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PLANT REQUIREMENTS FOR MANUFACTURE OF WORSTED YARNS

TECHNICAL AIDS BRANCH

INTERNATIONAL COOPERATION ADMINISTRATION

Washington, 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 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.

Code Number
PR-40

September 1961

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W O R S T E D Y A R N S

INTRODUCTION

The purpose of this report is to provide basic information for establishing a manufacturing plant in a foreign country to produce worsted yarns.

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, fifty weeks a year.

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

8. The following items cannot be estimated realistically:

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

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

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

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

PRODUCT SPECIFICATIONS

The specifications for this product is 1/32s worsted yarn using 62s grade wools.

PRODUCTION CAPACITY

The production capacity of this plant is 42,000 pounds of worsted yarns a week or 2,100,000 pounds per year using the American system.

MANUFACTURING UNIT

The manufacturing unit for this plant is one pound of worsted yarn.

GENERAL INFORMATION

Wool is produced in practically all parts of the world. The main producing areas and the approximate percentages of yarn produced in each area are shown below.

Australia	27%	South Africa	6%
USSR, China areas	14%	Uruguay	5%
Argentina	11%	United Kingdom	2%
New Zealand	10%	Spain	1%
United States	7%	Others	17%

Of the various types of wools sheared, certain qualities and grades are found to be better adapted to worsted than to woolen spinning and fabrication. The particular difference is found in the greater need to consider fibre diameter and lengths to fit into proposed worsted operations. The progressive manipulation from a machinery standpoint limits the range of fibre diameters and lengths that the spinning preparatory equipment can successfully handle.

Wool is graded according to fibre diameter and length. The English system of grading considers wool in relation to the numerical equivalent to which a yarn can be spun, such as 80s, 70s, 64s, 32s. The American system grades its values and character as Fine, 1/2 Blood, and Common. The processing machinery to be used is directly associated with the lengths and types of wool to be converted to yarns and fabrics. The so-called French system of processing can readily handle wool of two inches length and less. The so-called Bradford system is commonly associated with processing wools of longer staple.

MANUFACTURING OPERATIONS

Bradford System

The Bradford system generally embraces back washing, gill box and weigh gilling, combing, can or top gilling, drawing, two-spindle gilling, heavy draw box, fine drawing, first and second finishers, reducer and rover, all preceding cap or ring spinning. There are modifications as well as expansions of the processes indicated, but because of the prevailing competitive cost situation the tendency is to reduce processing as much as possible.

The first general process of backwashing is a necessary preliminary to top dyeing and by its removal of dirt and oil insures better color of stock for top making. The process flow calls for several lines of sliver to be guided through a soapy solution bath by feed rolls, rinsed and after drying the sliver is drafted and fibres further paralleled in a gill box. The original lubricating oil which has been washed out in this process is replaced by an oiling system.

Before combing there are generally two operations, - can gill box and weigh gill box with ball winding devices on the latter for winding four slivers in parallel on a cylinder preparatory for combing. The circular comb commonly used provides for the ribbon of slivers on the ball described in the preceding section to be fed through a feed box over the pins in two inside circles or rings. The separation motion of these circles combs the wool. The combed fibres are condensed into slivers by pairs

and fed into cans for further processing. The short fibres which do not extend from the circle are removed from the pins prior to the repetition of the combing operation. The short fibres are called noils. The longer fibres paralleled into a continuous strand of sliver are called top. The short fibres or noils which have been removed range from 10 percent to 25 percent of the weight of the stock to be combed as desired in the combing process.

The subsequent gilling operations embracing can and top gills, drawing and can gilling produce sliver without twist. Two-spindle gilling and draw box, weight box, fine draw box, first and second finisher, reducer and rovers, all draft and insert twist into the stock reducing it finally to the roving which is processed in spinning frames.

American System

The competitive situation has inspired extensive research by mill operators and machinery manufacturers which has resulted in the development of drastic modifications of the older methods of worsted spinning. The most commonly used modified method for producing worsted yarns up to 38s and 40s is an adaptation of the cotton system for processing roving and spinning, generally known as the American system.

The most commonly used method for producing sliver from balls of worsted top is through three processes of gilling or pin drafting. A commonly used setup is through two-can pin drafting from balls, followed by

two-can creeled to a single can and finishing with two quads producing sliver for either cone rover operation or modified roving frames patterned after cotton roving frames.

Successful results have been obtained in the use of converted cotton drawing frames in place of gills or the pin drafters described in the foregoing. Cotton drawing frame changes embrace increasing the distance between rolls to permit drafting longer woolen top fibres in the first process which is generally followed by a second or a third drawing operation. The resulting cans of finished sliver are creeled into roving frames also with roll adjustments to properly draft longer fibres. The roving prepared in this way is in turn creeled in either cap or ring spinning frames and made available in either warp or filling yarns for weaving or knitting. Cap spinning frames are being almost universally replaced with ring frames mainly because they permit producing at higher speed and in larger packages.

The worsted spun yarns are further processed in twisting, quilling, and winding according to specifications.

Worsted Spinning Operating Layout

The desired descriptions of worsted yarn plant layouts and the current machinery and equipment costs are being presented in the following two hypothetical plant organizations. The first treats with the so-called Bradford system layout, embracing the conventional setup for production

used in plants in the United States. The second covers the general requirements for the modified system known as the American system.

In both cases processing commences with wool in top form selected on the basis of requirements for spinning 1/32s worsted yarns.

Bradford System Machinery Requirements. As indicated, the machinery requirements are designed to produce 42,000 pounds of 1/32s worsted yarn on a three-shift, total 120-hour week basis, using 62s grade wools on 6,480 spindles.

The production capacity calculations by processes and the over-all requirements are shown in the following tabulations:

	PRODUCTION			MACHINERY	
PROCESS	WASTE	POUNDS @ HOUR	POUNDS PER @ 120 HOURS	STD. LBS. PER DELIVERY HOUR	MACHINES RECOMMENDED
CAN GILL BOX	-	413.6	49,640	137.9/DEL.HR.	2 @ 2 DEL.
SPINDLE GILL BOX	-	409.5	49,144	135.8/DEL.HR.	1 @ 3 DEL.
WEIGH BOX	5.2	401.7	48,653	6.65/SPDL.HR.	10 @ 6 DEL.
SET BOX	-	401.4	48,167	4.93/SPDL.HR.	10 @ 8 DEL.
FINISHER	-	396.6	47,589	2.36/SPDL.HR.	14 @ 12 DEL.
REDUCER	5.2	375.9	45,115	3.08/SPDL.HR.	2 @ 60
ROVING	5.2	356.4	42,769	.396/SPDL.HR.	9 @ 100
SPINNING	1.8	350.0	42,000	.0537/SPDL.HR.	27 of 240
TWISTING					13 @ 200

PRODUCTION TOOLS AND EQUIPMENT

For the Bradford System

Item	Number Required	Unit Cost	Cost Estimated	Cost Actual
Can gill boxes, single head, double delivery	2	$ 5,500	$ 11,000	_____
Spindle gill box, single head, triple delivery	1	5,450	5,450	_____
Weigh boxes, double head, six delivery	10	9,275	92,750	_____
Set boxes, eight delivery	10	12,366	123,666	_____
Finishers - 12 spindles per frame	14	1,800	25,200	_____
Reducers - 60 spindles per frame	2	9,000	18,000	_____
Roving frames - 10" x 5" bobbin - 100 spindles per frame	9	15,050	135,450	_____
Frames - 240 spindles per frame	27	17,460	471,420	_____
Frames - 200 spindles per frame	13	14,000	182,000	_____
Installation cost			159,740	
Total			$1,224,676	_____

OTHER TOOLS AND EQUIPMENT

Item	Cost Estimated	Cost Actual
Spare fallers	$ 500	_____
Cans	8,000	_____
Bobbins and tubes	8,000	_____
Trucks	1,000	_____
Spare parts	10,000	_____
Total	$ 27,500	_____

American System Machinery Requirements. The American system machinery requirements are based on the production of 42,000 pounds of 1/32s worsted yarn on a three-shift, total 120-hour week basis, using 62s grade wool on 4,080 spindles.

The production capacity by processes and the estimated over-all requirements are shown in the following tabulations:

	PRODUCTION			MACHINERY	
PROCESS	WASTE	POUNDS @ HOUR	POUNDS PER @ 120 HOURS	STD. LBS. PER DELIVERY HOUR	MACHINES RECOMMENDED
PIN DRAFTER	-	416.5	49,980	250 LBS./MACHINE	2
" "	5.0	395.7	47,484	145 " "	3
QUAD DRAFTER	5.0	375.9	45,108	145 " "	3
CONE ROVERS	5.2	356.4	42,768	.69 PER SPDL.	4 OF 130 SPDL.
SPINNING	1.8	350.0	42,000	.0850 " "	17 OF 240 "

PRODUCTION TOOLS AND EQUIPMENT

for the American System

Item	Number Required	Unit Cost	Cost Estimated	Cost Actual
Pin drafters --- two-can delivery with dual 12 ball creel	2	$ 8,750	$ 17,500	_____
Pin drafters --- two-can delivery with can creel and can delivery	3	7,833	23,500	_____
Pin drafters --- four can delivery with can creel and can delivery	3	9,333	28,000	_____
Cone rovers --- 130 spindle frames	4	20,000	80,000	_____
Spinning frames --- 240 spindle frames	17	12,235	208,000	_____
Twisting frames --- 240 spindle frames	8	11,625	93,000	_____
Winding frames --- doubling	3	6,333	19,000	_____
Winding frames --- cone	3	8,333	25,000	_____
Installation cost			73,000	_____
Total			$ 567,000	_____

OTHER TOOLS AND EQUIPMENT

Item	Cost Estimated	Cost Actual
Spare fallers	$ 500	_____
Cans	17,500	_____
Bobbins and tubes	4,000	_____
Trucks	1,000	_____
Spare parts	10,000	_____
Total	$ 33,000	_____

For the purpose of this report all operating cost figures shown will be based on the American system.

FURNITURE AND FIXTURES

Item	Number Required	Unit Cost	Cost Estimated	Cost Actual
Desks and chairs	5	$150	$ 750	_____
File cabinets	5	75	375	_____
Typewriters	3	150	450	_____
Adding machine	1	125	125	_____
Total			$ 1,700	_____

DIRECT MATERIALS

Item	Annual Requirements	Unit Cost	Annual Cost Estimated	Annual Cost Actual
Wool	2,500,000 lbs.	$1.10 lb.	$2,750,000	_____
Packaging			30,000	_____
Total			$2,780,000	_____

SUPPLIES

Item	Annual Cost Estimated	Annual Cost Actual
Lubricants and hand tools	$ 500	_____
Maintenance and spare parts	11,000	_____
Office supplies	500	_____
Total	$ 12,000	_____

PLANT LAYOUT

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

PLANT SITE

For the purpose of eventual expansion, about two acres will be required. The plant site should be located as advantageously as possible with respect to power, water, fuel, transportation, sources of labor and markets.

The estimated cost of the plant site is $4,000.

BUILDING

A one-story building 200 feet by 240 feet or 48,000 square feet will be required. In modern yarn plants the building is usually windowless in design with controlled humidity and temperature and flourescent lighting.

The total cost of the building is estimated at $288,000.

POWER

The connected load requirements for this plant amount to about 500 horsepower.

The annual cost of power is estimated at $15,000.

WATER

About 2,400,000 gallons of water is required annually for production and for sanitary fire prevention purposes.

The annual cost of water is estimated at $500.

FUEL

About 100,000 gallons of oil is needed annually. The cost of fuel is estimated at $8,000 per year.

DIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimated	Annual Cost Actual
Grilling and roving	3	$2.25	$ 13,500	_____
Pin drafters	6	1.80	21,600	_____
Roving tenders	6	1.90	22,800	_____
Spinning and twisting	3	2.25	13,500	_____
Spinners	27	2.00	108,000	_____
Yarn weighers, clean and oil	3	1.70	10,200	_____
Winder tenders	18	1.80	64,800	_____
Twister tenders	24	1.80	86,400	_____
Inspectors	6	1.50	18,000	_____
Packer	1	1.60	3,200	_____
Production clerk	3	1.60	9,600	_____
Stock handler	1	1.50	3,000	_____
Receiving and shipping clerk	1	2.00	4,000	_____
Total	102		$ 378,600	_____

INDIRECT LABOR

Occupation	Number Required	Annual Cost Estimated	Annual Cost Actual
Plant manager	1	$ 12,000	_____
Superintendent	1	8,000	_____
Office manager	1	8,000	_____
Office staff	3	12,000	_____
Mechanic	1	5,000	_____
Total	7	$ 45,000	_____

DEPRECIATION

Description	Estimated Cost	Years Life	Annual Cost Estimated	Annual Cost Actual
Building	$ 288,000	20	$ 14,400	_____
Production tools and equipment	567,000	10	56,700	_____
Other tools and equipment	33,000	10	3,300	_____
Furniture and fixtures	1,700	10	170	_____
Total			$ 74,570	_____

MANUFACTURING OVERHEAD

Item	Annual Cost Estimated	Annual Cost Actual
Depreciation	$ 74,570	_____
Indirect labor	45,000	_____
Power	15,000	_____
Water	500	_____
Fuel	8,000	_____
Supplies	12,000	_____
Total	$ 155,070	_____

MANUFACTURING COSTS

Item	Annual Cost Estimated	Annual Cost Actual
Direct materials	$2,780,000	_____
Direct labor	378,600	_____
Manufacturing overhead	155,070	_____
Total	$3,313,670	_____

FIXED ASSETS

Item	Cost Estimated	Cost Actual
Land	$ 4,000	_____
Building	288,000	_____
Production tools and equipment	567,000	_____
Other tools and equipment	33,000	_____
Furniture and fixtures	1,700	_____
Total	$ 893,700	_____

WORKING CAPITAL

Item		Cost Estimated	Cost Actual
Direct materials	30 days	$ 231,700	_____
Direct labor	30 days	31,600	_____
Manufacturing overhead	30 days	12,900	_____
Reserve for sales collections	30 days	350,000	_____
Total		$ 626,200	_____

CAPITAL REQUIREMENTS

Item	Cost Estimated	Cost Actual
Fixed assets	$ 893,700	_____
Working capital	626,200	_____
Total	$1,519,900	_____

SALES REVENUE

The annual production capacity of this plant is 2,100,000 pounds of worsted yarn. The current price of this yarn f.o.b. plant is $2.00 per pound.

Based on these figures the gross sales revenue would amount to $4,200,000.

RECAPITULATION OF COSTS, SALES AND PROFITS

Item	Estimated Cost		Actual Cost
Direct materials	$2,780,000		_____
Direct labor	378,600		_____
Manufacturing overhead	155,070		_____
Total manufacturing cost		$3,313,670	_____
Interest on loans	$ 45,600		_____
Insurance	4,560		_____
Legal	2,000		_____
Auditing	5,000		_____
Unforeseen expense	40,170		_____
Total administrative costs		$ 97,330	_____
Sales commissions		30,000	_____
Travel, bad debts, discounts and allowances, fright-out		15,000	_____
Profit before taxes		744,000	_____
Total annual gross sales		$4,200,000	_____

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	$_____	$ 4,763	$ 57,160	$_____
20	Sales	_____	3,750	45,000	_____
30	Direct Materials	_____	231,666	2,780,000	_____
40	Supplies	_____	1,000	12,000	_____
51	Power*	_____	1,250	15,000	_____
52	Water*	_____	41	500	_____
53	Fuel	_____	666	8,000	_____
60	Unforeseen Expense (Reserve Account)	_____	3,347	40,170	_____
71	Direct Labor*	_____	31,550	378,600	_____
72	Indirect Labor*	_____	3,750	45,000	_____
80	Depreciation (Reserve Account)	_____	6,214	74,570	_____

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.

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?

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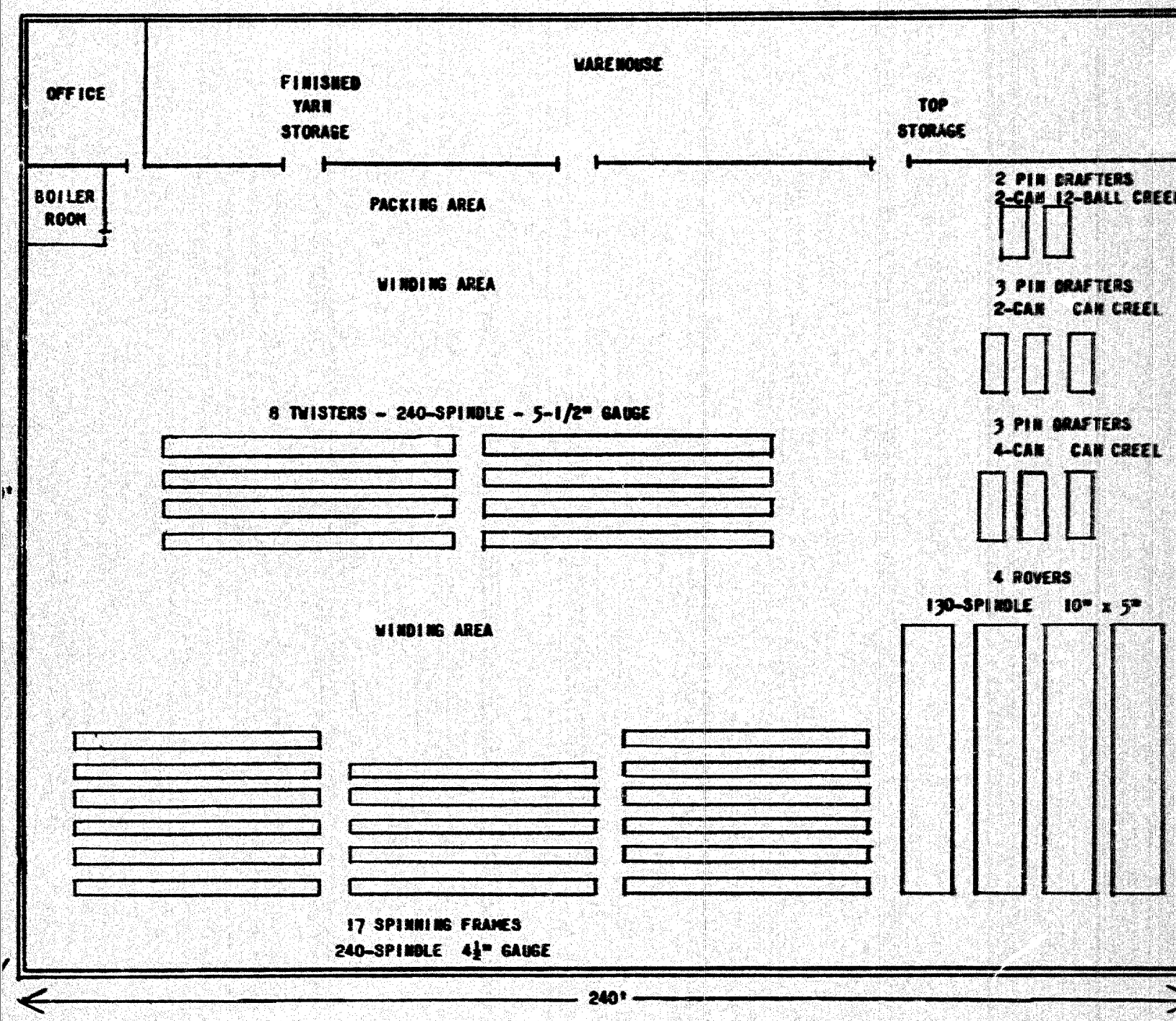
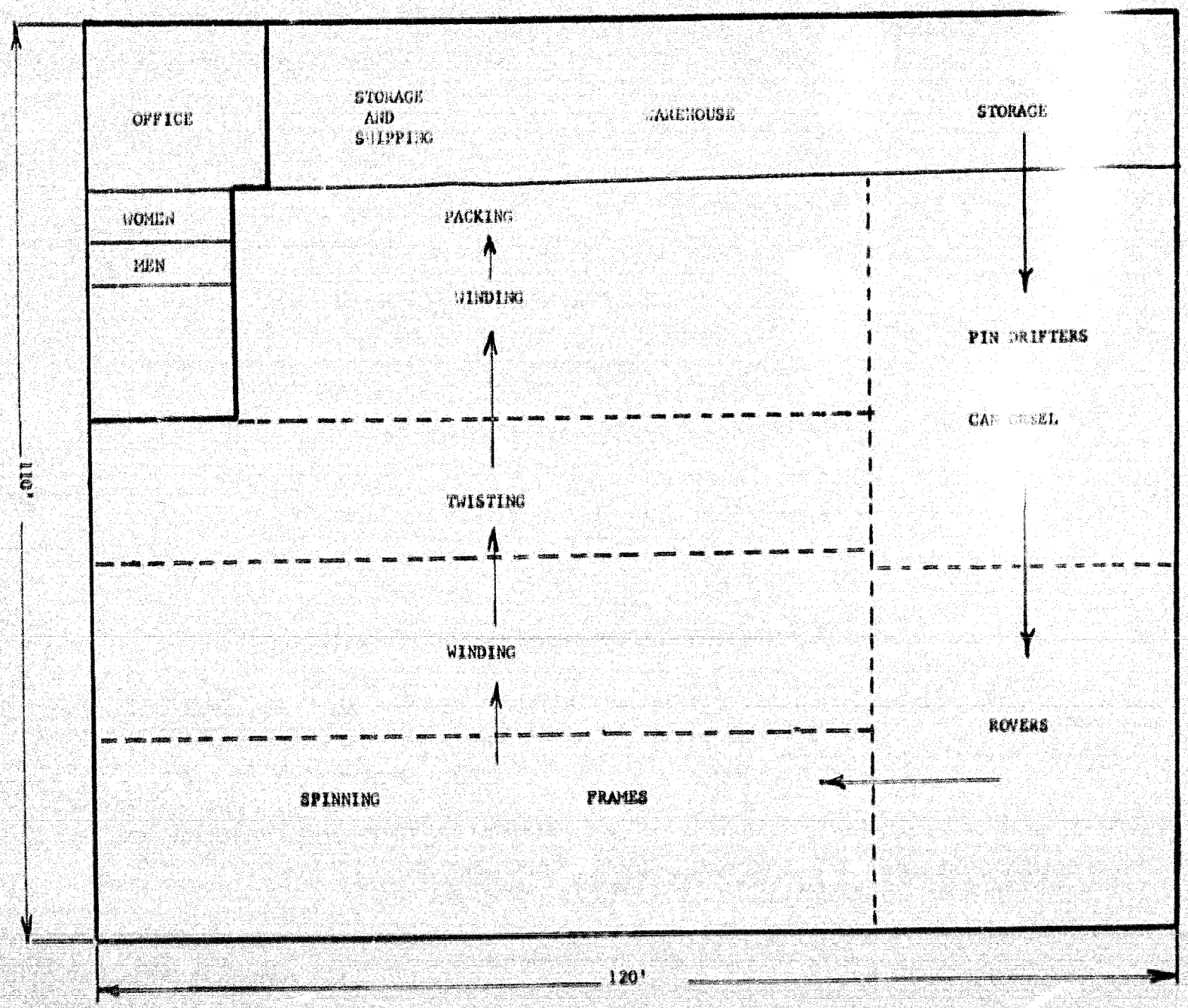


AMERICAN SYSTEM
MACHINERY LAYOUT FOR WORSTED SPINNING MILL

Scale 1" = 32'

ARROWS INDICATE WORK FLOW