PLANT REQUIREMENTS FOR MANUFACTURE OF PAINT

TECHNICAL AIDS BRANCH

INTERNATIONAL COOPERATION ADMINISTRATION

Washington, D. C.

REVISED
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F O R E W O R D

This manual is a revision of an earlier report of the same type issued in 1955. This revised version includes current costs of labor, machinery, equipment and supplies, as well as additional information relative to engineering, training, safety, markets, sales, financial and economic factors.

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This manual is designed to provide a general picture of the factors which must be considered in establishing and operating a small-scale factory of this type. It should prove useful in creating interest in the subject, and serve to give enough understanding of the related considerations to help government officials, other leaders and businessmen to determine whether the potential deserves more-detailed attention.

However, it is important to note that in most cases plans for the actual development and installation of a plant will require expert engineering and financial advice in order to meet specific local situations. For further information and assistance, readers should contact their local Productivity Center, Industrial Institute, Servicio, or United States Operations Mission.

Mention of the name of any firm, product, or process in this manual is not to be considered a recommendation or endorsement by the International Cooperation Administration, but merely a citation that is typical in its field.

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The original report was prepared by the Methods Engineering Council, Pittsburgh, Pennsylvania.

Technical information, as well as review, was provided by Technical Enterprises, Inc., 31 South Street, New York 4, New York.

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This manual has been revised and rewritten by
George H. Andrews Engineering Associates, Inc.
411 Southern Building, Washington 5, D. C.

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P A I N T

INTRODUCTION

Paint is a fundamental ingredient of modern society. Its protective coating extends the life of buildings, machinery, furniture, and many other things that are essential parts of a modern economy.

Paints consist generally of finely powdered pigments suspended in an oily vehicle which will dry to a solid when spread thin and exposed to air. Other ingredients are added to hasten drying, to give greater fluidity, opacity, or other physical characteristics, or to provide certain chemical properties such as resistance to color change and the like.

Recent research has led to the development of many types of paints, each with its own advantages. They are all, however, made by the same basic processes.

Paint is made in the United States by a great many small companies. Since large-lot production is not essential to low cost, it is more economical to have many small plants scattered throughout the market than it is to have a centralized large plant with high shipping costs to distant markets.

GENERAL ASSUMPTIONS

In order to make realistic estimates in this manual, 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.

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. and fifty weeks per 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. 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.

10. Each machine will be set up to do one operation on one particular product most of the time. Apart from slight adjustments, no setup time is required and none is allowed in the unit cost calculations.

PRODUCT SPECIFICATIONS

Detailed product specifications will depend on the type of market available, the end uses for which there is a demand, and the availability of material.

This report provides capital requirements for a reasonable assortment of material for making common, readily-salable paints. Exact formulation should be done by an expert in this field.

It is assumed that the largest market for paint will be in "shelf goods" -- that is, standard packages of one gallon or less sold from retail stocks by paint and hardware stores. There should also be an opportunity for direct sales to industrial users.

The plant described will be adequate to produce a limited line of paints packaged in small quantities. As additional production becomes necessary, additional equipment can be added as explained in the section "Provision for expansion."

MANUFACTURING OPERATIONS

The operations required to produce paint are:

1. Mixing ingredients
2. Grinding ingredients (dispersing)
3. Reducing to proper consistency
4. Shading (colorizing)
5. Packaging

The ball or pebble mill is considered to be the most versatile type of mill for carrying out the mixing and grinding operations. The principle of the operation of this type of grinder or mill is that the action of the balls, or pebbles, as they cascade from the lifter bars at the high point of the periphery to the bottom of the mill accomplishes the effect of dispersion. By dispersion is meant the breaking down of the pigment agglomerates and the wetting of the individual particles with vehicle to prevent re-agglomeration.

This operation is commonly referred to in the industry as "grinding," but what is actually meant is "dispersing." Dispersing refers to particle separation plus even distribution in the dispersing medium, while grinding implies particle size reduction.

The pebble mill, figure 1, which has been selected for this proposed plant, in view of its adaptability, is half filled with pebbles at the initial charge. The vehicle is next added in sufficient quantity to reach the top of the pebble charge. The dry materials, or pigments, are added last. The mill is run for the required number of revolutions, then stopped -- and the completely ground wet product is discharged through the outlet valve. The operating capacity is approximately 70% of the total volume.

The size of the pebbles used ordinarily runs from 1 1/4" to 1 1/2" in diameter. Either flint or porcelain pebbles may be used. The porcelain pebbles have an advantage in uniformity of size, while in wear resistance the flint pebbles have a definite superiority over the porcelain pebbles.

The speed at which the mill is run is determined from the critical speed, the critical speed of the mill being that speed at which a pebble at the periphery of the mill would be carried completely around the mill. The critical speed of any mill can be determined by dividing a constant of 76.6 by the square root of the mill diameter in feet. In the case of a 3'6" diameter mill, as proposed in this report, this would be 76.6 divided by the square root of 3.5 (1.87) or about 41 RPM. It has been determined that the optimum speed of a mill with lifter bars is approximately 60% to 70% of the critical speed, or in this case, about 27 RPM.

The pebble size is, of course, uniform only when the mill is initially charged, and, as losses are replaced, the mill eventually will have a range of sizes from the initial size on down. Thus it is apparent that some schedule of screening out the worn pebbles is advisable. The rate of pebble wear depends largely on the type of pigment being ground, with the hard, coarse pigments wearing out the pebbles more rapidly than the softer types. The schedule for replacement of pebbles in the proposed mill would be determined by experience gained during its operation.

It is common practice in plants of this size to charge the mill just before the end of the working day, and allow it to run overnight with only a watchman in attendance. This procedure makes it possible to get more than one batch per day from the mill.

The feasibility of such a night operation depends on the amount of paint to be processed. Running the ball mill day and night will provide about 40% greater output but will require at least two additional people.

The figures in this report are based on daytime operation only.

When the ingredients have been ground to the point where the desired dispersion occurs, the paint is emptied into mixing containers for reduction and shading, using a portable mixer similar to the one shown in figure 2. Reduction is the process of mixing additional vehicle or other liquids to achieve the proper consistency.

Shading is the addition of small amounts of color pigment to obtain the desired color of the batch.

The foregoing operations are relatively simple, but the operations of shading and reducing do require an operator with experience and training in these lines.

The proportions of pigments and vehicle that go into the mill must be determined by an expert in the formulation and shading of paint. He would also be responsible for determining the schedule for recharging the mill with pebbles.

The finished paint is poured into cans and the cans are labeled and packed for shipment. Most paint is shipped by truck in the United States because more rapid and convenient service to small distributors and dealers can be provided in this way.

MANUFACTURING UNIT USED

In the United States paint is measured in United States standard gallons. Package quantities range in size from one gallon to as small as one-quarter pint (2 fluid ounces). Commercial packages of five and ten gallons are available in some types of paint. Large quantities are put up in 55-gallon steel drums.

It is therefore necessary for the paint manufacturer to ship paint in all of the different size containers in which it is to be marketed.

The plant described in this report is capable of producing an average of 100 gallons of paint per day. This paint can be packed in the sizes of containers for which there is a demand.

DIRECT MATERIALS

The list of paint ingredients shown on page 6 represents the requirements for the group of six paints listed below. These six comprise a typical product mix. The quantities of these paints are chosen so that the smallest is not less than the amount produced in one batch.

Gallons	Type of Paint
1,000	Simple white lead
500	Red lead primer
300	Ready mixed aluminum
700	One-coat exterior house paint
200	Primer-sealer for plaster and wallboard
300	Interior flat wall paint
3,000	

The quantities of direct materials shown on page 6 are necessary to produce 3,000 gallons of the six different paints listed. This quantity of paint is the result of six weeks' production. The annual production will amount to 25,000 gallons.

Direct materials required for typical product mix for six-week period

Description	Pounds	Unit Price	Total Price	Actual Unit Price	Actual Total Price
Basic carbonate white lead	13,980	$ .17	$ 2,377		
90% red iron oxide	250	.10	25		
98% red lead	2,025	.17	344		
Magnesium silicate	1,000	.15	150		
Standard aluminum paste	462	.43	199		
Anatase titanium dioxide	490	.23	113		
Titanium calcium pigment	6,056	.09	545		
Lead-free zinc oxide	1,386	.14	196		
3x asbestine	400	.14	56		
Precipitated calcium carbonate	1,490	.20	298		
Aluminum stearate	12	.34	4		
24% lead naphthanate	156	.24	37		
6% manganese naphthanate	14	.27	4		
6% cobalt naphthanate	20	.49	10		
	Gallons				
Mineral spirits	466	.18	84		
Aromatic solvents	25	.20	5		
Vehicle (oil)	1,828	1.60	2,925		
Cans and cartons			600		
Total			$ 7,972		

The market requirements in a given area may dictate a product mix entirely different from that shown. The total cost of ingredients, however, will not differ widely from that given above unless large quantities of high grade, bright colored enamels are to be made.

Paint ingredients for six weeks' production cost $7,972. The total cost of direct materials for one years production will, therefore, amount to $66,433.

PRODUCTION TOOLS AND EQUIPMENT

To facilitate beginning production with minimum capital investment, the equipment listed below is simple and inexpensive. It is assumed that paint in process will be handled in 55-gallon drums with one head removed.

Production tools and equipment needed

Description	Hours for One Week's Production	Number Required	Installed Price Each	Total Price	Actual Price Each	Actual Total Price
Pebble mill 3'6" diameter x 4' long	40	1	$ 2,200	$2,200	____	____
Drive for mill 7 1/2 horsepower	40	1	1,600	1,600	____	____
Pebbles for mill		2 charges	100	200	____	____
Portable mixer 1/2 horsepower	20	1	400	400	____	____
Drums for handling		10	6	60	____	____
Miscellaneous scoops, ladles				50	____	____
Hand truck		2	45	90	____	____
Scale for weighing materials 1,000 pound capacity		1	200	200	____	____
	Total			$4,800		

OTHER TOOLS AND EQUIPMENT

Tools and equipment required other than for production

Description	Number Required	Price Each	Total Price	Actual Price Each	Actual Total Price
Laboratory - quality control equipment			$ 300		
Miscellaneous maintenance tools			100		
Typewriter for office	1	$ 150	150		
Total			$ 550		

FURNITURE AND FIXTURES

Furniture and fixtures needed

Description	Number Required	Price Each	Total Price	Actual Price Each	Actual Total Price
Bins and shelves for storing pigments			$ 200		
Storage shelves for empty cans and finished product			200		
Miscellaneous work benches	3	$ 30	100		
Desk and chair for office	1	100	100		
File cabinet	1	50	50		
Total			$ 650		

PLANT LAYOUT

Figure 3 shows a typical plant layout for a small paint plant. The elevated area for pigment and vehicle storage is highly desirable to facilitate loading the pebble mill. It is even more desirable for some of the other types of mills which may be used.

Distribution of plant area is approximately as follows:

Department	Area (square feet)
Pigment and vehicle storage	60
Material unloading	40
Mill loading	40
Vehicle storage for thin-down	40
Mixing area	130
Empty can storage	40
Can filling area	120
Finished product storage	240
Office	80
Rest room	50
Aisles, steps, and miscellaneous	60
Total	900

PLANT SITE

To provide for eventual expansion the plant site should contain about 2,000 square feet. The amounts of materials used in a plant of this size are small enough that transporation can be ertirely by truck. Rail access may be valuable if expansion is considered.

The availability of large amount of power, water, or other facilities need not influence the coice of the plant site.

The cost of the plant site is estimated at $500.

BUILDING

A one story building of about 900 square feet is adequate and can be constructed with any fire proof material such as steel or masonry.

Provisions should be made for natural illumination of the mixing area to guide the shading operation.

It is important that pigments in storage be kept dry to avoid deterioration and caking.

The cost of the building including the necessary plumbing, wiring, and heating facilities is estimated at $5.00 per square foot or about $4,500.

UTILITIES

The annual cost of power, water and fuel should not exceed $900.

DEPRECIATION

Estimated depreciation schedule

Item	Cost	Actual Cost	Years' Life	Depreciation per Year	Actual Depreciation per Year
Building	$4,500	_____	20	$225	_____
Production tools and equipment	4,800	_____	10	480	_____
Other tools and equipment	550	_____	10	55	_____
Furniture and fixtures	650	_____	10	65	_____
Total				$825	_____

DIRECT LABOR

Only two operators will be required in this plant. At $1.75 per hour the annual cost of direct labor would amount to $7,000.

INDIRECT LABOR

The managers salary of $8,000 will constitute the total indirect labor. The manager will have to be experienced in paint manufacturing. He will be responsible for the mixture of materials to produce the various paint products required, as well as, the testing and analyst work required in the laboratory for quality control. He will also do the buying and selling and keep all books and records.

SUPPLIES

Item	Estimate	Actual
Maintenance	$100	_____
Lubricant and hand tools	50	_____
Office supplies	250	_____
Total	$400	_____

MANUFACTURING OVERHEAD

Item	Estimate	Actual
Depreciation	$ 825	
Indirect Labor	8,000	
Utilities	900	
Supplies	400	
Total	$ 10,125	

MANUFACTURING COST

Direct Materials	$ 66,433	
Direct Labor	7,000	
Manufacturing Overhead	10,125	
Total	$ 83,558	

FIXED ASSETS

Land	$ 500	
Building	4,500	
Production tools and equipment	4,800	
Other tools and equipment	550	
Furniture and fixtures	650	
Total	$ 11,000	

WORKING CAPITAL

Direct Material	- 30 days	$ 5,530	
Direct Labor	- 30 days	580	
Overhead	- 30 days	840	
Reserve for sales collection	- 30 days	12,050	
Total		$ 19,000	

CAPITAL REQUIREMENTS

Fixed Assets	$ 11,000	
Working Capital	19,000	
Total	$ 30,000	

SALES REVENUE

A manufacture, operating a plant to that described in this report, could expect to receive an average price for his products of about $4.80 per gallon. On this basis the annual gross sales would amount to about $120,000.

The manager should be able to devote some of his time to actual sales. In addition a commission salesman will be required. Direct sales should be made to industries using large quantities of paint. On this basis the annual selling costs are estimated at $13,000.

RECAPITULATION OF COSTS, SALES AND PROFITS

Item		Estimate	Actual
Direct Materials	$ 66,433		
Direct Labor	7,000		
Manufacturing Overhead	10,125		
Total Manufacturing Cost		$ 83,558	
Interest on Loans	$ 600		
Insurance	300		
Legal	300		
Auditing	300		
Unforeseen Expense	1,942		
Total Administrative Cost		3,442	
Sales commissions, freight out, travel, discounts, allowances and bad debts		13,000	
Profit before Taxes		20,000	
Gross Sales		$120,000	

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	$_____	$ 125	$ 1,500	$_____
20	Sales	_____	1,083	13,000	_____
30	Direct Materials	_____	5,537	66,433	_____
40	Supplies	_____	33	400	_____
51	Power*	_____	25	300	_____
52	Water*	_____	25	300	_____
53	Fuel	_____	25	300	_____
60	Unforeseen Expense (Reserve Account)	_____	180	1,942	_____
71	Direct Labor*	_____	583	7,000	_____
72	Indirect Labor*	_____	666	8,000	_____
80	Depreciation (Reserve Account)	_____	69	825	_____

Note: Administrative includes interest on loans, insurance, legal and auditing.

PURCHASE REQUISITION	COMPANY NAME	DATE

☐ 10 ADMINISTRATION ☐ 40 SUPPLIES

☐ 20 SALES ☐ 50 UTILITIES

☐ 30 MATERIALS ☐ 60 UNFORESEEN EXPENSE

INDICATE BELOW THE USE OF MATERIALS

☐ DIRECT MATERIALS ☐ MAINTENANCE SERVICES

☐ MAINTENANCE MATERIALS ☐ 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

YOUNG & SELDEN CO

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 ards 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.

SUMMARY

A small plant, built and operated according to the assumptions made in this manual would be a profitable undertaking.

There are some determinations, however, that should be made before a decision is reached to build and operate such a plant. Among the necessary determinations to be made are those with respect to the following items:

MATERIALS AND SUPPLIES:

1. Are all materials and supplies available locally?
2. Is the local material market competitive?
3. Are 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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Paint & Varnish Manufacturing — Transatlantic Arts Inc. Hollywood-by-the-Sea Florida

Periodicals

Paint & Varnish Production — Powell Magazines Inc. 855 Avenue of the Americas New York 1, New York

Paint, Oil & Chemical Review — Trade Review Company 332 Harrison Street Oak Park, Illinois

ABBREVIATIONS

'	Foot or feet
"	Inch or inches
%	Percent
RPM	Revolutions per minute

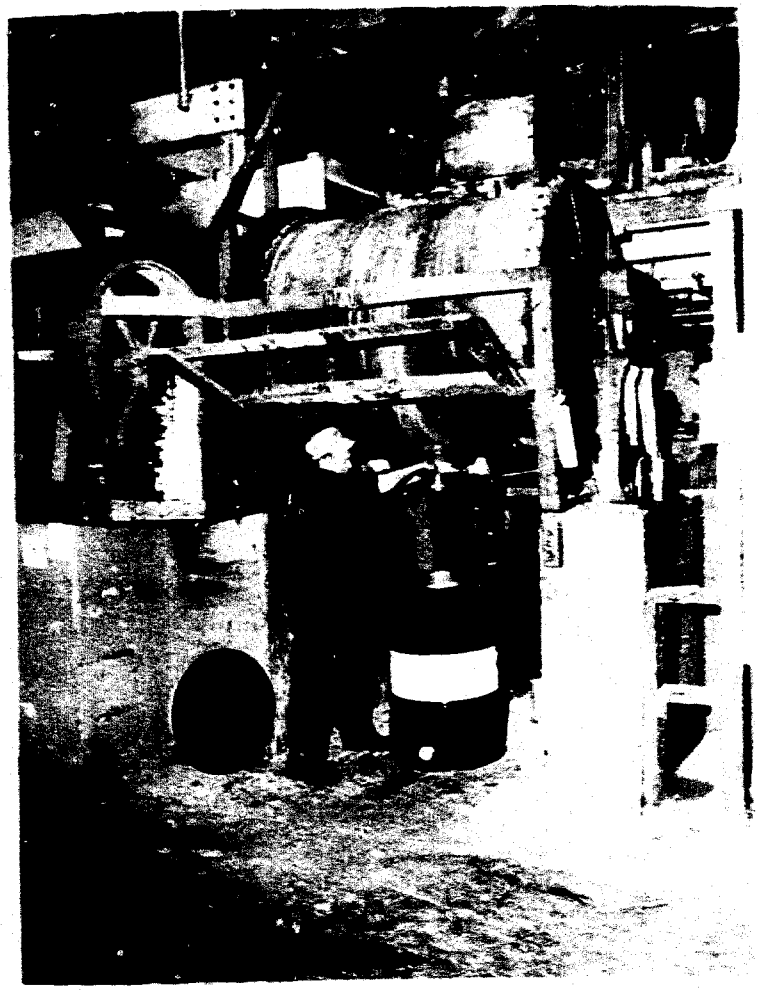

Figure 1 - Pebble Mill

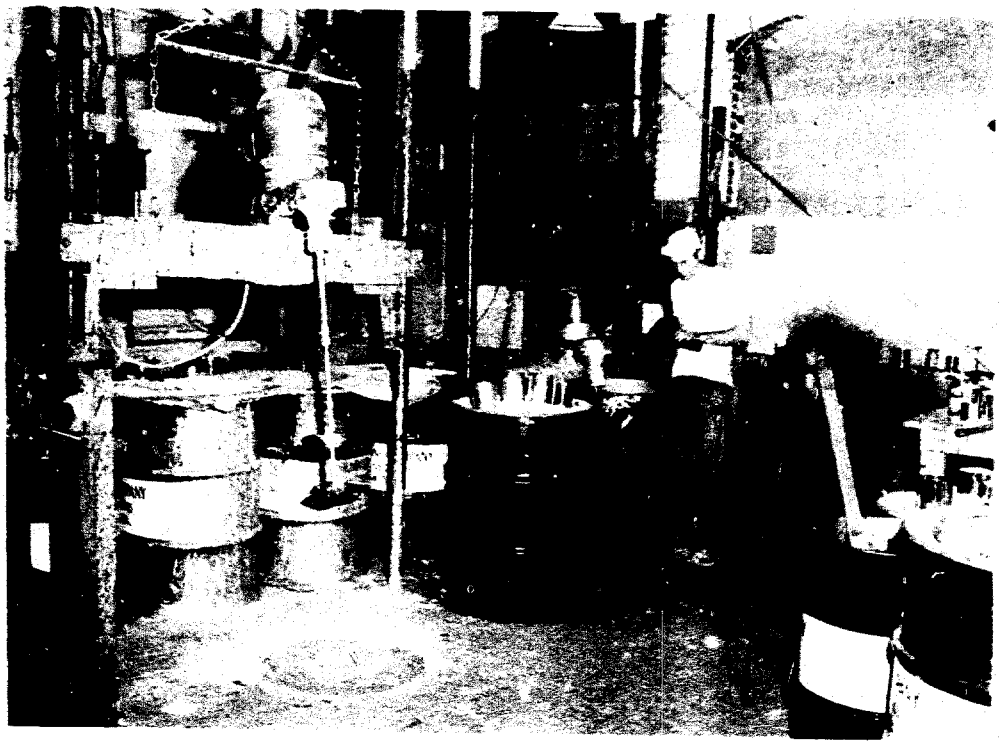

Figure 2 - Reduction and shading of paint using paint mixer

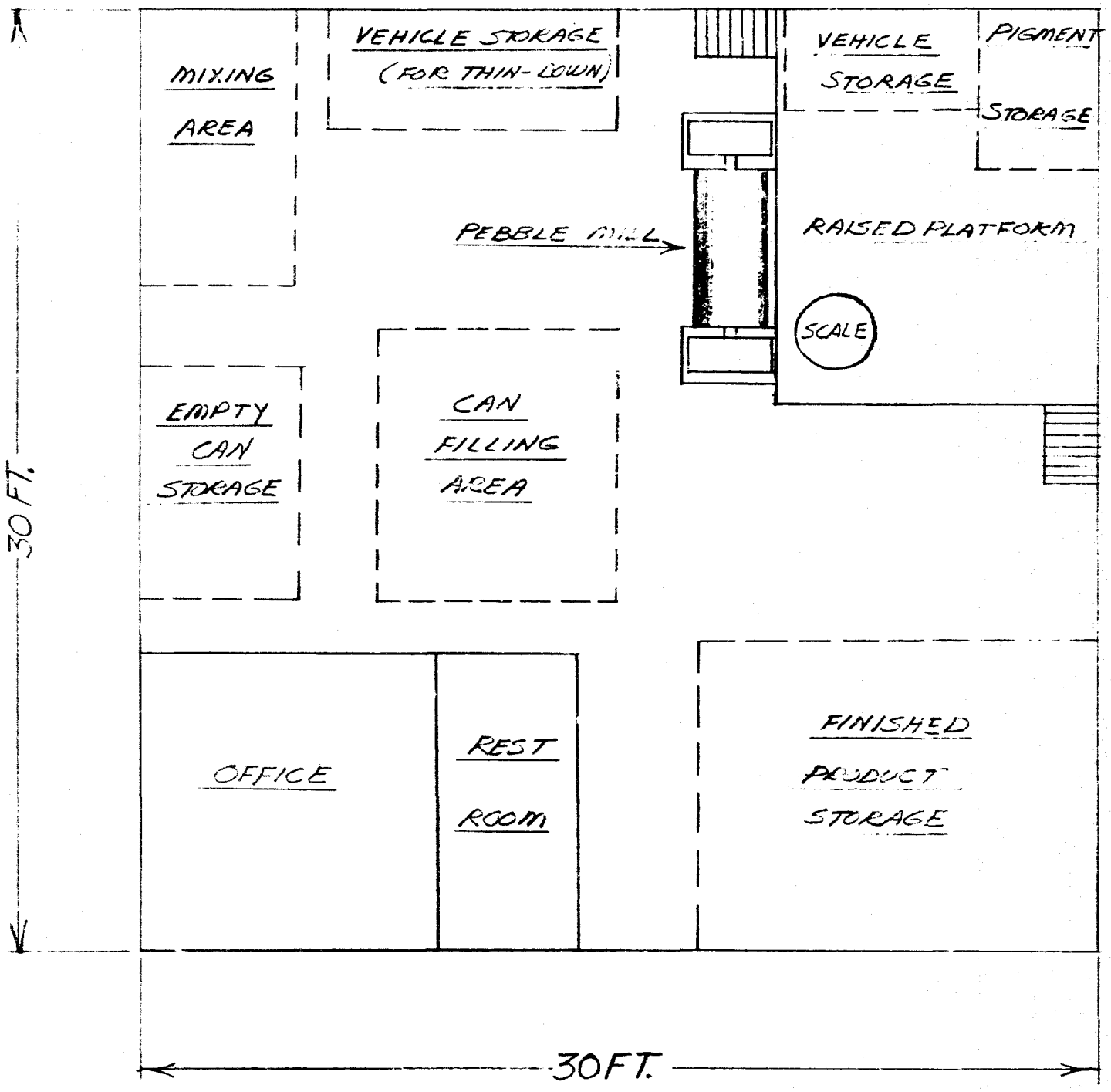

Figure 3 - Typical layout for small paint plant

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