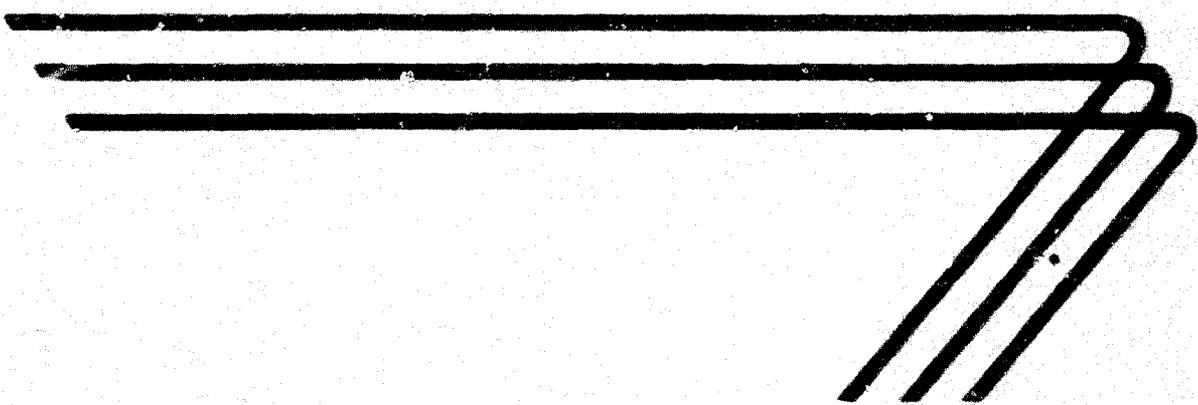
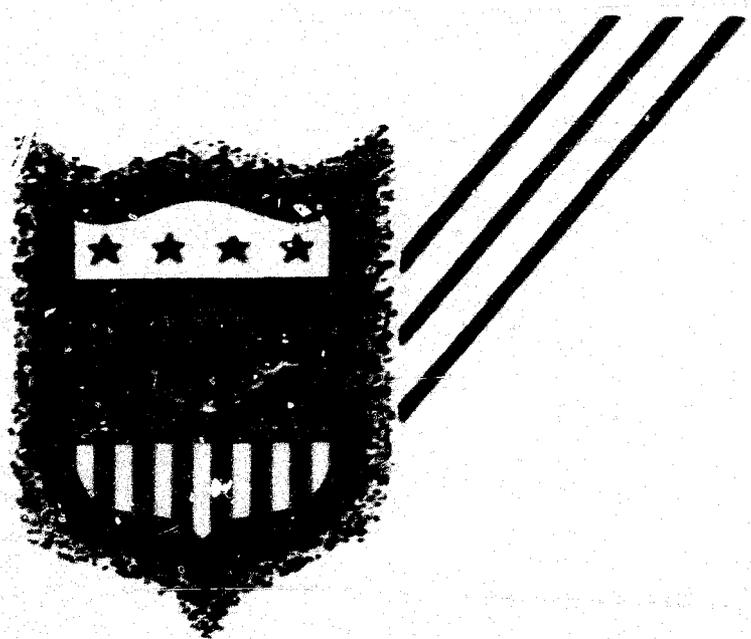


L 473

PLANT REQUIREMENTS FOR MANUFACTURE OF FLEXIBLE STEEL CONDUIT



**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.

Industrial reports prepared for ICA under special contract are customarily reviewed and edited before publication. This report, however, like other technical inquiry replies, has not been reviewed; it is the sole responsibility of the firm that prepared the report.

This brochure was prepared in February 1957 by A. M. Lederer and Company, New York, New York. Technical information was provided by Sleeper and Hartley, Inc., Worcester, Massachusetts.

* * * * *

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-49

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335 Chandler Street
Worcester 1, Massachusetts

Waterbury Farrell Foundry Company
Waterbury, Connecticut

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FLEXIBLE STEEL CONDUIT

INTRODUCTION

Flexible steel conduit consists of a single strip of galvanized steel spirally wound on itself and interlocked in such a manner as to provide a round cross section of high mechanical strength and great flexibility. The regulations governing its electrical use are the same as those for rigid conduit. However, it is not moisture proof and can not be used where the action of any considerable amount of moisture is objectionable.

The operations involved in the making of flexible steel conduit are not very complex and, with the exception of supervisory personnel, the work can be done by semi-skilled labor.

The production unit described herein involves the minimum capital outlay commensurate with the efficient and economical manufacture of all standard sizes of flexible steel conduit up to and including two-inch inside diameter.

Two armoring machines are used in this production unit. One machine operates at 625 revolutions per minute and the other operates at 300 revolutions per minute. The faster machine can wind conduit up to one-inch diameter. The slower machine can wind conduit from one-half inch to two inches diameter. To achieve the lowest production cost, the small sizes, one-half inch and three-quarter inch, are wound on the 625 revolutions per minute machine and the larger sizes, one inch, one and one-half inch, and two inch diameter, are wound on the 300 revolutions per minute machine. In the event both machines are required for one-half inch or three-quarter inch conduit production, they can be used. How-

ever, the production cost on the slower machine would be almost twice that of the fast machine.

This plant, while intended for the manufacture of flexible steel conduit, is capable of manufacturing many similar products with the same equipment, such as: flexible tubing and exhaust hose. With the addition of some relatively inexpensive equipment, the plant can manufacture moisture-proof conduit and tube, armored cables, parkway cables, and similar armored products.

In addition to steel, other metals such as aluminum, brass, and bronze may be used to make conduit, tubing, and armored cable.

GENERAL ASSUMPTIONS

In order to make realistic estimates, certain assumptions must be made, These are:

1. Costs are based on 1959 prices in the United States. Labor rates are those prevailing in the electrical industry for the various job classifications indicated.
2. Adequate water, electric power, and transportation facilities are available at the plant site.
3. The plant will operate one eight-hour shift, five days per week, fifty weeks per year.
4. The necessary raw materials are available at proper prices.
5. Labor saving devices, which would increase investment out of proportion to the corresponding reduction in unit costs, have not been included in equipment requirements.
6. The following items are omitted because they can not be estimated realistically:
 - a) Freight in and out
 - b) Land value
 - c) Taxes, insurance, and interest

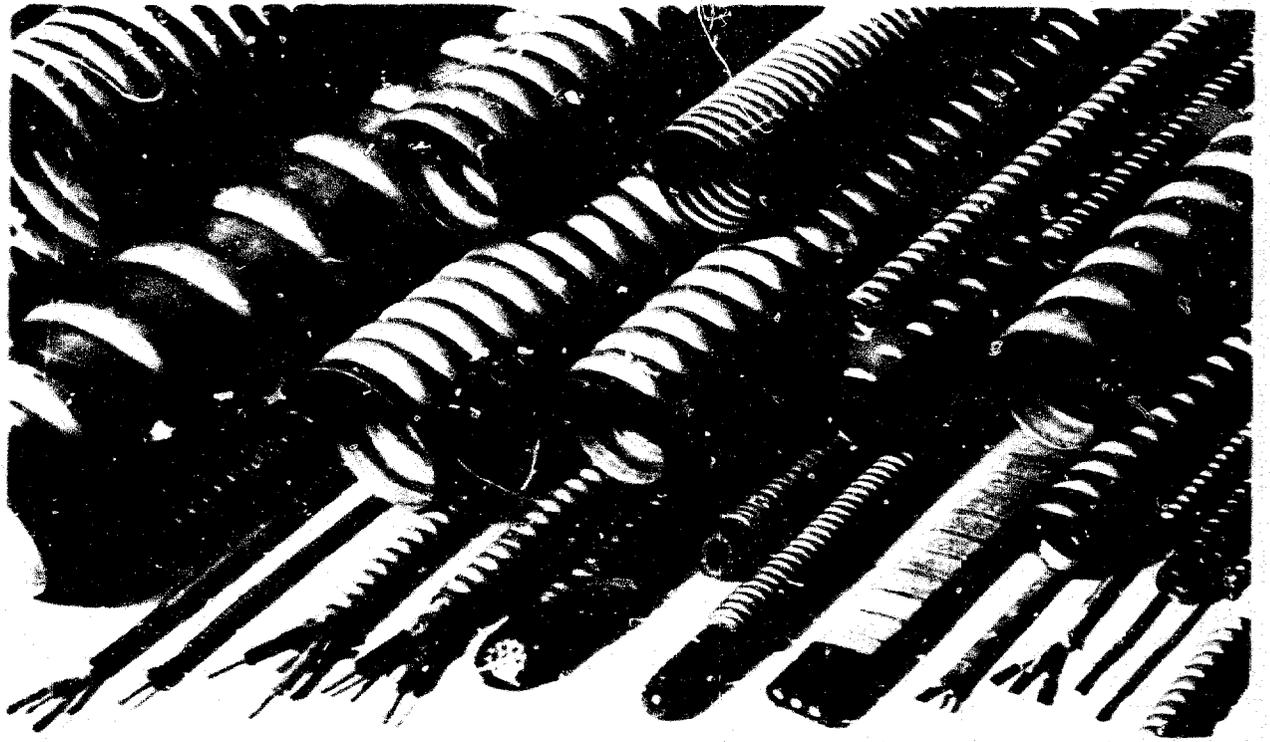
PRODUCT SPECIFICATIONS

TABLE I

FLEXIBLE STEEL CONDUIT

<u>Nominal Inside Diameter Inches</u>	<u>Approximate Outside Diameter Inches</u>	<u>Approximate Number of Feet In Coil</u>	<u>Approximate Weight Per 1000 Feet In Pounds</u>
5/16	0.470	250	160
3/8	0.617	250	180
1/2	0.910	100	520
3/4	1.090	50	620
1	1.400	50	1180
1-1/4	1.665	50	1480
1-1/2	1.975	25	1800
2	2.440	25	2280
2-1/2	3.000	25	2840
3	3.350	25	3000

Note: See product photograph on following page.



CABLES, CONDUIT, HOSE AND OTHER ARMORED PRODUCTS WHICH
MAY BE MADE WITH THE EQUIPMENT IN THE PLANT DESCRIBED.

MANUFACTURING OPERATIONS

Preparation of the Steel Strip:

Hot rolled strip steel in coils is delivered by rail or truck to the receiving and steel storage area of the plant. When required, a coil of appropriate thickness is delivered by lift-truck to the slitting machine where it is mounted on the uncoiler, slit to proper width, and recoiled.

Hot rolled steel, when delivered from the mill, is usually coated with an oxide film which must be removed before it can be successfully galvanized. This film removal operation is called pickling.

Coils, which have been slit to required width, are placed on an uncoiler and threaded through a diluted sulphuric acid bath and washer. As each coil is exhausted, the starting end of another coil of the same section is outt-welded to it to make a continuous strip.

When drawn through the pickling bath and washer at a controlled rate of speed, the strip emerges free of oxide and is dried in a hot-air chamber. As it emerges from the drying operation, the strip travels on conveyor rollers to the galvanized bath.

The galvanizing bath is molten zinc containing two-tenths (0.2) of one percent of aluminum and covered with a layer of sal ammoniac, which acts as a flux and inhibits the formation of zinc dross. The bath is maintained at a temperature of 454^o Centigrade.

The galvanizing tank is fitted with adjustable rollers, which pass the strips under the surface of zinc at a controlled rate of speed to insure proper adhesion of the zinc to the steel strip. When the strip emerges from the galvanizing bath, it passes between asbestos pads to remove excess metal, and then through a water spray-cooling chamber. Passing out of this chamber, still hot to the touch but dry, it is recoiled on spools.

Armoring Operations (Forming the Conduit):

The armoring or forming operations are carried out by a series of machines set in line. First is the armoring machine, which forms the conduit; next to it, and concentric with it, is the hollow spindle spooler;

next to the spooler is the flexing and measuring machine; and at the end of the line is a recoiler equipped with collapsible block spools.

First Operation:

The galvanized strip, wound on spools, is placed on an uncoiler and rewound on the split spool of the hollow spindle spooler.

Second Operation:

The loaded split spool is removed from the hollow spindle spooler and placed on the armoring machine.

Third Operation:

The strip is threaded through the forming head of the armoring machine and started in a circle with pliers or tongs.

Fourth Operation:

The armoring machine is started and as it rotates the strip is formed to the correct sectional contour in the forming head and wound spirally on itself to form a circular section.

As the formed conduit emerges from the armoring machine, it is threaded through the spindle of the hollow spindle spooler, around the drums of the flexing and measuring machine, through the cutter jaws, and around the spool of the recoiler.

General:

As the armoring machine produces conduit, the hollow spindle spooler rewinds more strip. When the spool of strip on the armoring machine is exhausted, the machines are stopped, the empty spool on the armoring machine removed, and the full spool on the hollow spindle spooler moved into its place. The end of the strip in the armoring machine is butt-welded to the starting end of the new spool, making possible an endless length of conduit.

The conduit, after passing through the hollow spindle spooler, is flexed in two directions on

the flexing machine and measured, the length being recorded on a counter. The measuring machine may be set to actuate the cutters for any standard length of conduit.

The take-up or recoiler winds the finished conduit on collapsible blocks, which permit tying the conduit in bundles and ready removal from the machine.

After tagging for identification, the bundles are stacked on skids and moved to the finished goods storage and shipping area.

Other than tying the coils or bundles with wire, no packaging is necessary for local distribution. For export, the conduit is wrapped with burlap and crated.

MATERIALS

DIRECT

Steel: Hot rolled strip steel in coils -
24 inches wide, .040, .055,
.060 inches thick - base price - \$0.0510
per pound freight on
board mill, Youngs-
town, Ohio, U.S.A.

(All extras, such as cutting, are added to the base price.)

Usage:

1/2 inch conduit	-	52 pounds per 100 feet
3/4 inch conduit	-	62 pounds per 100 feet
1 inch conduit	-	118 pounds per 100 feet
1-1/2 inch conduit	-	180 pounds per 100 feet
2 inch conduit	-	220 pounds per 100 feet

Specifications:

Mild steel between 40,000 - 70,000 pounds per square inch tensile strength. Elongation, minimum 10 percent between bench marks, 10 inches apart.

<u>Zinc (Prime Western):</u>	\$0.11 per pound freight on board East Saint Louis, Missouri, U.S.A.
Lead - 1.60 percent	
Iron - 0.08 percent	
<u>Aluminum:</u> (Ingot Price)	\$0.268 per pound freight on board New York, New York U.S.A.
99.90 percent	

Estimated Average Usage:

Zinc usage averages 5 percent by weight
of steel strip galvanized.

Aluminum usage averages 0.2 percent by
weight of zinc usage.

INDIRECT

<u>Sulphuric Acid:</u>	\$19.35 per ton, in tanks, freight on board, New York, New York, U.S.A.
(Commercial 66° Baumé)	
<u>Sal Ammoniac:</u>	\$0.0865 per pound freight on board New York, New York U.S.A.
(Commercial Gray)	

Estimated Average Usage:

Sulphuric Acid - 1.7 pounds per 100 pounds
of steel

Sal Ammoniac - 250 pounds per month

SUPPLIES

TABLE II

<u>Yearly Average Usage</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Total Cost</u>
1000 pounds	Tying Wire	\$0.30 per pound	\$300.00
25 gallons	Lubricating Oil	2.00 per gallon	50.00
12 pair	Rubber Gloves	2.25 per pair	27.00
6	Rubber Aprons	6.50 each	39.00
12 pair	Fire Resistant Coveralls	9.00 each	108.00
6 pair	Asbestos Gloves	5.00 per pair	30.00
144 pair	Leather Palm Gloves	1.25 per pair	180.00
2 pair	Shatter-proof Goggles	7.50 per pair	15.00
6	Face Shields	5.00 each	30.00
6	Safety Respirators	10.00 each	60.00
	Yearly Total		\$839.00

Monthly Usage: $\frac{\$839.00}{12} = \70.00

EQUIPMENT REQUIREMENTS

PRODUCT TOOLS AND EQUIPMENT

<u>Number</u>	<u>Description</u>	<u>Price</u>
1	24-inch Rotary Slitter and Trimmer, complete with Un-Coiler, Recoiler, Cutters, 30-Horsepower Motor, and Starting and Control Gear	\$30,500.00
100	Metal "Take-Off" Spools	9,000.00
1	Butt Welder and Grinder	2,725.00
1	Pickle and Wash Tank with Heating Coils and Controls, Internal Conveyors, Exhaust Hoods and Ducts, 5-Horsepower Motor and Controls and Uncoiler	23,500.00
1	Hot Air Drying Tunnel with Exhaust Fan, 1-Horsepower Motor and Controls, Ducts, and Instrumentation	2,800.00
1	Galvanizing Bath complete with Oil-fired Heating Units, Internal Conveyors, Exhaust Hoods and Ducts and Recoiler, 5-Horsepower Motor and Controls	44,000.00
1	Spray Chamber, complete with Pump, Spray Nozzles, Piping Fan and Ducts and all Controls	4,700.00
1	Sleeper and Hartley Armoring Set, complete with Hollow Spindle Spooler with 1-Horsepower Motor; one Number 494, 2-inch Armoring Machine with 10-Horsepower Motor; one Flexing Machine; one Measuring Machine; one Automatic Cutter; one Recoiler, and all Control Gear	33,700.00

<u>Number</u>	<u>Description</u>	<u>Price</u>
3	Sleeper and Hartley Armoring Set complete with Hollow Spindle Spooler with 1-Horsepower Motor; one Number 655 1-inch Armoring Machine with 5-Horsepower Motor; one Flexing Machine; one Measuring Machine; one Automatic Cutter; one Recoiler, and all Control Gear	\$27,000.00
1 Set	Forming and Coiling Tools for five Conduit Diameters	7,700.00
2	Electric Lift-Trucks with interchangeable Bar and Fork Attachments	13,000.00
100	Corrugated Steel Skids	4,000.00
1	Portable Butt Welder for Strip	2,200.00
1	Overhead 10-Ton Hoist and Rail	3,700.00
1	Battery Charger for Electric Trucks	1,350.00
2	Platform Scales, 3000-pound capacity	3,600.00
3	Hand Pallet Trucks	1,500.00
		<hr/>
		\$214,975.00
	Complete installation of all machines, tanks, duct work, electric power wiring, water and sewer lines, oil burners	35,000.00
		<hr/>
	Total Cost	\$249,975.00

OTHER TOOLS AND EQUIPMENT

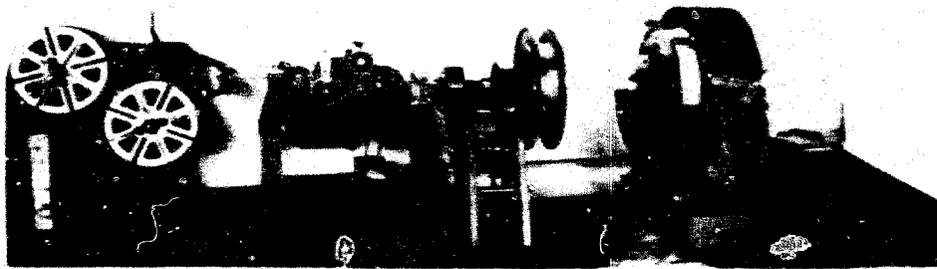
<u>Number</u>	<u>Description</u>	<u>Price</u>
100	Wooden Pallets	\$1,200.00
1	Hand-drawn Carbon Dioxide Fire Extinguisher Truck	2,200.00

<u>Number</u>	<u>Description</u>	<u>Price</u>
5	Carbon Dioxide Hand Fire Extinguishers	\$100.00
	Miscellaneous small tools and benches for Production and Maintenance Departments	2,000.00
	Total Cost	\$5,500.00

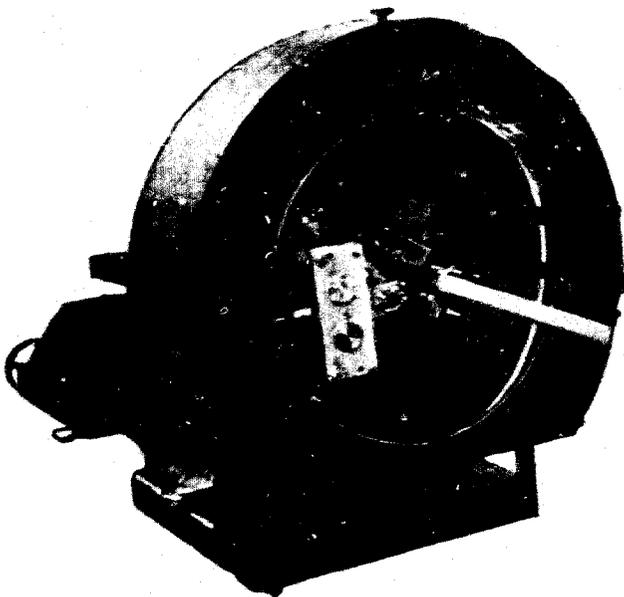
FURNITURE AND FIXTURES

TABLE III

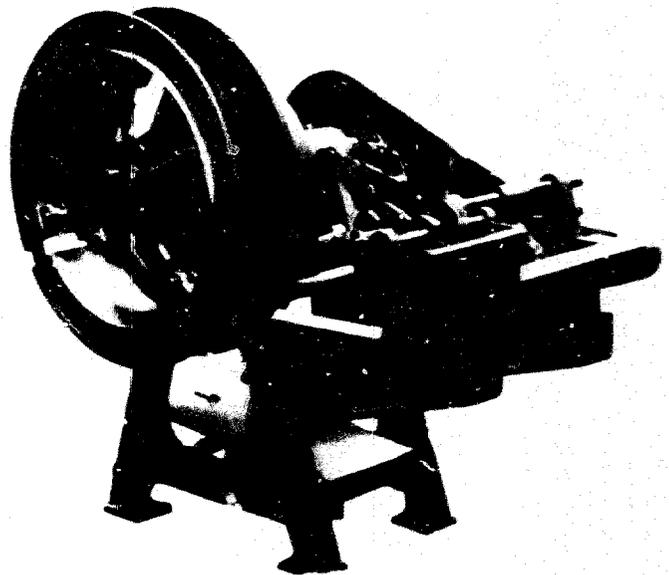
<u>Description</u>	<u>Unit Cost</u>	<u>Number Required</u>	<u>Total Cost</u>
Executive Metal Desks	\$215.00	5	\$1,075.00
Typewriter Metal Desks	265.00	6	1,590.00
Chairs - Metal	96.00	11	1,056.00
Bookcases	60.00	5	300.00
Typewriters	250.00	6	1,500.00
File Cabinets	112.00	10	1,120.00
Adding Machines	225.00	3	675.00
Calculator	900.00	1	900.00
Desk Lamps	30.00	11	330.00
Drawing Board	100.00	1	100.00
Small Table	116.00	1	116.00
Waste Baskets	3.00	11	33.00
Miscellaneous Rugs			800.00
Clothes Racks			
Extra Chairs			
Benches			
	Total Cost		\$9,595.00



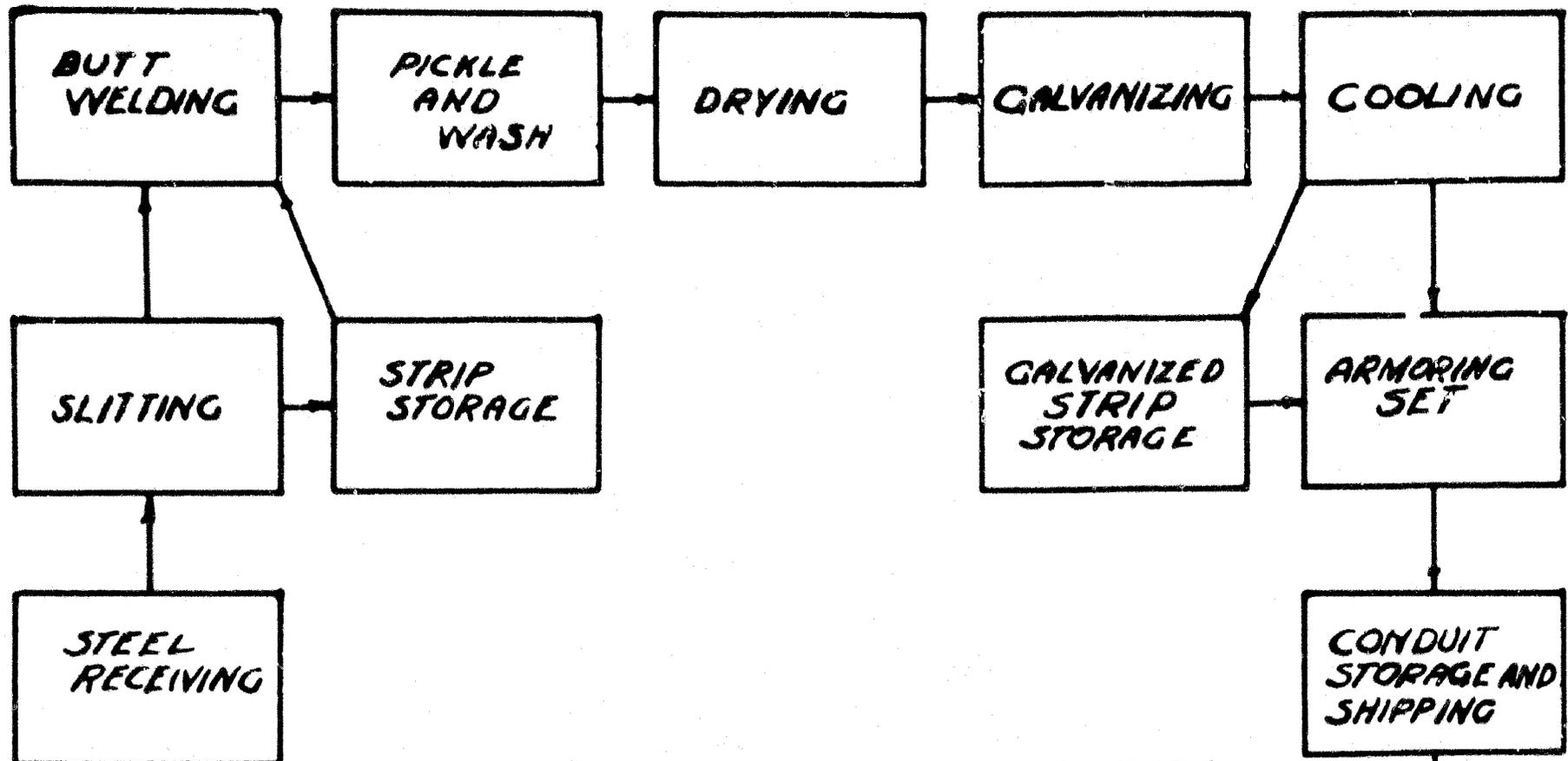
**ARMORING SET SHOWING, RIGHT TO LEFT,
ARMORING MACHINE, HOLLOW SPINDLE SPOOLER,
FLEXING AND MEASURING MACHINE, CUTTER
AND RECOILER**



**TWO INCH ARMORING MACHINE
WITH 10 HORSEPOWER MOTOR
SHOWING FORMING HEAD WITH
CONDUIT EMERGING**



**HOLLOW SPINDLE SPOOLER WITH ONE
HORSEPOWER MOTOR SHOWING SPLIT
SPOOL IN PLACE ON QUICK ACTING
COLLAPSIBLE CENTER**



FLOW DIAGRAM FOR THE MANUFACTURE OF FLEXIBLE STEEL CONDUIT

PLANT SITE

Size

Minimum Requirements: 175 feet by 180 feet
Suggested Area for Expansion: 225 feet by 200 feet

Requirements

Plant should be located in or near a large manufacturing center, preferably a port. It must have rail or truck facilities with raw materials, water, electric power, and fuel available at reasonable prices.

BUILDING

Dimensions: 125 feet by 95 feet

Area: 11,875 square feet

Loading Platform: 125 feet by 10 feet

Area: 1,250 square feet

Construction:

Concrete block and steel sash. Steel truss and pitched roof. One row of columns. Reinforced concrete floor rated 500 pounds per square foot. Foundations for major equipment included.

Cost: At present United States prices,
approximately \$122,500.00

POWER

Connected Machine Horsepower -	58 Horsepower
Estimated Lighting, Battery Charging, and Welding Load -	30 Kilowatts
Total Power, approximately -	74 Kilowatts
Total Energy Usage for Eight Hours -	592 Kilowatt Hours

Estimated Cost at \$0.02 per Kilowatt Hour, for one eight-hour day =	\$11.84
Average Electric Cost per 40-hour week =	59.20
Average Electric Cost per month, \$59.20 x 4.33 weeks =	256.34

FUEL

Fuel requirements are for process heating only and do not include heating of building spaces.

Fuel

Number 4 Fuel Oil	
Cost: Barge, New York Harbor, per barrel (\$0.1025 per gallon)	\$3.23

For start up and operation for eight hours:

1. Galvanizing Bath:

Initial start up	80 gallons
Running rate, per hour	7 gallons
8-hour run	56 gallons
Stand-by rate, per hour	1.5 gallons
16-hour stand-by	24 gallons
2. Total daily requirement	80 gallons
3. Total weekly requirement 5 x 80 = 400 / 80 =	480 gallons
4. Total weekly fuel cost	\$49.20
5. Total monthly fuel cost \$49.20 x 4.33 weeks =	\$213.00

NOTE: This fuel furnishes heat for the drying chamber (flue gases) and the heating coils in the pickling tank.

WATER

Quality

The ideal quality of water for pickling and washing would be clean, soft and neutral. The presence of some alkaline salts increases acid usage and forms sludges.

Quantities Used

Pickle Wash Bath -	1,800 gallons per hour
	14,400 gallons per 8 hours
	72,000 gallons per 40-hour week

Cost

Average rate, per 1000 gallons	\$0.15
Per 8 hours	2.16
Per 40 hours	10.80
Monthly average cost - \$10.80 x 4.33 weeks	46.76

NOTE: This water is first used in the cooling chamber and piped to the washer. Acid pickle solution is made up with used wash water.

TOOL WEAR

Estimated replacement of forming and coiling tools for 5 sizes of conduit on armoring machine:

3 sets per year at \$7,700.00 per set	\$23,100.00
---------------------------------------	-------------

Estimated replacement of cutting tools on slitting machine, per year	900.00
--	--------

Total tool replacement, per year	\$24,000.00
----------------------------------	-------------

Tool replacement, per month - $\frac{\$24,000}{12}$	\$2,000.00
---	------------

FIXED ASSETS

Land	-----
Building	\$122,500.00
Production Equipment	249,975.00
Other Tools and Equipment	5,500.00
Furniture and Fixtures	9,595.00
	<hr/>
Total Fixed Assets	\$387,570.00

DEPRECIATION

TABLE IV

<u>Item</u>	<u>Estimated Cost</u>	<u>Life Years</u>	<u>Yearly Depreciation</u>
Building	\$122,500.00	20	\$6,125.00
Production Equipment	249,975.00	10	24,998.00
Tools and Equipment	5,500.00	5	1,100.00
Furniture and Fixtures	9,595.00	10	960.00
			<hr/>
Total Yearly Depreciation			\$33,183.00
Monthly Depreciation -	$\frac{\$33,183.00}{12}$	-	\$2,765.00

MONTHLY MANUFACTURING OVERHEAD EXPENSES

Depreciation	\$2,760.00
Indirect Labor	7,469.00
Electric Power	257.00
Fuel	213.00
Water	47.00
Indirect Materials	60.00
Supplies	70.00
Tool Wear	2,000.00
Insurance, Taxes, Interest	-----
<hr/>	
Total	\$12,876.00

LABOR REQUIREMENTS

TABLE V

INDIRECT LABOR

<u>Job Title</u>	<u>Number Required</u>	<u>Rate</u>	<u>Total Per Week</u>
Plant Superintendent	1	\$225.00	\$225.00
Line Foreman	1	130.00	130.00
Maintenance Mechanic	1	100.00	100.00
Maintenance Helper	1	80.00	80.00
Cleaner	1	60.00	60.00
Warehouse Supervisor	1	130.00	130.00
Shipping Supervisor	1	130.00	130.00
Materials Handlers	6	75.00	450.00
Electric Truck Operators	2	90.00	180.00
Stock and Shipping Clerks	3	80.00	240.00
<hr/>			
Total Weekly Wages			\$1,725.00
Indirect Labor Cost, per month - \$1,725.00 x 4.33 weeks =			\$7,469.00

TABLE VI
DIRECT LABOR

<u>Job Title</u>	<u>Number Required</u>	<u>Rate</u>	<u>Total Per Hour</u>
Slitter Operator	1	\$2.60	\$2.60
Slitter Helper	2	1.90	3.80
Pickle Bath Operator	1	2.50	2.50
Pickle Bath Helper	2	1.90	3.80
Galvanize Bath Operator	1	2.50	2.50
Galvanize Bath Helper	2	1.90	3.80
Armoring Machine Operator	1	2.60	2.60
Armoring Machine Helper	2	1.90	3.80
<hr/>			
Total	12		\$25.40
Total Weekly (40 Hours)			\$1,016.00
Direct Labor Cost, per month			
\$1,016.00 x 4.33 weeks =			\$4,400.00

UNIT COST OF MANUFACTURE

Average production of all sizes of Flexible Steel Conduit, per month -		222,995 pounds
Direct Labor -	$\frac{\$4,400}{222,995}$	= \$0.01973 per pound
Materials -	$\frac{\$12,856}{222,995}$	= 0.05765 per pound
Overhead -	$\frac{\$12,876}{222,995}$	= 0.05774 per pound
Total Average Production Cost of Flexible Steel Conduit,		<hr/> \$0.13512 per pound

WORKING CAPITAL

Inventories

Direct Materials (3 months)	\$38,569.00
Indirect Materials (3 months)	181.00
Supplies (3 months)	210.00
Work in Process (2 days)	2,781.00
Finished Goods (2 weeks)	13,905.00

Payroll

Direct (3 months)	13,200.00
Indirect (3 months)	22,407.00

Utilities

Water (3 months)	141.00
Fuel (3 months)	639.00
Power (3 months)	771.00

<u>Bank Balance (Minimum)</u>	10,000.00
-------------------------------	-----------

Total Working Capital	\$102,804.00
-----------------------	--------------

ANNUAL SALES

The average annual production (50 weeks) of flexible steel conduit would be 2,575,000 pounds, made up of conduit sizes 1/2, 3/4, 1, 1-1/2, and 2 inches. In the United States the greater sales are in the smaller sizes and for convenience prices are quoted in feet instead of pounds.

Distributors' prices to electrical contractors:

<u>Size</u>	<u>Price Per 100 Feet</u>	<u>Weight Per 100 Feet</u>	<u>Price Per Pound</u>
1/2 inch	\$12.20	52 pounds	\$0.235
3/4 inch	15.60	62 pounds	.258
1 inch	32.30	118 pounds	.274
1-1/2 inch	52.00	180 pounds	.289
2 inch	67.90	228 pounds	.298

In computing annual sales for the manufacturing plant described:

1. Capacity production is sold.
2. Sales are made directly to electrical contractors and other users at the quoted contractors' prices.
3. The average selling price for the five sizes listed would be \$0.2708 per pound.

Annual Sales:

2,575,000 x \$0.2708 = \$697,310.00

SALES AND DISTRIBUTION

A manufacturing plant of this size could also be its own distributor locally. In distant locations, where sales and service justified it, it may be desirable to use independent distributors.

The firm's sales staff would be made up of:

- 1 Sales Manager
- 5 Salesmen
- 1 Order Clerk
- 2 Stenographers
- 1 Secretary

The cost of sales, including wages, expenses, sales promotion, and supplies should be budgeted at 10 percent of sales, or approximately at \$70,000.00 annually.

Practically all flexible steel conduit is sold to building contractors, electrical contractors, and industrial plants. The major sales effort is directed toward these groups.

RECAPITULATION OF COSTS, SALES, AND PROFITS

Gross Sales (2,575,000 x \$0.2708) -	\$697,310.00
Less: Cost of Manufacturing (2,575,000 x \$0.13512)	347,924.00
	<hr/>
Gross Profit on Sales	\$349,386.00
Less: Sales and Administrative Expense (15 percent of sales)	104,597.00
	<hr/>
Net Profit	\$244,789.00

(Before interest, taxes, insurance, and
amortization of possible funded debt.)

COST CONTROLS

Before starting operations in the plant, standards for all materials, labor, both direct and indirect, and for all controllable overhead items should be set.

A wage incentive plan might be established.

Reports on daily production, man-hours required, scrap, and spoilage should be made for each cost center.

Reports on supplies usage, maintenance labor, and maintenance materials usage should be made, using requisitions for supplies and maintenance orders for maintenance labor and materials.

The standards set and the reportage of actuals will give the necessary information for control action and will lay the ground work for the possible establishment of a standard cost system later.

BUDGET

The dollar volume of this firm's business, in the starting stages, would not be sufficient to justify wide budget coverage or statistical methods of forecasting

and other information gathering. Initially, three budgets should be used, each based on historical records modified by apparent trends or conditions:

Cash Budget
Sales Volume Budget
Purchasing Budget

The Cash Budget shows for each month the cash receipts, budgeted and actual and the variance between them, the cash disbursements, budgeted, actual and variance, and the monthly balance. The column marked "Action" notates the corrective action which the controller recommends.

The Sales Budget follows the same form, showing budgeted sales, actual sales, variance, and corrective action recommended.

The Purchasing Budget follows the same form also, showing total amount budgeted for purchases, the actual amount spent, the variance, and a column showing the sum of the variances. The "Action" column notates corrective action taken or recommended.

SAFETY

This type of plant has severe major accident hazards:

1. Heavy weights
 2. Sharp metal
 3. Strong acid
 4. Hot metal
 5. Moving machinery
 6. Toxic fumes
 7. Heavy traffic
-
1. The lifting of weights over fifty pounds must be done by lift-truck or hoist.
 2. All handling of metal must be done with leather palm or asbestos gloves.
 3. Acid handling must be done with rubberized aprons, rubber gloves, face shields, and approved type respirators. Acid transfer must be done by syphor or chemical pumps.

4. Any work done in or near the galvanizing bath must be done in fire resistant clothing, asbestos gloves, face shield, respirator, and protective shoes or boots.
5. All machinery must be guarded and equipped with safety switches. Only the designated machine operator can start or stop a machine in production. Helpers will assist in loading, unloading, and similar activities, but not stop or start a machine except in an emergency.
6. All points of toxic fumes are hooded and exhausted. Any work required for any reason in a toxic atmosphere must be done in protective clothing and with the use of respirators.
7. The trucking of heavy weights in working areas makes it imperative to keep all such areas and aisles clear at all times.

Aside from the seven major hazards noted, others exist normally in all industrial plants. Therefore, constant effort must be exerted to make all employees safety conscious. The plant superintendent should make frequent safety inspections, stressing cleanliness of plant, the correct functioning of safety devices, testing and inspecting fire and first-aid equipment, and all hazard areas.

TRAINING

The training of personnel for a plant manufacturing flexible steel conduit starts, as it should in all industrial plants, after the proper person, having the skills or aptitudes and physical requirements, is selected.

The training steps are:

1. Orientation of new employee
2. On-the-job training:
 - a) Detailed description of each step in the operation, with emphasis on key points.

- b) Quality specifications for the operation.
- c) Safety factors.
- d) Machine care instruction.

The new employee's foreman is responsible for this training. A machine operator or supervisor may assist. The essential part of all employee training is "show how" by qualified employees who "know how".

On-the-job training does not cease when the employee becomes a qualified operator. It is continuous with the objectives of training:

- Reduction of waste and spoilage
- Improvement of methods
- Reduction of absenteeism and labor turnover
- Reduction of machine maintenance costs
- Improvement of quality
- Reduction of accident rate
- Improvement of morale

SUMMARY

All materials and supplies used in the manufacture of flexible steel conduit are standard and readily available.

Flexible steel conduit is a building material and its sales follow the trends of construction and industrial improvement and expansion. Present world trends in these fields indicate a good export market.

Marketing in the construction and industrial fields demands an intimate knowledge of the trend in building activities. Constant contact with contractors and industrial buyers is necessary to be invited to bid on large projects.

Operating personnel are semi-skilled and unskilled and a training period of four to six weeks, by a

capable foreman should produce a qualified machine tender or operator.

Financial Plan

Suggestions for procuring capital required:

1. Twenty-year mortgage on land and building.
2. Sale and lease-back of land and building.
3. Bank financing of equipment.
4. Discounting of good accounts receivable.

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**FLEXIBLE STEEL CONDUIT CO.
CASH BUDGET
1959**

BALANCE JAN 1

MONTH	CASH RECEIPTS			CASH DISBURSEMENTS			BALANCE	ACTION
	BUDGET	ACTUAL	VARIANCE	BUDGET	ACTUAL	VARIANCE		
JAN								
FEB								
MAR								
APR								
MAY								
JUNE								
JULY								
AUG								
SEPT								
OCT								
NOV								
DEC								
TOTAL FOR YEAR								

29

CASH BUDGET FORM

APPENDIX I

REQUISITION ON PURCHASING DEPARTMENT

52926

To _____ Date _____ 19____

Purchasing Agent: Please order items listed below Order No. _____

Ship to _____ When Wanted _____

QUANTITY	DESCRIPTION	FOR

BUDGET CONTROL

Allowance for Period \$	Balance Available \$ Amt. this Purchase \$ Remaining Balance \$	Ordered By Approved By
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REQUISITION ON PURCHASING DEPARTMENT

APPENDIX II