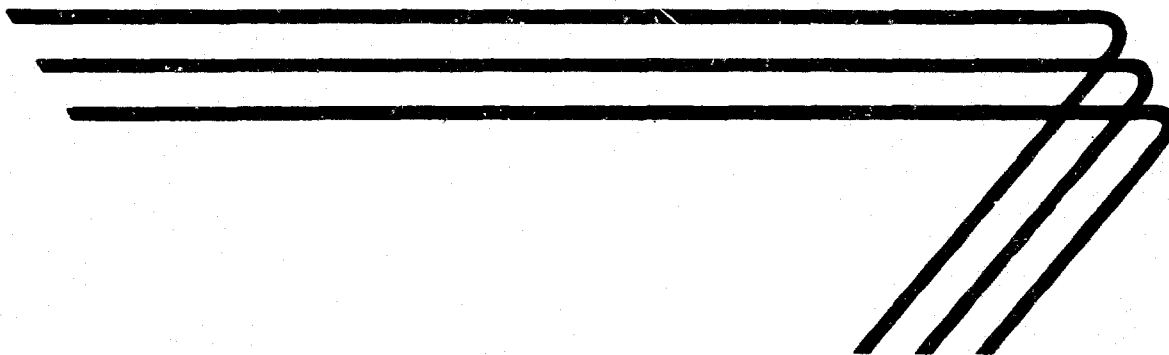


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PLANT REQUIREMENTS FOR MANUFACTURE OF SOUVENIRS AND SMALL JEWELRY



DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
COMMUNICATIONS RESOURCES DIVISION

Washington 25, D. C.



A.I.D.
Reference Center
Room 1656 NS

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.

This report was prepared in November 1956 by H. D. Nottingham and Associates, Arlington, Virginia, for the industry program through the facilities of the Office of Technical Services, U. S. Department of Commerce.

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

Code Number
FR-112

SOUVENIRS AND SMALL JEWELRY

INTRODUCTION

The establishment of a souvenir and small jewelry plant is an extremely variable undertaking due to the many ramifications. Questions which are invariably posed concerning this endeavor include, among others, "How many different types of products should I produce", "How many different variations of each type should I produce," "Should I concentrate on just one line of production such as metallic, or should I have many", "If I have more than one line, and how many should I have". The answer to these, and other questions, depend on too many elements to precisely answer them for any given locale. Consideration must be given to the demand (ie. is it for local consumption, interior distribution, or export?), facilities and capital available, materials locally available or importable at a reasonable cost, skill of available laborers, and other factors. Regardless of all other considerations in establishing a plant of this type, the primary factor is production control. Illustrative of this is the clay and glaze control required in the ceramics field for a consistently high grade of production.

The amount and type of production are pure assumptions, and an infinite number of variations of production types and amounts, both for initial plant establishment and post-operative enlargements, are possible. The plants described herein may be established as individual operations in the manner described; they may be combined into one operation; or a combination of plants which may be utilized with other type plants.

GENERAL ASSUMPTIONS

The following assumptions have been made in order to reduce this report to a useable size.

1. A minimum of two products, but preferably more, should be manufactured. For the purpose of this report three types of products have been considered. They are: conventional jewelry, ceramic souvenirs and jewelry and wooden souvenir products. Initial plant establishment may be any one of or combination of the three.
2. Although plant production will probably be of a seasonal nature, depending on the location and type of production, it has been assumed for this report that production will be on a year-round basis.
3. A market is or may readily be made available.
4. Adequate and suitable water, sewage, electrical, material and transportation facilities are or may readily be made available.
5. Adequate and suitable labor is readily available.
6. The numbers and types of products to be manufactured give sufficient variety for selected sales.
7. Enlargement of production types during initial stages of operation is only a small capital consideration, since in most cases it requires only additional molds.
8. Plant equipment and materials used are based on estimated commercial prices. If the resulting capital requirements prove to be prohibitive they may readily be lowered by either making your own equipment, or performing the operations by hand. For example, clay prices have been based on estimated commercial prices for refined clay. This may be circumvented by refining and preparing your own clay, providing it is locally available. In like manner, large reductions may be made in initial capital requirements and overhead expenses by preparing your own glazes. For further possible reductions, see the descriptive areas of each of the three sub-plant establishments.
9. This report is divided into three descriptive parts to fully cover all phases of the different types of manufacturing plants described herein.
10. For each of the plants described, only a limited number of products, simple in design, and easy to manufacture are considered. In each case, special orders or custom jobs might be accepted to increase the total plant revenue.
11. The diversity of the final product of each of the plants is so great, that care should be taken during the initial stages of production so that too many types of products are not undertaken. The resulting ramifications could prove to be a disadvantage.

12. Although each of the plants has been set up separately and specializing in specific fields, each of them is capable of multiple operations. The jewelry plant may also produce souvenirs, just as the ceramics and wood products plants are capable of producing jewelry. Since each of the plants were designed as a small enterprise, it was felt that the initial stages of production should be on a specialized basis.

PART I - JEWELRY

GENERAL ASSUMPTIONS

1. It is assumed that the owner-operator is experienced in the production of jewelry.
2. Although many methods of production are available, only one technique, the precision casting method, has been utilized in order to hold material, equipment and labor requirements to a minimum.
3. The figure of fifty items per day of production is only an assumed figure, and should not be construed as either a maximum or minimum goal. Since the possible types of products are extremely varied, concrete figures cannot be established as being "the plant production capacity." Dependent upon types, quality and other variables, production might feasibly vary from ten or twelve items a day, to exceed a hundred. For the basis of later estimates and calculations, the figure of fifty items per day has been used.
4. Although mold materials have been included under material requirements, it is assumed that all models and molds for initial plant use have been either made, or preferably purchased, in advance of actual operations.
5. All items produced during the early stages of operation are assumed to be simple in nature, and of neither a cheap, gawdy nature, or excessively expensive such as custom contracts. Production, for the most part, would be of the simple ring, bracelet, necklace and scatter pin variety. The addition of more complex and expensive items should be undertaken only after firm establishment of the plant.

PRINCIPLES OF MANUFACTURING

The manufacturing of jewelry may be as simple or as complex as desired, depending upon the type of materials used, the type of design employed, and many other variables. It may be mass produced by the production line method, or it may be predominantly of the hand made, custom type. Regardless of the type and technique employed, the primary consideration should be quality, not quantity; and the governing factor here will normally revolve around production control. The so-called production type of jewelry obviously may not be obtained by the hand made processes, so emphasis has been placed in this brochure on the more mechanical means of jewelry production which will give quality as well as quantity. Foremost in the production line methods of jewelry manufacturing are the die-stamping and the "lost-wax" casting techniques. It has been assumed for the purpose of this report that the precision casting, or "lost-wax" casting method will be the most economically feasible, and will lend itself more readily to small operations.

Although precision casting by the lost-wax process dates back thousands of

years to the Chinese, it has only been utilized in the jewelry field since the late 1930's.

The first step in the casting of jewelry by this process is to make a master pattern of the object to be cast. This master pattern may be of wood, plastic or metal. It must be exact in specifications, including allowances for shrinkage in subsequent operations. Following the completion of the master pattern, a mold is made by one of three following methods: Machine tooled out of steel; a low-fusing metal or metal alloy may be cast around or against the pattern; or it may be made by vulcanizing rubber against the pattern. Although all three methods are acceptable, most present day jewelers tend to prefer the use of the vulcanized rubber method. To prevent distortion the low-fusing metal molds are frequently utilized.

At this point, you are ready to make a wax pattern from the mold. This is accomplished by forcing molten wax into the mold by centrifugal force or injection. The resulting pattern is expendable, and in case of breakage, can be re-melted and re-used. Depending upon the type of object to be made, the master pattern, master mold, and wax patterns may be in one, two, or more parts. In any event, one wax pattern must be made for each casting. This is a small problem since the master pattern and master mold may be re-used innumerable times. Since the primary consideration here is profit, as many patterns as the flask will accommodate at one time are fastened to a wax rod, called a sprue, forming a "tree" of wax patterns. The maximum utilization of the flask capacity is required for ultimate economy of operation.

After the "tree" is made, it is placed in a cylindrical steel flask into which is poured the "investment", a plaster-like material capable of withstanding extremely high temperatures. After the investment has hardened, which usually requires about one-half hour, the flask, or casting ring, is heated until the wax melts, drains out of the opening formed by the tree sprue, and is completely burned. This phase of the process is normally referred to as the burn-out, and produces the hollow pattern of the objects to be made. During this phase, the wax is not only eliminated, thus the name "lost-wax method", but the mold is being heated to the proper temperatures for the actual casting to begin. After the wax has been dissipated in this manner, the flask is placed on a machine which whirls rapidly, causing the metal to completely fill all cavities of the mold by centrifugal force. The flask is then cooled, the investment is removed from the casting, and the individual articles are cut from the sprue tree. Except for polishing (and assembling, if required) the process is complete.

Figure 1 shows a typical flow line which indicates the above processes.

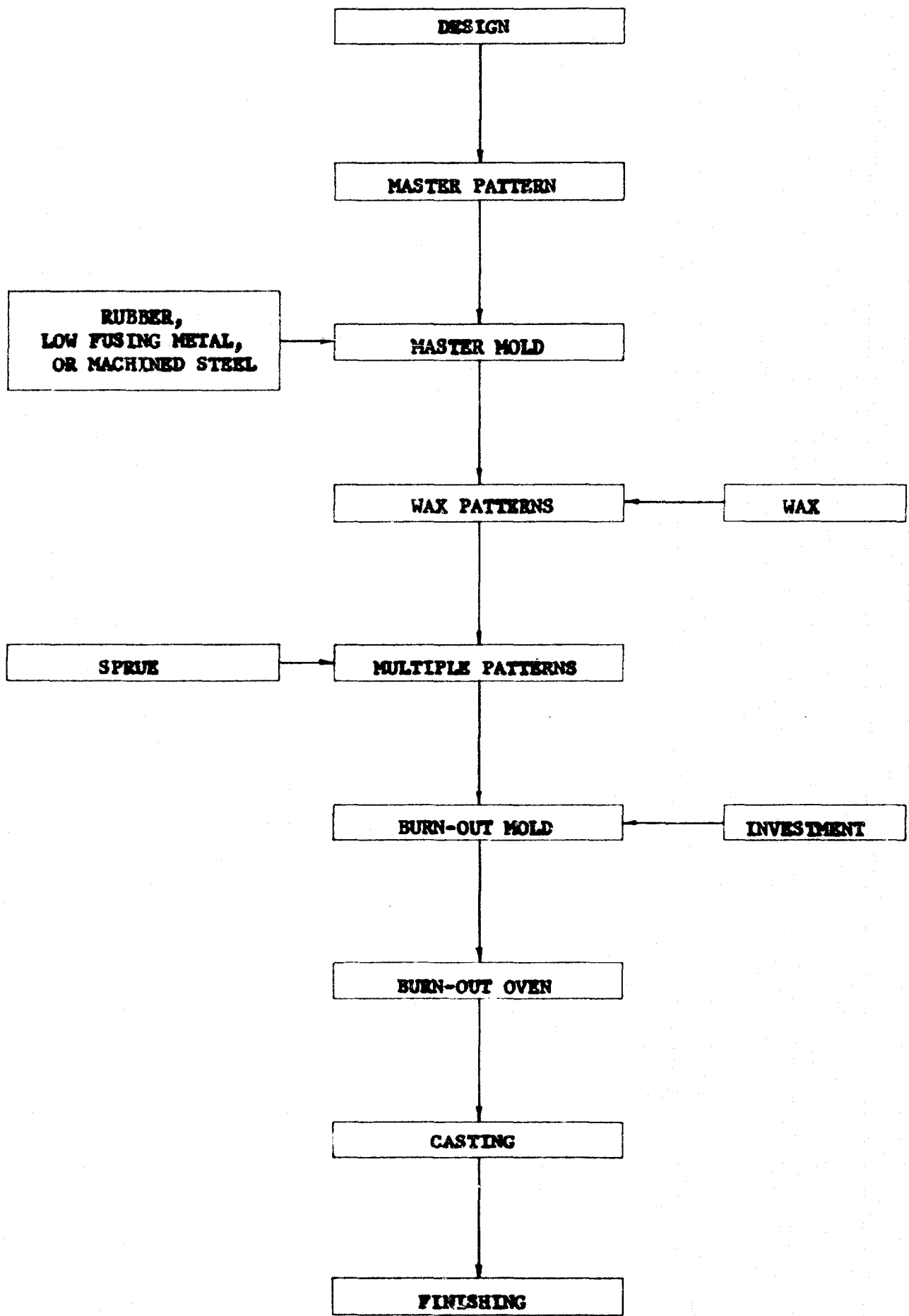


Figure 1. Typical flow diagram for a jewelry plant

BUILDING REQUIREMENTS

PLANT LOCATION

The location of a small plant is variable due to its small size, and the primary consideration is nearby transportation facilities for easy importation of required supplies and the export of completed products. Since the plant may be set up in conjunction with the wood-products plant described in Part II, the basic considerations for location will be the same as the ones described therein.

PLANT LAYOUT

The layout of a plant of this nature is also variable, dependent upon the individual concerned. Since the plant described herein is designed as a very small operation, any number of variations are possible. A suggested layout is shown in figure 2.

Floor space allowances for a plant capable of manufacturing fifty articles of jewelry a day are as follows:

		<u>Square Foot</u>
1. Office -----	10' by 10'	100
2. Production Room -----	10' by 15'	150
3. Model Room -----	5' by 10'	50
4. Display Room -----	10' by 10'	100
5. Materials Storage Room --	5' by 10'	50
6. Packaging, Storing, and Shipping Room -----	10' by 15'	<u>150</u>
	Total	600

This building is rather liberal in size for all but the production room and would cost approximately \$5,000.00 for all cinder block construction. In the event that sufficient initial capital is not available, considerable savings may be implemented by combining the display room with the office, the model room with the production room, and the materials room with the packaging and shipping room. With just these small changes, the initial square footage can be reduced from 600 square feet to 400 square feet. This, in turn, would reduce the estimated building cost to about \$3,600.00. All of the above areas may be combined into one room if so desired.

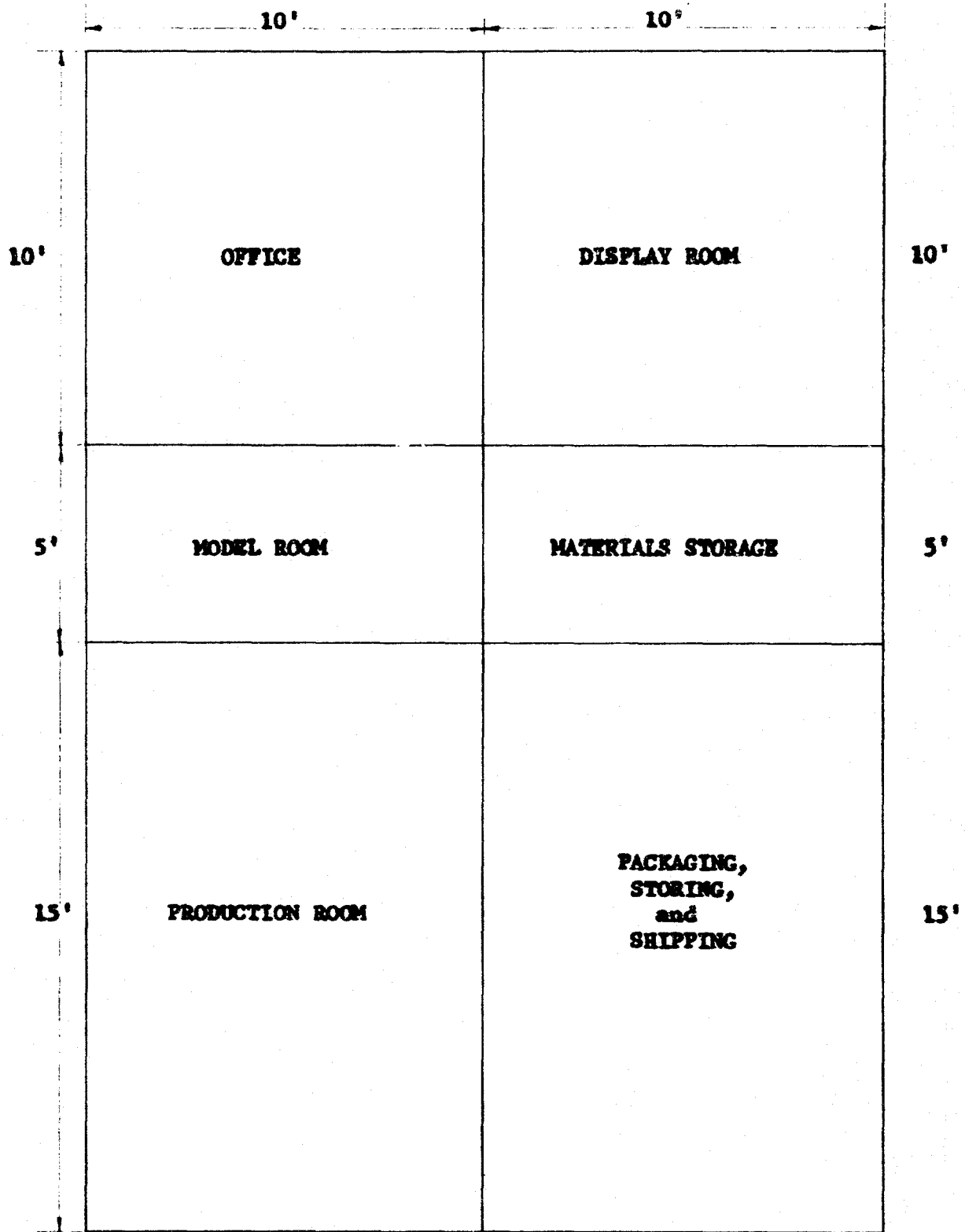


Figure 2. Suggested layout for a jewelry plant.

EQUIPMENT REQUIREMENTS

	<u>Estimated Cost</u>
1. Model Makers' Tools (knives, drills, awls.)	\$200.00
2. Model Makers' Work Bench	handmade
3. Rubber Mold Making Equipment	
Small Vulcanizer	\$ 75.00
Mold Frames (10 @ \$7.00)	70.00
Carving Tools (10 @ \$2.00)	20.00
Knives (2 @ \$2.00)	4.00
Incidentals (sprue formers, treeing rods, spatulas, sprue cutters, timer.)	<u>131.00</u>
	300.00
4. Mold Makers' Work Bench	handmade
5. Wax Pattern Making Equipment (crucibles, wax pots, burners, wax injectors.)	200.00
6. Wax Pattern Work Bench	handmade
7. Investing Equipment	
(flasks of varying sizes, sprue bases, vacuum machine mixer, mixing bowls.)	450.00
8. Work Bench for Investing	handmade
9. Wax Burn-Out Equipment (burn-out oven, tongs, gloves.)	200.00
10. Melting furnace, tongs, crucibles, torches.	100.00
11. Work Bench	handmade
12. Casting Machine, Crucibles, and Miscellaneous Equipment	200.00
13. Work Bench	handmade
14. Incidental Equipment (polishing, files, gauges, mill- ing and soldering equipment, saws.)	<u>100.00</u>
Total Cost	\$2,250.00

NOTE: The preceding estimates are considered liberal and reflect the cost of neither the more expensive nor the less expensive type equipment. In the event that initial capital will not cover these estimates, considerable reductions may be made throughout. Also, some of the equipment, other than the work benches may be handmade or purchased second hand.

LABOR REQUIREMENTS

Although the plant described herein is basically designed as a one-man plant, the cost of one laborer is included to ease the owner-manager's work load and to increase production. Based on the plant described, the work load is broken down as follows:

<u>POSITION</u>	<u>DUTIES</u>	<u>ESTIMATED MONTHLY SALARY</u>
1. Owner-manager	Manages plant, keeps records, makes sales, maintains equipment, makes models, and molds (if possible), assists in actual production.	Percentage of gross receipts.
2. Laborer	Makes wax models, handles burn-out, casting and stipping operations, polishings, and other related duties.	\$400.00
3. Contract Labor	Special models or molds	<u>200.00</u>
		\$600.00

NOTE: The addition of the contract labor is to cover the cost of any models beyond the capabilities of the owner-manager, and to cover the cost of any special models or molds purchased. It is recommended for a small operation of this type that models and molds be purchased from an established supplier. This will eliminate initial capital outlay for model and mold making equipment and supplies.

MATERIAL REQUIREMENTS

The material requirements should be sufficient in quantity to keep the plant operating at maximum capacity for one month (20 working days). It is recommended not to spare any cost in ordering working items, as the finer the materials utilized, the finer the end product.

ESTIMATED COST

1. Mold Rubber (5 lbs. @ \$3.00 per lb.)	\$ 15.00
2. Molding Wax (50 lbs. @ \$2.00 per lb.)	100.00
3. Investments (varying kinds)	100.00
4. Molding Metal (10 lbs. @ \$4.00 per lb.)	40.00
5. Incidentals	<u>160.00</u>
	\$ 415.00

NOTE: This material requirements list includes only the major items required with the rest combined under incidentals. The quantity of precious metals (gold, silver) or base metals for finished products are extremely variable depending on the amount of production and concrete estimates of monthly cost cannot be ascertained. A plant of this type might vary in the use of precious metals from \$50.00 to \$5,000.00 a week.

OVERHEAD RATE

ESTIMATED DEPRECIATION

<u>Item</u>	<u>Cost</u>	<u>(Years) Estimated Life</u>	<u>Estimated Yearly Depreciation</u>
Building	\$5,000.00	25	\$200.00
Equipment	2,250.00	15	112.50
Maintenance (based on 3% of building and equipment cost. or 0.03 x \$7,250.00)			<u>217.50</u> \$530.00

Estimated Monthly Depreciation and

Maintenance equals ----- $\frac{\$530.00}{12}$ = \$44.17

OVERHEAD

Electricity	\$50.00
Water	10.00
Incidentals	20.00

Total Estimated Monthly Overhead

1. Electricity	\$50.00
2. Water	10.00
3. Incidentals	20.00
4. Depreciation	<u>42.92</u>
	\$122.92

NOTE: The above depreciation estimates were based on the following figures:

1. Building ----- 4% annually on the total building cost.
2. Equipment ----- 5% annually on the total equipment cost.
3. Maintenance ----- 3% annually on the total building and equipment cost.

UNIT COST OF MANUFACTURING

<u>Item</u>		<u>Estimated (per item)</u>
Labor:		
	<u>\$600.00</u>	
	50 items/day x 20 days/month	= \$0.60
 Overhead		
	<u>\$122.92</u>	
	50 items/day x 20 days/month	= 0.12
 Materials:		
	<u>\$415.00</u>	
	50 items/day x 20 days/month	= <u>0.42</u>
		\$ 1.14

NOTE: The figures above are for production only, and do not reflect the value of the precious metals utilized in each item.

CAPITAL REQUIREMENTS

<u>Working Capital</u>	<u>Estimated Cost</u>
Material for 1 Month	\$ 415.00
Operating Expenses	
Labor ----- \$600.00	
Electricity ----- 50.00	
Water ----- 10.00	
Incidentals ----- 20.00	<u>680.00</u>
	\$1,095.00
 <u>Fixed Assets</u>	
Land	\$ -----
Building	5,000.00
Equipment	<u>2,250.00</u>
	\$7,250.00
 <u>Total Capital</u>	
Working Capital	\$1,095.00
Fixed Assets	7,250.00
Reserves (operating and incidental expenses)	<u>1,000.00</u>
	\$9,345.00

SALES REVENUE

Based on 100% production for an 8-hour day, 5-day week, the expected revenue for a jewelry plant of this size would be:

Monthly production:

$$50 \text{ items/day} \times 20 \text{ days/month} = 1,000 \text{ items/month.}$$

Monthly revenue:

$$1,000 \text{ items/month} \times \$2.00 \text{ per item} = \$2,000.00.$$

Yearly Production:

$$1,000 \text{ items/month} \times 12 \text{ months} = 12,000 \text{ items/year.}$$

Yearly revenue:

$$12,000 \text{ items/year} \times \$2.00 \text{ per item} = \$24,000.00.$$

NOTE: The figure of \$2.00 per item is an assumed wholesale price and will, of course, vary with the type of item produced. The price of the precious metals used are not reflected in this figure of \$2.00. To be more nearly accurate, the cost of the precious metals used per figure (plus profit) should be added to this figure. As assumed, the major items of production during the first year will be simple in nature, and relatively low in cost. As the plant and its products gain stature, larger and more complicated items may be produced, with custom jewelry, which will show a marked increase in profit for the manufacturer.

PROJECTED PROFIT AND LOSS

Profit and loss based on 100% production for an entire year will be:

Estimated yearly sales revenue	\$24,000.00
Less cost of production (\$1.14 per item)	<u>13,680.00</u>
Operating Profit (before payment of principal and interest on loan, taxes and insurance.)	\$10,320.00

INFORMATIONAL DATA

In addition to the numerous supply houses located throughout the metropolitan New York area, the following have indicated an express interest in being contacted for further information concerning additional information relating to jewelry manufacturing.

1. Mr. Robert Limon
Manufacturing Jeweler
1218 Connecticut Avenue
Washington 6, D. C.

2. Mr. Charles Lipstein
Models and Molds for the Jewelry Trade
64 West 48th Street
New York 19, New York

PART II - Wood Products

PRINCIPLES OF MANUFACTURING

The primary factor in the manufacturing of the so-called wood-fiber plastic material souvenirs is the control of the mold material during mixing. This initial mix is the determining factor in the properties and appearance of the final product. Although the exact formulation of this mold material is dependent upon the plant or individual concerned, it is composed basically of wood flours, resins, and inner fillers.

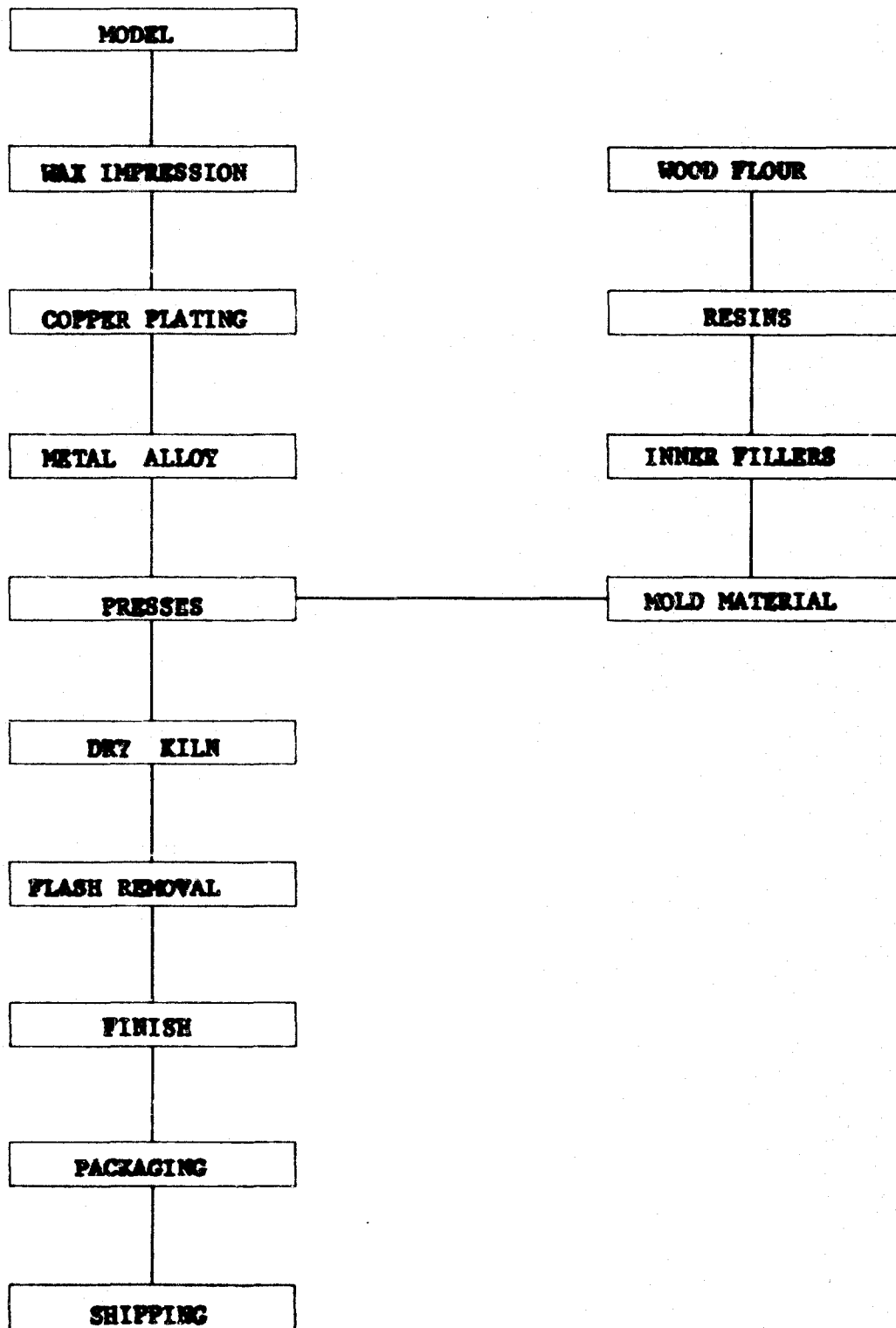
The first step in the actual production of these wood products is the making of a wood model from which a wax impression is taken. Care should be taken in the initial model construction since any slight error in this phase will be reflected in the authenticity and realism of the final product. After the wax impression is taken, it is plated with copper, and the copper plated shell is backed-up, and reinforced with poured metal alloys. This metal mold is then utilized in hydraulic presses that develop from 75 to 150 tons pressure per square inch, dependent upon type and make of the final product.

The mold material mixture, previously described, is used in the hydraulic presses, in which the raw material is formed in the metal molds. After taking shape under pressure in the molds, the formed material is taken to a dry kiln where the moisture is extracted. Upon completion of the moisture removal, the material is taken to flash or excess material, equipment which cleans all excesses from the piece. At this point, the merchandise is ready for the final finish. The final finish of the object is accomplished with the same finishes that are normally utilized on furniture and other whole wood products. Application of the final finish may be done by spray gun, air brush, hand finishing, or a combination of these methods.

The final production steps are packaging for final shipping, or storage for shipment at a later date. The overall manufacturing process is descriptively illustrated in the flow diagram shown in figure 3. The types of souvenirs possible from this process are unlimited in number, and vary only with consumer demand and the imagination of the manufacturer.

GENERAL ASSUMPTIONS

The assumptions for the wood products plant are similar in nature to the assumptions made for jewelry and ceramics.



**Figure 3. FLOW DIAGRAM FOR THE PRODUCTION OF
WOOD-PRODUCTS SOUVENIRS**

BUILDING REQUIREMENTS

PLANT LOCATION

Ideally, a plant of this type should be located at or near a railhead, and good road net, for the easy importation of required materials, and the dissemination to surrounding areas of the final product. Other considerations in locating the plant are the availability of wood products for use in the mold materials and sources of electricity and water.

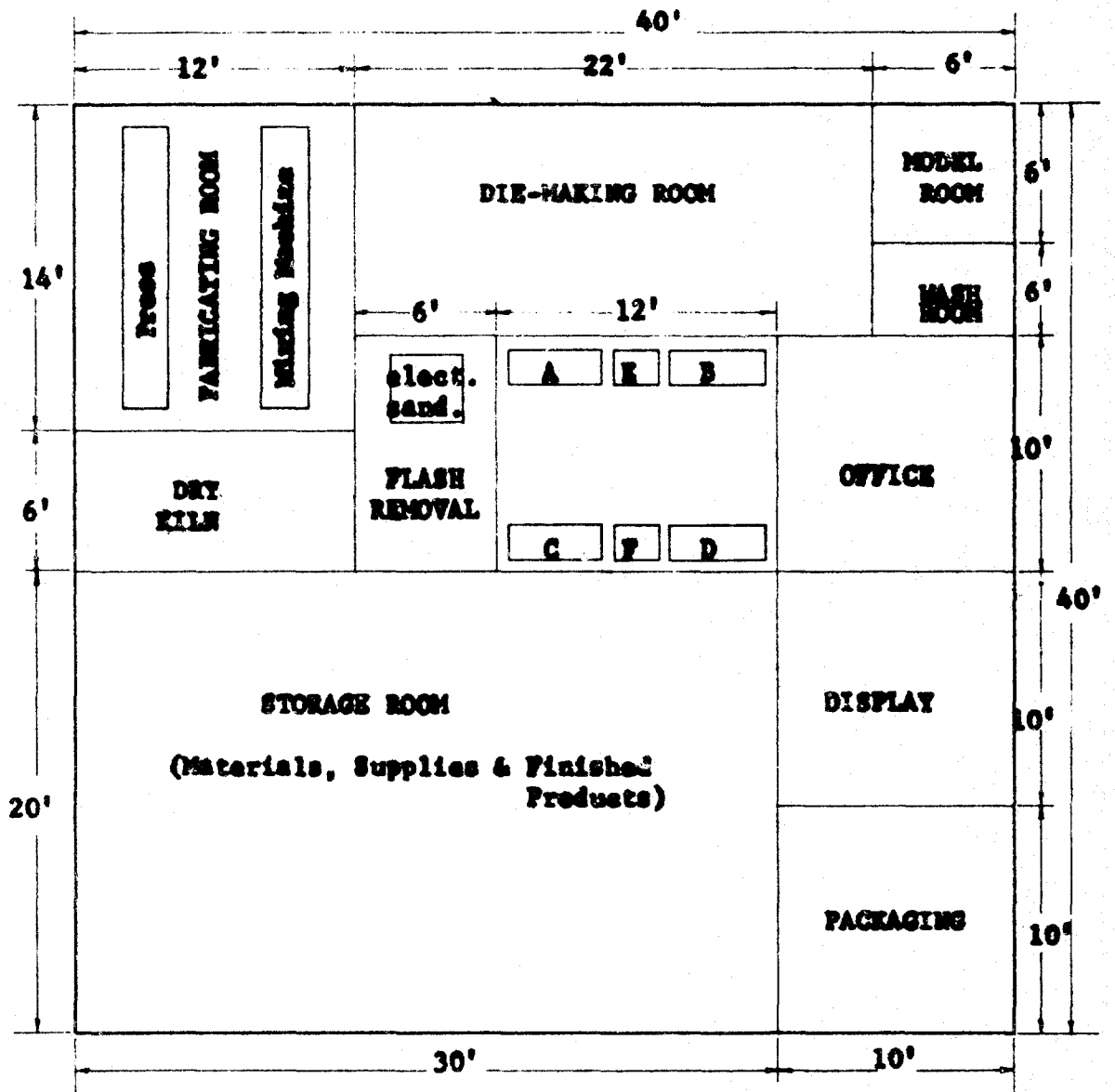
PLANT LAYOUT

Although there are no standards for a typical plant layout for the production of wood-fiber souvenirs, figure 4 shows a plant layout which can be contained in a one-story structure. The plant layout shown is based on years of experience by a leading manufacturer of products of this type, and is capable of producing between 1,000 and 1,200 souvenirs a day. The sketch shown indicates interior building dimensions and the location of major items of equipment.

Floor space allowances for a plant capable of producing 1,000 souvenirs a day are:

		<u>Sq. Ft.</u>	
1.	Model Room	6' by 6'	36
2.	Die Making Room	10' by 22'	220
3.	Fabricating Room	12' by 14'	168
4.	Dry Kiln	6' by 12'	72
5.	Flash Removal Room	6' by 10'	60
6.	Finish Room	10' by 12'	120
7.	Packaging Room	10' by 10'	100
8.	Storage Room	20' by 30'	600
9.	Wash Room	4' by 6'	24
10.	Office	10' by 10'	100
11.	Display Room	10' by 10'	100
	Total		1600

The above dimensions generally are liberal in nature so as to avoid any cramped working space. In the event it is necessary to reduce initial expenses, each of the room dimensions may be reduced. The building costs, for this proposed plan layout is estimated to be about \$5,000.00 for a frame building with concrete floor and around \$8,000.00 for a cinder block building.



- A & B -- Finishing Rooms (lacquer booths with exhaust equipment).
- C & D -- Paint spraying booths with exhaust equipment.
- E & F -- Hand painting booths.

Figure 4. PLAN VIEW OF A PLANT LAYOUT OF WOOD-PRODUCTS MANUFACTURING.

EQUIPMENT REQUIREMENTS

	<u>Estimated Cost</u>
1. Model Maker's Tools (knives, drills, awls, vises.)	\$ 200.00
2. Forms (handmade), Heating Vessels, and Heating Unit for Wax Impressions.	250.00
3. Wood Electroplating Tank (3'x6'x4' deep) and Electrical Equipment for Copper Plating	150.00
4. Drill Press, Shaper, for Die-Making.	1,000.00
5. Mechanical Mixer (second hand dough mixer) and Motor.	400.00
6. Hydraulic Press and Motor.	8,000.00
7. Dry Kiln with Heating Unit (includes insulated room, heating pipes, and circulating apparatus)	2,500.00
8. Mechanical Sander with Wire Brush Attachment (for flash removal)	500.00
9. Paint Spraying Booths with Fume Removal Mechanism plus Paint and Lacquer Spray Guns and Air Brushes.	1,000.00
10. Incidental Equipment (drying racks, dollies, most of which can be homemade.)	1,000.00
11. Cleaning Equipment and Office Furniture.	500.00
	<hr/>
Total Cost	\$ 15,500.00

NOTE: The above estimates, unless otherwise stated, are for new equipment. This is not to be construed to mean that the equipment must be new. In many instances other than those noted, equipment may be built, or purchased second hand. In this even the estimated initial capital requirements may be lowered.

LABOR REQUIREMENTS

Other than the wood carver and the owner-manager, no previous experience in this type of work is required on the part of the laborers. For the most part, they may be either semi-skilled or unskilled. With an assumed production of 1,000 souvenirs a day, and with the plant design illustrated, the estimated labor requirements for this plant will be as follows:

<u>Position</u>	<u>Duties</u>	<u>Estimated Monthly Salary</u>
1 Manager-Owner	Manages shop. Orders and maintains inventory of necessary supplies. Handles display and show room. Takes and fills orders. Designs new products. Paper work.	See note below
1 Clerk	Assists owner-manager in all but actual management procedures and ordering of supplies.	\$ 75.00
1 Model Maker	Carves original models from which dies are made. This employee may be either on a part time basis or may normally fulfill one of the other positions described.	See note below
1 Die or Mold Maker	Makes wax impressions, plates with copper and applies the reinforcing metal alloys.	175.00
1 Materials Mixer	Operates mixing machine and prepares mixed material for use on presses.	150.00
2 Press Operators	Place and exchange dies as required. Insert mold material in press, remove formed objects from press, stack on racks and place in dry kilns.	300.00
1 Flash Remover	Removes cured objects from kiln, removes excess material from objects, cleans and sets up for final finish.	125.00
2 Finishers	Apply final paint, lacquer, or stain finish.	300.00

<u>Position</u>	<u>Duties</u>	<u>Estimated Monthly Salary</u>
1 Paint Laborer	Mixes paints and lacquers, delivers objects from flash removal to finishers and delivers finished objects to packaging room.	\$ 100.00
2 Laborers	Wrap and package finished articles for local delivery or shipment and stock in storage room for later shipment.	200.00
TOTAL MONTHLY SALARIES		\$ 1,425.00

NOTE: No estimated salary has been indicated for the owner-manager, since it is presumed he is the sole owner, his salary will be the net proceeds of the plant. In like manner, no salary has been indicated for the model maker as he may be either part time labor, special contract or one of the normal laborers. Also, the models, if desired, may be contracted from other sources.

Salaries are based on an eight-hour day, five-days a week, or twenty-days a month.

MATERIAL REQUIREMENTS

The material requirements should be sufficient in quantity to keep the plant operating at maximum capacity for one month (20 working days). The estimate cost of materials requirements are based on the many years of experience of an outstanding manufacturer and should prove to be relatively accurate.

	<u>Estimated Cost</u>
1. Wood flour, resins, and inner fillers	\$ 1,000.00
2. Copper plating	100.00
3. Wax	25.00
4. Back-up metal	500.00
5. Paints and lacquers	200.00
6. Incidentals (wrapping, packing, crating.)	<u>300.00</u>
Estimated Monthly Material Requirements	\$ 2,125.00

OVERHEAD RATE

ESTIMATED DEPRECIATION

<u>Item</u>	<u>Cost</u>	<u>Estimated Life (Years)</u>	<u>Estimated Yearly Depreciation</u>
Building	\$ 8,000.00	25	\$ 320.00
Equipment	15,500.00	15	775.00
Maintenance (based on 3% of building & equipment cost, or 0.03 x \$23,500.)		*	<u>705.00</u>
			\$ 1,800.00
Estimated Monthly Depreciation and Maintenance equals.....	<u>\$1,800.00</u>	<u>12</u>	equals 150.00

OVERHEAD

Electricity	\$ 150.00
Water	25.00
Depreciation	<u>150.00</u>
Total estimated monthly overhead	\$ 325.00

NOTE: The above depreciation estimates are based on the following figures:

1. Building ---- 4% annually on the total building cost.
2. Equipment --- 5% annually on the total equipment cost.
3. Maintenance-- 3% annually on the total building & equipment cost.

The estimated overhead rates are based on figures from an actual operating plant.

UNIT COST OF MANUFACTURING

<u>Item</u>		<u>Estimated (per souvenir)</u>
Labor	<u>\$1,425.00</u> 20,000 souvenirs/month equals	\$0.071
Overhead	<u>\$325.00</u> 20,000 souvenirs/month equals	0.011
Material	<u>\$2,125.00</u> 20,000 souvenirs/month equals	<u>0.106</u>
Total estimated unit cost of manufacturing		\$0.118 \$0.20

CAPITAL REQUIREMENTS

WORKING CAPITAL

ESTIMATED COST

Materials (for 1 month)		\$ 2,125.00
Operating Expenses		
Labor.....	\$1,425.00	
Water.....	25.00	
Electricity.....	150.00	
		<u>1,600.00</u>
Total Working Capital (exclusive of insurance, taxes.)		\$ 3,725.00

FIXED ASSETS

Land		-----
Building		\$ 8,000.00
Equipment		<u>15,500.00</u>
		\$ 23,500.00

TOTAL CAPITAL

Working Capital		\$ 3,725.00
Fixed Assets		23,500.00
Reserves (operating, advertising, incidental expenses)		<u>5,000.00</u>
		\$ 32,225.00

SALES REVENUE

Monthly Production

1,000 articles/day x 20 working days equals 20,000 per month.

Monthly Revenue

20,000 per month x \$0.50 per souvenir equals \$10,000.

Yearly Production

1,000 souvenirs/day x 240 (estimated working days) equals 240,000 souvenirs/year

Yearly Revenue

240,000 x \$0.50 per souvenir equals \$120,000.00

NOTE: The figure of \$0.50 per souvenir is an estimated wholesale price to distributors and does not reflect the cost of the income from souvenirs sold directly to consumers. All direct consumer sales will, of course, alter the above figures in favor of the manufacturer. The figure of \$0.50 has been used as an average figure of the wholesale price of articles similar to those shown herein. This figure should not be used for smaller or less comprehensive types of souvenirs.

PROJECTED PROFIT AND LOSS

Estimated yearly sales revenue	\$120,000.00
Less cost of production (\$0.20 per souvenir).....	<u>48,000.00</u>
Operating Profit (before payment of principal and interest on loan, taxes and insurance)	\$ 72,000.00

INFORMATIONAL DATA

For further information relating to the establishment of a wood-product manufacturing plant, the following organization has indicated an interest in being contacted:

Burwood Products Company
Traverse City, Michigan

PART III - CERAMICS

GENERAL ASSUMPTIONS

In order to more clearly picture the operation of a one-man ceramic shop, the following assumptions have been made:

1. It has been assumed that the basic materials necessary for the operation of the plant will be purchased from wholesale suppliers. Although it is possible, and not excessively difficult, to refine your own clay and prepare your own glazes, it is felt that to do so during the trial stage of a new shop, would deduct far too much time from the actual production phases. With future growth and the addition of extra laborers, this undertaking may be attempted in order to reduce overhead. An additional factor here is that the initial cost of the required equipment would prove to be prohibitive.
2. Initial products will be simple in nature such as ash trays, cigarette boxes, ear rings, and plates. This has been done in order that all objects during initial production can be formed by the slip casting method, from molds to eliminate unnecessary and time-consuming hand forming methods.
3. Little or no hand decorating processes will be utilized. Decoration, when required, will for the most part be in the form of decalcomanias purchased in bulk from suppliers.
4. No special work which requires potters wheels or sculpturing will be undertaken until after the shop is well established.
5. It has been assumed that the required molds have either been handmade or purchased before starting actual production, and the cost has been included under equipment requirements. Here again, practically all of the molds may be made by hand, but the time element required would detract from production quotes.
6. Since the plant is a one-man proposition, it has been assumed that the owner of the shop will also do the work. Therefore, the salary shown is somewhat higher than might normally be expected. However, this is a variable factor dependent upon profits.
7. Once a flow of greenware has been established, the assumed production rate will be 50 pieces a day. This is assuming the three kilns will be operated on a staggered schedule.
8. Production is based on an 8-hour day and a 5-day week.
9. The figure of 50 items a day is purely an assumed figure, since actual production will vary greatly with the type and complexity of the item being produced on any given day. On some days (with ceramic hot pads or ceramic tile) production could be 100 or more, whereas on other days, (when producing more complicated items) production might be as low as 10 or 15 items a day. Therefore, the figure of 50 items per day has been used as an estimated daily production rate for the purpose of later computations.

PRINCIPLES OF MANUFACTURING

In general, the principles of manufacturing for ceramic objects are the same as those stated for jewelry and wood-products. Basically, the flow is from model to mold to object. This is illustrated in figure 5.

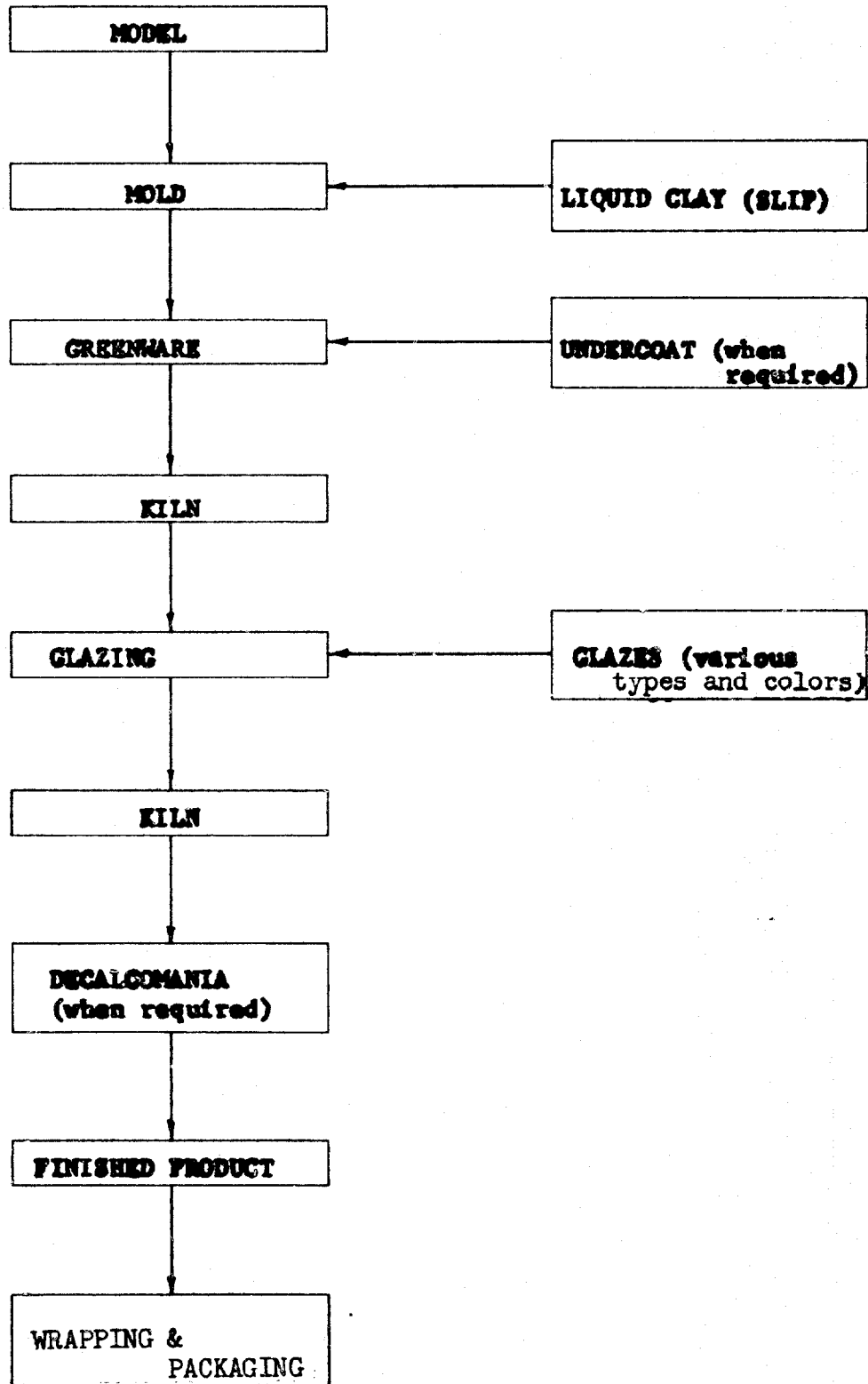


Figure 5. TYPICAL FLOW DIAGRAM OF A CERAMICS SHOP.

BUILDING REQUIREMENTS

LOCATION

When considering the location of an establishment of this type, initially it should be decided whether the final product is for local or interior distribution or for export. Since this is to be a one-man operation, it has been assumed that it is being set up initially for local trade. In like manner, other considerations have been satisfied by the initial assumptions. The one remaining factor then is whether to establish the organization in an existing building or to set up shop in a new building. Assuming that future years will show an ever increasing volume of business, this brochure is based on establishing the plant in a separate building so the expansion can be accomplished by addition, rather than by frequent moving from small to larger quarters.

LAYOUT

Figure 6 shows a plan view of a suggested layout which can be built into a small one-story structure. This plan view shows the building dimensions, and basic equipment location. Since the entire venture can be accomplished in one room, no breakdown of dimensions are shown. Basic floor space allowance is a building which is 16' x 10', or 160 square feet, and the estimated cost is \$4,000.00.

EQUIPMENT REQUIREMENTS

The basic equipment requirements and their estimated cost for a one-man ceramic shop are:

	<u>Estimated Cost</u>
1. Two 16½" fire brick kilns (@ \$50.00 each)	\$ 100.00
2. One 20" metal kiln	75.00
3. Assorted molds	50.00
4. Assorted brushes	5.00
5. Knives (paring) and spatulas	5.00
6. Scrapers	2.00
7. Sgraffito knives	5.00
8. Sieves	3.00
9. Stilts (for kiln)	5.00
10. Two spray guns (for glazing)	50.00
11. Incidentals (ceramic pens, crocks, bowls and pitchers, wire screening, strainers, sponges.)	250.00
	<hr/>
	\$ 550.00

NOTE: Equipment such as work benches have not been included, since they can be handmade to lower the initial investment. In like manner, other equipment such as wedging boards and cookie cutters for cutting designs.

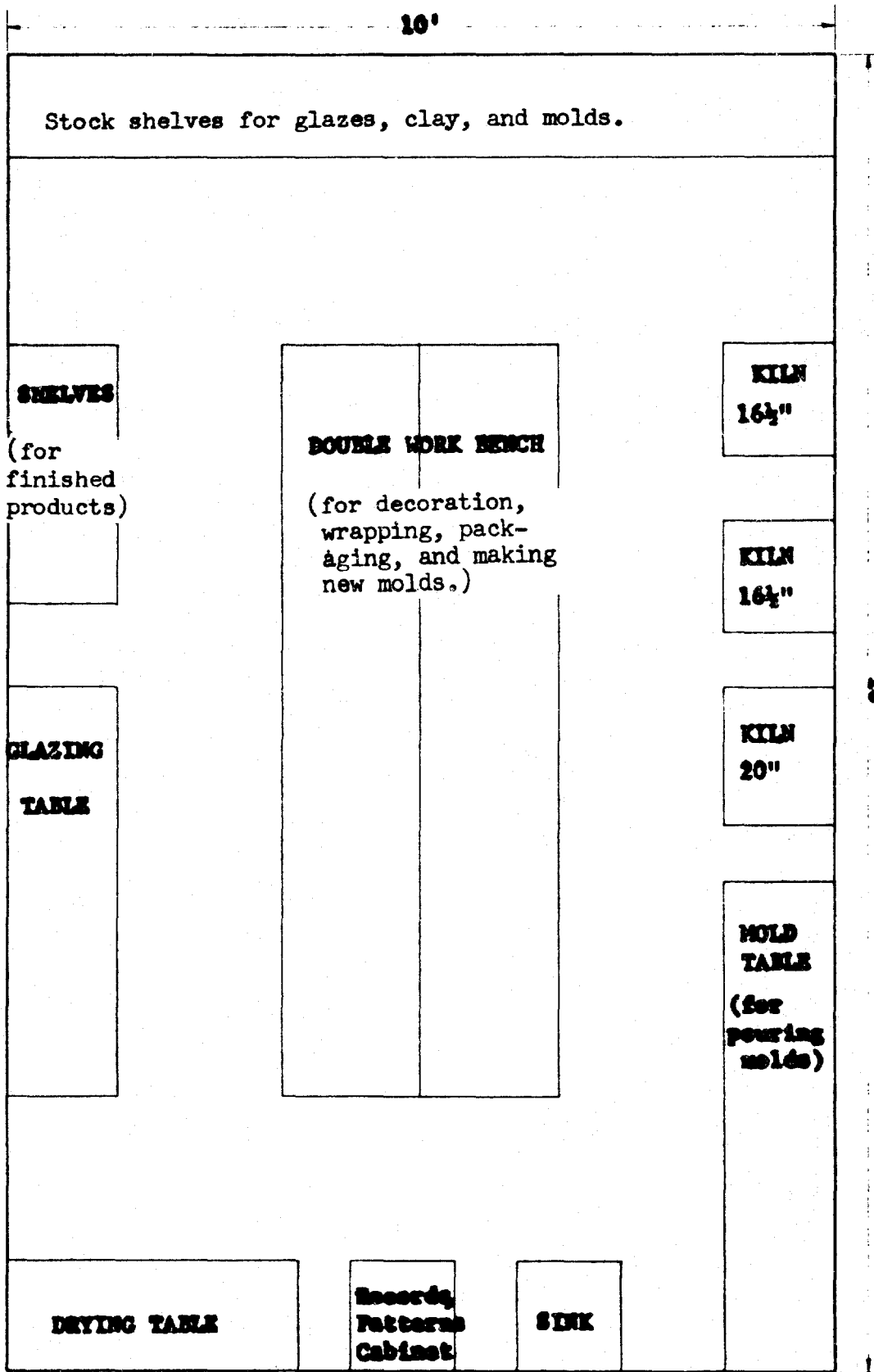


Figure 6. LAYOUT FOR A CERAMICS SHOP.

have been eliminated here since they can be handmade or obtained at small cost. However, an allowance has been made under incidentals to cover the cost of materials.

LABOR REQUIREMENTS

To allow for the occasional part-time help which may be required, an allotment has been made under the heading of contract labor. Basically, however, as explained in the assumptions the labor force will consist only of the owner-operator.

<u>Position</u>	<u>Duties</u>	<u>Estimated Monthly Salary</u>
Owner-operator	Performs all duties.	\$ 600.00
Contract labor	Part-time help to aid during rush periods and to allow for the purchase of special models and/or molds.	200.00
TOTAL MONTHLY SALARIES		\$ 800.00

MATERIAL REQUIREMENTS

The material requirements should be sufficient in quantity to keep the ceramic shop described operating at 100% capacity for a period of one month. Care should be taken in ordering supplies such as glazes and clay, as the quality of these articles will be reflected in the end product.

	<u>Estimated Cost</u>
1. Glue and quick drying cements	\$ 1.00
2. Slip-casting clay (150 lbs @ \$0.20 per lb.)	30.00
3. Glazes (various types and colors at varying prices)	15.00
4. Decalcomanias (1,000 @ \$0.10 each)	10.00
5. Glaze stains and underglaze stains	15.00
6. Overglazes	20.00
7. Plaster	1.00
8. Cones	10.00
9. Incidentals	50.00
	<u>\$ 152.00</u>

NOTE: The above list of material requirements lists only the major items required with the rest combined under incidentals.

OVERHEAD RATE

ESTIMATED DEPRECIATION

<u>Item</u>	<u>Cost</u>	<u>Estimated Life Years</u>	<u>Estimated Yearly Depreciation</u>
Building	\$4,000.00	25	\$ 160.00
Equipment			
Kilns	175.00	5	35.00
Paint brushes and sponges.	50.00	1	50.00
Remainder	225.00	10	22.50
Maintenance (based on 3% of building & equipment cost, or 0.03 x \$4,550.00)			<u>136.50</u>
			\$ 404.00
Estimated Monthly Depreciation and Maintenance equals.....	<u>\$404.00</u> 12	equals	\$ 33.67

OVERHEAD

Electricity	\$ 50.00
Water	10.00
Incidentals	<u>20.00</u>
	\$ 80.00
 <u>Total estimated monthly overhead</u>	
1. Utilities and incidentals	\$ 80.00
2. Depreciation	<u>33.67</u>
	\$ 113.67

NOTE: The above depreciation estimates were based on the following figures:

1. Building - - - 4% annually on the building cost.
2. Equipment
 - Kilns - - 20% annually on the cost of kilns.
 - Sponges, brushes - - 100% annually on the total cost.
 - Remainder - - 10% annually on the total cost.
3. Maintenance - - - 3% annually on the total building and equipment cost.

UNIT COST OF PRODUCTION

<u>Item</u>			<u>Estimated (per item)</u>
Labor:	$\frac{\$800.00}{50 \text{ items/day} \times 20 \text{ days/month}}$	equals	\$ 0.80
Overhead:	$\frac{\$113.67}{1,000}$	equals	0.114
Materials:	$\frac{\$152.00}{1,000}$	equals	<u>0.152</u>
			\$ 1.07

CAPITAL REQUIREMENTS

<u>Working Capital</u>	<u>Estimated Cost</u>
Material (for one month)	\$ 152.00
Operating Expenses	
Labor.....	\$800.00
Electricity...	50.00
Water.....	10.00
Incidentals...	20.00
	<u>880.00</u>
	\$ 1,032.00
<u>Fixed Assets</u>	
Land	-----
Building	4,000.00
Equipment	<u>550.00</u>
	\$ 4,550.00
<u>Total Capital</u>	
Working Capital	\$ 1,032.00
Fixed Assets	4,550.00
Reserves (operating and incidental expenses)	<u>1,000.00</u>
	\$ 6,582.00

SALES REVENUE

Based on 100% production -- after the shop reaches full production -- the expected revenue for a ceramics shop of this size would be:

Monthly production
50 items/day x 20 days/month equals 1,000 items months.

Monthly revenue

1,000 items/month x \$2.00 per item equals \$2,000.00 per month.

Yearly production

1,000 items/month x 12 months equals 12,000 items/year.

Yearly revenue

12,000 items/year x \$2.00 per item equals \$24,000.00 per year.

NOTE: The figure of \$2.00 per item is a hypothetical figure, and will vary greatly with the type of item being produced, the locale, and the demand. These figures are a guide only and are not to be construed as being factual in every respect.

PROJECTED PROFIT AND LOSS

The projected profit and loss, based on 100% production, for a ceramic shop of this size will be:

Estimated yearly sales revenue	\$24,000.00
Less cost of production (\$1.07 per item)	<u>12,840.00</u>
Operating Profit (before payment of principal and interest on loan, taxes, and insurance.)	\$ 11,160.00

SUMMARY

Although all of the figures utilized in compiling this brochure have not come from operating organizations of the size described, they are, for the most part, based on experience from individuals and organizations directly concerned. Generally, the estimates are accurate enough to draw the following conclusions:

1. Assuming a market is available, it is advisable, and should be profitable, to establish any one, or a combination, of the plants described herein.
2. Although none of the plants described may be economically sound for any given geographical area, they may all be applicable with very few changes: these being predominantly the addition or subtraction of equipment or personnel, and the amount of mechanization desired.
3. In any of the plants described, the initial capital outlay may be reduced by the addition of personnel and hand-labor methods and the deletion of some of the more expensive items of equipment. In addition, many of the listed equipment, other than those so indicated, may be handmade or purchased second hand.
4. No labor problems in terms of number or experience of personnel should exist.
5. Further informational data on design, operation, and cost is readily available.
6. In any location where there is a potential market, the unit cost of production should be low enough to put the plant on an economically sound basis.