PLANT REQUIREMENTS FOR MANUFACTURE OF JUTE YARN

TECHNICAL AIDS BRANCH
INTERNATIONAL COOPERATION ADMINISTRATION
Washington, 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 International Cooperation Administration, but merely a citation that is typical in its field.

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

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J U T E Y A R N

INTRODUCTION

The purpose of this report is to present basic information for establishing a manufacturing plant, in a foreign country, to produce jute yarn.

Some of the uses of this product are listed below:

Rug Backing	Linoleum Backing
Twine	Reinforced Paper
Feed Bags	Rope
Furniture Webbing	Knit Tubing
Auto Upholstery Supports	Hooked Rugs and Embroidery
Electric Cable Covering	Women's Skirts
Sugar Bags	Brattice Cloth (Mine Ventilating)
Fertilizer Bags	Nursery Burlap
Cotton Bale Covering	Rug Pad Centers

GENERAL ASSUMPTIONS

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

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

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

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

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

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

6. The plant operates three eight-hour shifts 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. Administrative costs.
   E. Taxes.

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

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

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

PRODUCT SPECIFICATIONS

All information and figures contained in this report are based on the production of 14 pound jute yarn, commonly known as carpet yarn and used primarily for carpet backing.

PRODUCTION CAPACITY

This plant is designed to produce 700 pounds of jute yarn an hour or 4,200,000 pounds a year based on a three shift operation, two hundred and fifty days a year.

MANUFACTURING UNIT

The manufacturing unit of the product is one pound of jute yarn.

MANUFACTURING OPERATIONS

Opening and Softening

The jute, which arrives at the manufacturing plant in the highly compressed pucca bale, must first be loosened up and blended. An appropriate number of bales of each mark is selected and put through the first machine, a bale breaker. This loosens and crushes the heads, which are picked up by the operators on the delivery side of the machine and pieced out in handfuls weighing about two pounds each.

The jute then goes to the softening machine, which consists of a series of pairs of rollers arranged horizontally in a long, narrow frame. On the way through the softener, the jute is further separated and loosened and is sprayed at the same time with an oil and water emulsion which assists in making it more pliable. The water dries out as the jute passes through further stages of

manufacture. In the early days of the industry, whale and fish oils were extensively used, but lower priced mineral oil is now increasing in favor.

After passing through the softener, the jute stands for 24 to 48 hours in boxes, so that the oil and water emulsion may thoroughly permeate the fibre. This process is commonly known as the "batching" of the jute.

Carding and Preparing

Batching is followed by a series of four consecutive and fairly distinct operations which start with the batched jute and finish with a product known as "rove." The first two operations, breaking and carding, are concerned with the separation of the fibres by combing; the third process, drawing, is the one which draws out and combs the fibre simultaneously in order to refine the degree of parallelism; and the last, roving, still further draws the fibres and then gathers them together to give a preliminary twist which puts them in a form suitable for spinning.

Breaking and carding are performed on machines very similar in the basic principles of their construction. The breaker consists essentially of a large central cylinder and two or three pairs of smaller cylinders. All of these rolls are driven so as to revolve at widely different but carefully interrelated speeds, and all have their surfaces completely covered with strips of wood into which

steel pins are inserted at an angle. The jute, evenly spread over the feed sheet, enters the machine under the feed roller and is torn and broken by the action of the pins on the rapidly moving central cylinder. In passing the small rollers, the fibre is combed and parallelized to some extent, and is delivered in the form of a web which, condensed to a ribbon, is collected in a can. The ribbon of fibre which results from this and all carding and drawing operations is called a "sliver."

The card or finisher is essentially the same as a breaker except that there are more cylinders, and the pinning on them is finer. A card takes several breaker slivers and amalgamates them, producing a more refined ribbon of fibre, which is then ready for the drawing frames. In the breaking and carding processes, the action of the pins removes short pieces of fibre and bark which are drawn down below the cylinders and periodically collected as a waste product.

The drawing frame, as its name implies, refines the sliver still further by drawing it out longitudinally and leveling it. At the same time, by combining two or more slivers a thorough blending of the fibre is effected. The drawing action is attained by passing the material between two consecutive pairs of rolls, the second having a greater surface speed than the first. In the space between the two pairs of rolls, the sliver is held in a bank of fine pins, mounted on traveling bars, which serve to give a further combing. Two,

three and even four drawings are used in the manufacture of jute yarn, the number varying with the fineness required in the ultimate product.

The roving frame, the last machine of the preparing series, combines a drawing with a twisting operation. The back of a roving frame is, in fact, a modified drawing frame, and the sliver fed to it is there further attenuated. At the front of the machine, a row of 40 or more steel flyers, revolving around wooden bobbins, impart a twist to the thin sliver which then winds upon the bobbins. Because the roving frame must provide for the vertical movement of the bobbins as the sliver is built up on them, as well as for their rotation at a continually varying speed, and for the rotation of the flyers at a fixed speed, and the feeding of the sliver through a drawing apparatus, it will be recognized that the machine is a complicated and ingenious piece of mechanism.

Spinning

The jute spinning frame converts drafted or reduced roving into yarn by the action of flyers which, rotating exactly as on a roving frame, put the final twist into the material and again wind it on bobbins. Because the creels holding the supply of roving are placed above the spinning frame, the machine can be, and usually is, built with two sides or banks, although it is feasible to use a spinning frame of but one side. Such frames are commonly used at

the end of a room where there is not space enough for two sides. The bobbins, when full, are removed by the spinner and helpers, or by squads of doffers.

Winding

The spun yarn must now be put in some larger package more convenient to ship and handle, so it is wound in skeins, cops, or tubes, or in some other shape, the exact nature of which is dictated either by the requirements of a subsequent process or by convenience in packing. Skeins are made by leading the yarn from a row of bobbins, set on pegs, to revolving reels which are collapsible to permit of easy removal of the yarn. Skeins, being loose in structure, are the most convenient form for jute yarn which is to be dyed. Tubes (variously called tubes, cheeses and spools) are large cylinders or cones of closely wound yarn. They provide for a relatively large weight of yarn in a minimum of space and are built on a winding frame. On this machine, the yarn is led from the bobbins, set on a row of pegs, through a device designed to remove any gross imperfections in the yarn, and then on to a wooden or paper tube. The tube rests on one side against a rapidly turning roller which winds the yarn into a cylindrical or conical package. Cops are small, elongated cylinders of yarn which are used only in weaving.

Twisting

Certain products are plied, that is, two or more yarns are twisted

together. To accomplish this, the manufacturer uses a twister which much resembles a large spinning frame. The material on the creel is yarn either in tubes or on bobbins, and two or more ends are led down to the flyer, which twists them together without draft and deposits the plied material on a bobbin. The plied yarn is then wound into the desired package in the same fashion as single yarn. Another type of twister is a horizontal machine. In this case, the ends to be twisted are led through a die and on to a horizontal flyer and bobbin.

Twine or "string" as it is commonly called, is of many sizes, shapes, and constructions, but all twines fall into one of two groups - finished and unfinished. Jute twine is a number of plies of jute yarn twisted together. These plied yarns may be converted, in turn, into still heavier cords by twisting several of them together. Finished twine is polished by passing the natural twine, of desired size and ply, through a polisher, where several processes go on at one time. The material is coated with thick paste, made from starch and other material, scrubbed, dried, and polished. It is then wound on bobbins, from which it can be made into any desired form or package.

The operations described up to this point concern the production of yarn, either single or plied, and comprise the work of a jute spinning mill. It should be noted in passing that there is in strict definition, a difference between a mill and a factory. The former is defined as a plant in which a raw material is worked into

a usable form; a factory, on the other hand, takes the material so worked, and fabricates it into the finished article. In the jute trade, the difference is observable, because, although in many plants both spinning and weaving are carried on, the processes through winding are referred to as the "mill," while that part of the plant housing the weaving machinery is called the "factory." In India, all plants are mills and factories combined, but in Dundee and on the Continent many of the jute manufacturers have spinning mills only.

DIRECT MATERIALS

The following direct materials are required for the annual production of 4,200,000 pounds of jute yarn.

Item	Number Required	Unit Cost	Annual Cost Estimated	Annual Cost Actual
Jute	4,620,000 lbs.	$ .15	$ 693,000	_____
Packaging			10,000	_____
TOTAL			$ 703,000	_____

SUPPLIES

Item	Annual Cost Estimated	Annual Cost Actual
Lubricants and hand tools	$ 300	_____
Maintenance and spare parts	9,000	_____
Office supplies	300	_____
TOTAL	$ 9,600	_____

PLANT LAYOUT

A plant layout and work flow sheet showing the location of the equipment and the sequence of operations described in this report is shown on the last page of this report.

PLANT SITE

In order to provide for future expansion a plant site of about one acre is required. The plant site should be as advantageously located as possible with respect to power, water, fuel, sources of labor and markets.

The estimated cost of the plant site is $1,000.

BUILDING

A one story building 100 feet by 160 feet or about 16,000 square feet will be required for the manufacture of jute yarn. Any suitable local material may be used.

The cost of this building is estimated at $64,000.

POWER

The connected load requirements for this plant amount to about 90 horsepower.

The annual cost of power is estimated at $3,000.

WATER

The annual water requirements for production, sanitary purposes, and fire protection are estimated at 1,000,000 gallons.

The cost of water is estimated at $250 per year.

FUEL

It is estimated that the fuel consumption for heating and other uses will amount to about $600 per year.

PRODUCTION TOOLS AND EQUIPMENT

Description	Number Required	Unit Cost	Cost Estimated	Cost Actual
Oil tank, pump and sprayer	1	$ 1,000	$ 1,000	_____
Bale breaker	1	3,200	3,200	_____
Softening machine	1	5,000	5,000	_____
Breaker cards	2	5,000	10,000	_____
Finishing cards	4	5,000	20,000	_____
First drawing frames	2	5,000	10,000	_____
Second drawing frames	2	5,000	10,000	_____
Roving frames	2	6,000	12,000	_____
Spinning frames	4	6,000	24,000	_____
Winders	4	3,000	12,000	_____
TOTAL			$ 107,200	_____
Estimated installation cost			16,300	_____
TOTAL COST INSTALLED			$ 123,500	

OTHER TOOLS AND EQUIPMENT

Item	Cost Estimated	Cost Actual
Batch boxes, cans, tubes and oil storage	$ 1,500	_____

FURNITURE AND FIXTURES

Item	Number Required	Unit Cost	Cost Estimated	Cost Actual
Desks and chairs	4	$150	$ 600	_____
File cabinets	6	75	450	_____
Typewriter	1	150	150	_____
Adding machine	1	150	150	_____
TOTAL			$ 1,350	_____

DIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimated	Annual Cost Actual
Softener tenders	3	$1.50	$ 9,000	_____
Breaker tenders	3	1.60	9,600	_____
Card tenders	3	1.80	10,800	_____
Drawing tenders	3	1.75	10,500	_____
Tender helpers	6	1.50	18,000	_____
Roving tender	3	1.85	11,100	_____
Spinners	6	1.85	22,200	_____
Section hands	6	1.50	18,000	_____
Winder tenders	12	1.60	38,400	_____
Floor hands and packer	6	1.50	18,000	_____
TOTAL	51		$ 165,600	_____

INDIRECT LABOR

Occupation	Number Required	Annual Cost Estimated	Annual Cost Actual
Manager	1	$ 11,000	_____
Superintendent	1	8,000	_____
Foremen carding and spinning	3	16,500	_____
Office manager	1	5,000	_____
Office staff	2	6,000	_____
Mechanic	1	5,000	_____
TOTAL	9	$ 51,500	_____

DEPRECIATION

Description	Estimated Cost	Years Life	Annual Cost Estimated	Annual Cost Actual
Building	$ 64,000	20	$ 3,200	_____
Production tools and equipment	123,500	10	12,350	_____
Other tools and equipment	1,500	10	150	_____
Furniture and fixtures	1,350	10	135	_____
TOTAL			$ 15,835	_____

MANUFACTURING OVERHEAD

Item	Annual Cost Estimated	Annual Cost Actual
Depreciation	$ 15,835	_____
Indirect labor	51,500	_____
Power	3,000	_____
Water	250	_____
Fuel	600	_____
Supplies	9,600	_____
TOTAL	$ 80,785	_____

MANUFACTURING COSTS

Item	Annual Cost Estimated	Annual Cost Actual
Direct materials	$ 703,000	_____
Direct labor	165,600	_____
Manufacturing overhead	80,785	_____
TOTAL	$ 949,385	_____

FIXED ASSETS

Item	Cost Estimated	Cost Actual
Land	$ 1,000	_____
Building	64,000	_____
Production tools and equipment	123,500	_____
Other tools and equipment	1,500	_____
Furniture and fixtures	1,350	_____
TOTAL	$ 191,350	_____

WORKING CAPITAL

Item		Cost Estimated	Cost Actual
Direct material	30 days	$ 58,600	_____
Direct labor	30 days	13,800	_____
Manufacturing overhead	30 days	6,700	_____
Reserve for sales collections	30 days	122,500	_____
TOTAL		$ 201,600	_____

CAPITAL REQUIREMENTS

Item	Cost Estimated	Cost Actual
Fixed assets	$ 191,350	_____
Working capital	201,600	_____
TOTAL	$ 392,950	_____

SALES REVENUE

The average price for jute yarn of the type produced in this plant is $0.35 per pound. The production capacity of this plant is 4,200,000 pounds of jute yarn per year. Based on these figures the annual sales revenue would amount to $1,470,000.

RECAPITULATION OF COSTS, SALES AND PROFITS

Item	Estimated Cost		Actual Cost
Direct materials	$ 703,000		_____
Direct labor	165,600		_____
Manufacturing overhead	80,785		_____
Total manufacturing cost		$ 949,385	_____
Interest on loans	1,800		_____
Insurance	1,200		_____
Legal	2,000		_____
Auditing	5,000		_____
Unforeseen expense	29,615		_____
Total administrative costs		49,615	_____
Sales commissions		30,000	_____
Travel, bad debts, discounts and allowances, freight-out		20,000	_____
Profit before taxes		421,000	_____
Total annual gross sales		$1,470,000	_____

BUDGET CONTROL:

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

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

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

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

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

BUDGET CONTROL ACCOUNTS:

Account Number		Monthly Expense	Monthly Budget	Annual Budget	Actual
10	Administrative	$_____	$ 1,666	$ 20,000	$_____
20	Sales	_____	4,166	50,000	_____
30	Direct Materials	_____	58,583	703,000	_____
40	Supplies	_____	800	9,600	_____
51	Power*	_____	250	3,000	_____
52	Water*	_____	20	250	_____
53	Fuel	_____	50	600	_____
60	Unforeseen Expense (Reserve Account)	_____	2,468	29,615	_____
71	Direct Labor*	_____	13,800	165,600	_____
72	Indirect Labor*	_____	4,291	51,500	_____
80	Depreciation (Reserve Account)	_____	1,319	15,835	_____

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 and produce the quality and quantity of the product stated in the contract for an agreed period of time. Such a contract would assure adequate personnel training, since full quantity and quality could not be produced with an untrained organization.

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

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

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

SAFETY:

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

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

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

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

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

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

OTHER CONSIDERATIONS

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

MATERIALS AND SUPPLIES

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

MARKET FACTORS

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

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

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

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

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

EXPORT MARKETS:

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

MARKETING PROBLEMS:

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

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

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

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

ECONOMIC FACTORS:

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

PERSONNEL:

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

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

LAWS AND REGULATIONS:

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

FINANCIAL FACTORS:

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

FINANCIAL REQUIREMENTS OF THE PROJECT:

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

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

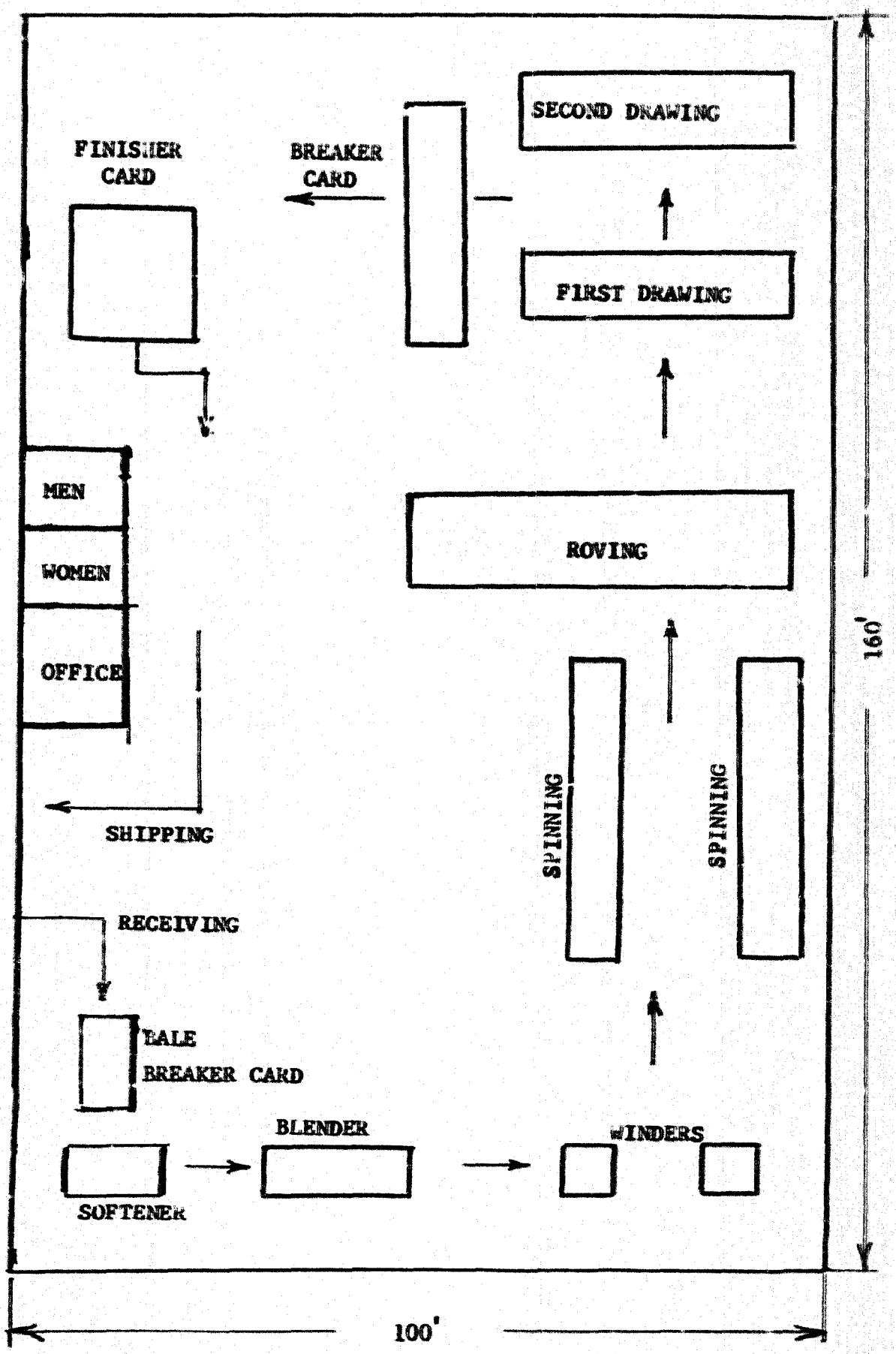
3. If the economy is in a period of inflation, has full allowance been made for the influence of rising prices and wages on the cost of the project and on working capital requirements?

SHORT TERM BANK CREDITS:

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

FINANCIAL PLAN:

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

PLANT LAYOUT

ARROWS INDICATE FLOW OF WORK