weight plastometer (du Pont type), ring and ball apparatus, glassware, thermometers, indentation tester, flex tester.

FURNITURE AND FIXTURES

Item	Number Required	Unit Cost	Cost Estimated	Cost Actual
Desk and chair	1	$150	$ 150	_____
File cabinets	2	75	150	_____
Typewriter	1	150	150	_____
Adding machine	1	150	150	_____
TOTAL			$ 600	

SUPPLIES

Item	Annual Cost Estimated	Annual Cost Actual
Lubricants and hand tools	$ 100	_____
Maintenance materials and repair parts	1,500	_____
Office supplies	100	_____
TOTAL	$ 1,700	_____

DIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimated	Annual Cost Actual
Mixer	1	$1.50	$ 3,000	_____
Compounder and storesman	1	1.50	3,000	_____
Sheeter operator	1	1.50	3,000	_____
Calender operator	1	1.50	3,000	_____
Cutter operator	3	1.50	9,000	_____
General operator	2	1.50	6,000	_____
TOTAL	9		$ 27,000	_____

INDIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimated	Annual Cost Actual
Manager	1	$3.00	$ 6,000	_____

The manager buys, sells, keeps books and supervises the nine operators.

DEPRECIATION

Description	Estimated Cost	Years Life	Annual Cost Estimated	Annual Cost Actual
Building	$ 18,500	20	$ 925	_____
Production tools and equipment	43,400	10	4,340	_____
Other tools and equipment	2,500	10	250	_____
Furniture and fixtures	600	10	60	_____
TOTAL			$ 5,575	_____

MANUFACTURING OVERHEAD

Item	Annual Cost Estimated	Annual Cost Actual
Depreciation	$ 5,575	_____
Indirect labor	6,000	_____
Supplies	1,700	_____
Power	1,880	_____
Water	300	_____
Fuel	300	_____
TOTAL	$ 15,755	_____

MANUFACTURING COSTS

Item	Annual Cost Estimated	Annual Cost Actual
Direct materials	$ 49,240	_____
Direct labor	27,000	_____
Manufacturing overhead	15,755	_____
TOTAL	$ 91,995	_____

FIXED ASSETS

Item	Cost Estimated	Cost Actual
Land	$ 500	_____
Building	18,500	_____
Production tools and equipment	43,400	_____
Other tools and equipment	2,500	_____
Furniture and fixtures	600	_____
TOTAL	$ 65,500	_____

WORKING CAPITAL

Item		Cost Estimated	Cost Actual
Direct materials	30 days	$ 4,100	_____
Direct labor	30 days	2,200	_____
Manufacturing overhead	30 days	1,300	_____
Reserve for sales collections	30 days	10,600	_____
TOTAL		$ 18,200	_____

CAPITAL REQUIREMENTS

Item	Cost Estimated	Cost Actual
Fixed assets	$ 65,500	_____
Working capital	18,200	_____
TOTAL	$ 83,700	_____

SALES REVENUE

The current selling price, f.o.b. plant, for asphalt tile, 9 inches by 9 inches, is $.085 per piece. The annual production is 1,500,000 tiles.

Based on these figures the gross annual sales would amount to 1,500,000 x $.085, or $127,500.

RECAPITULATION OF COSTS, SALES AND PROFITS

Item	Estimated Cost		Actual Cost
Direct materials	$ 49,240		_____
Direct labor	27,000		_____
Manufacturing overhead	15,755		_____
Total manufacturing cost		$ 91,995	_____
Interest on loans	2,600		_____
Insurance	300		_____
Legal	500		_____
Auditing	900		_____
Unforeseen expense	2,205		_____
Total administrative costs		$ 6,505	_____
Sales expense		1,200	_____
Travel, bad debts, discounts and allowances, freight-out		1,200	_____
Profit before taxes		26,600	_____
Total annual gross sales		$127,500	_____

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	$_____	$ 358	$ 4,300	$_____
20	Sales	_____	200	2,400	_____
30	Direct Materials	_____	4,103	49,240	_____
40	Supplies	_____	142	1,700	_____
51	Power*	_____	156	1,880	_____
52	Water*	_____	25	300	_____
53	Fuel	_____	25	300	_____
60	Unforeseen Expense (Reserve Account)	_____	183	2,205	_____
71	Direct Labor*	_____	2,250	27,000	_____
72	Indirect Labor*	_____	500	6,000	_____
80	Depreciation (Reserve Account)	_____	464	5,575	_____

PURCHASE REQUISITION	COMPANY NAME	DATE

- ☐ 10 ADMINISTRATION
- ☐ 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

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 [illegible] 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?

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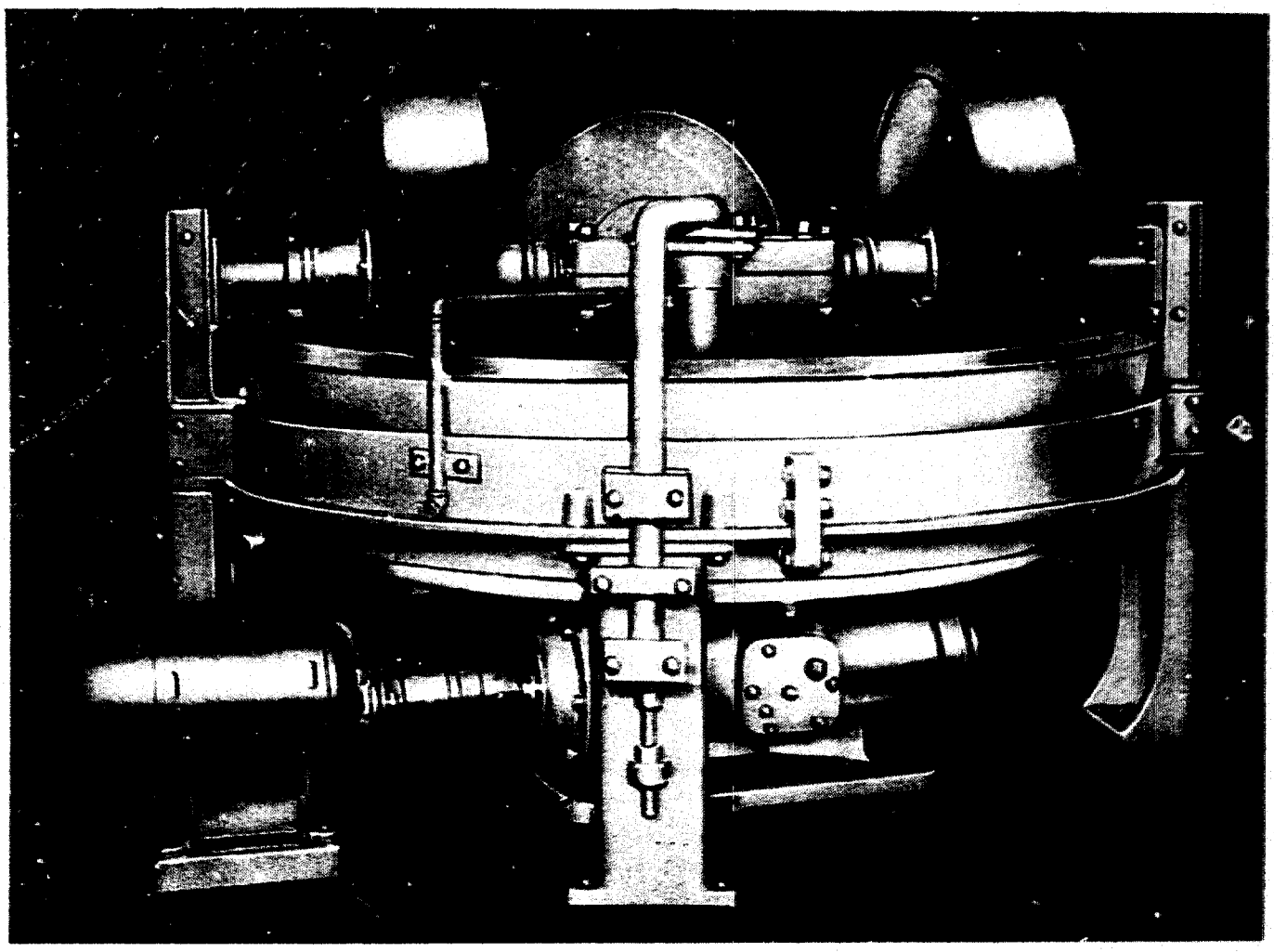
ABBREVIATIONS

^{o}F	Degree Fahrenheit
'	Feet
"	Inches
hp.	Horsepower

MIXER



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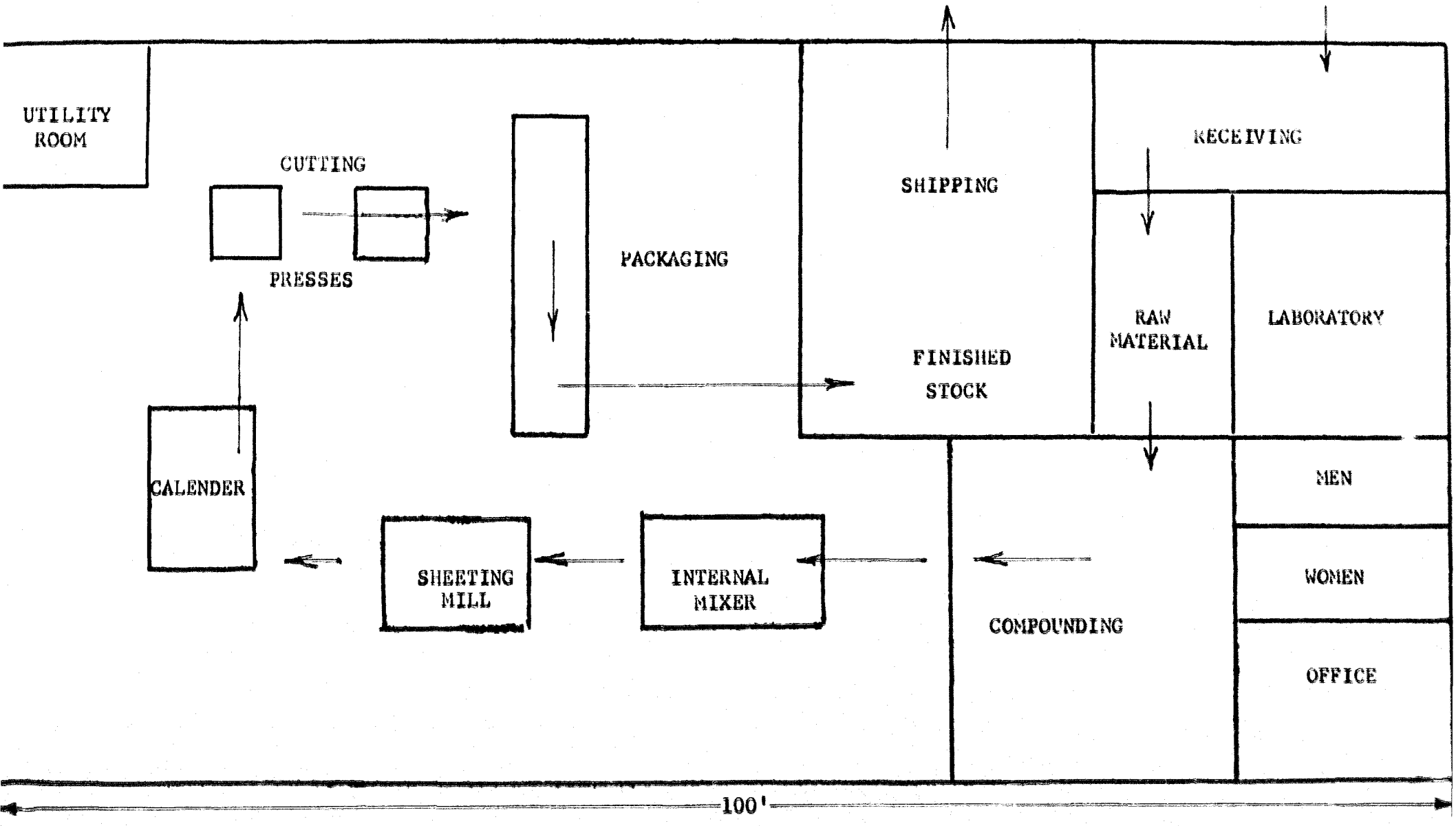
Clearfield Machine Company
Clearfield, Pennsylvania

PLANT LAYOUT

ARROWS INDICATE WORK FLOW