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18439

BLACK AND GALVANIZED STEEL PIPES MAKING PLANT

1. **PRODUCT DEFINITION**

The description deals with the production of welded pipes for water, gas, condensers, heat-exchangers as well as for structural and general purposes according to the international standards ISO 65, DIN 2440-2441, BS 1387, UNI 8863.

The pipes are finished with plain ends or with threaded ends according to ISO 7 (GC UNI 339, R DIN 2999, BS 21).

A coupling according to ISO 50 (UNI 349, DIN 2886, BS 1387) is screwed-up at one of the threaded ends.

The length of the manufactured pipes is 20 feet \pm 1 inch. The outside diameter range is 3/8" + 6" (NW 10 \div 150 mm). The base material is carbon steel with $R = 33 \div 55 \text{ Kg/mm}^2$ and $A = 15\%$.

The plant is dimensioned for a production of 50,000 metric tons/year of black and galvanized pipes in the O.D. range 3/8" - 6" (N.W. 10+150 mm), with the following distribution :

Outside diameter mm	Black Pipes metric ton/year	Galvanized Pipes metric ton/year
10 \div 50	17,000	14,000
51 \div 100	10,000	6,000
101 \div 150	3,000	-
	<hr/> 30,000	<hr/> 20,000

Approx the 50% of pipes is foreseen with threaded ends.

The plant is sized on the base of the above mentioned mix of products (which is suggested by the state of the international market) and with the possibility of working thicknesses in the range $2 \div 6$ mm; the machines are supposed to operate for two shifts/day, so that the plant capacity can be increased proportionally by adding a third shift.

2. TECHNOLOGY REVIEW

The presently used technology foresees the use of welding lines. The whole plant (welding lines, finishing machines, galvanizing plant) utilizes appropriate technology, and it is designed in order to minimize mechanical and electrical break-down. Source of technology and equipment for this kind of plant can be DEMAG (Federal Republic of Germany), Italimpianti (Italy), CLECIM (France) and several others.

3. DESCRIPTION OF THE PRODUCTION PLANT

3.1 SCHEMATIC PROCESS DESCRIPTION

Basic materials are carbon steel coils. These coils are longitudinally slitted in different dimensions according to the diameters of the pipes to be produced. The pipe mill effects the pipe cold forming, the radio frequency welding, the final dimension sizing, the cutting in commercial length and the final straightening. Then the pipes arrive at a finishing battery composed of end facing machines and non-destructive testing plant (eddy current type).

According to final application, the pipes :

- are sight controlled and arrive at the final storage in bundles;
- arrive at the end threading plant and then, after coupling screwing-up and sight control, at the final storage in bundles;
- are sent to the galvanizing plant where they are pickled, zinc-coated, straightened and then, with plain or threaded ends, arrive at the final control and, in bundle, at the final storage.

In Fig. 1 the process flow diagram is shown.

3.2 PLANT DESCRIPTION AND LIST OF MAIN MACHINERY AND EQUIPMENT

The plant is subdivided in the following sections :

- Coils Storage, covering an area of 600 m² sufficient for storing the raw material for 2 working months at full load.
- Coils cutting line, with a slitted coil storage of 300 m², corresponding to approx 2 weeks of operation of the welding line.
- Two welding lines : one for the range 3/8" ÷ 1/2" (NW 10 ÷ 40 mm), the other for the range 2" ÷ 6" (NW 50 ÷ 150 mm).
- Finishing department composed of :
 - * End facers and N.D.T. (non destructive tester) for the range 3/8" ÷ 2".
 - * End facers and N.D.T. for the range 1/2" ÷ 6". This battery works in bypass with a special lathe suitable for end bevelling (and eventual threading) in the range 5" ÷ 6". The non destructive tester of this line can control pipes up to 6".

At the finishing department inlet, a store corresponding to approx 2 working days (450 ton.) is envisaged.

- Galvanizing plant for the range 3/8" ÷ 4" consisting of :
 - * Pickling line
 - * Re-heating furnace
 - * Hot zinc-coating line
 - * Cooling tank
 - * Straightening equipment

At the galvanizing plant inlet a store corresponding to approx 2 working weeks (440 ton.) is envisaged.

- Finishing line composed of two batteries of pipe threaders complete of coupling screwers for the range 3/8" ÷ 4".

At finishing line inlet a store corresponding to approx 1 working week (530 ton.) is envisaged.

The plant is complete of :

- Finished pipes area for rack storing of approx 2200 ton. corresponding to approx 2 working weeks.

So the list of machinery and equipment will include :

. Technological machinery

- 1 - 59" x 236" x 20,000 slitting line
- 2 - 1. 1/4" O.D. radio frequency pipe mill
- 3 - 6" O.D. radio frequency pipe mill
- 4 - Pipe cropper
- 5 - Crush test press
- 6 - Straightener
- 7 - End facers (3/8" ÷ 2") (1 battery)
- 8 - Non destructive tester (Eddy current) (3/8" ÷ 2")
- 9 - End facers (1/2" ÷ 4") (1 battery)
- 10 - Lathe (5" ÷ 6")
- 11 - Non destructive tester (Eddy current) (1/2" ÷ 6")
- 12 - Automatic galvanizing plant
- 13 - Straightener
- 14 - Threading and socket screwing (3/8" ÷ 4") (2 batteries)
- 15 - Handling equipment
- 16 - Tools for pipe mill

. Cranes (see fig. 3)

. Various small equipment for pipe mill and galvanizing plant

. Coil storage - final storage - warehouse

Coil rack, strip rack, pipe rack, pallets, shelvings, etc.

. Maintenance shop and tooling workshop

Machines and equipments, workbenches, mechanic's tool kit, electrical tool kit, etc.

. Utilities

- Air compressor
- Steam generator
- Softener and cooling water plant

. Diesel fork lift, hand fork lift, platform truck, etc.

3.3 MACHINERY AND EQUIPMENT COSTS

The cost of the equipment and machinery listed in para. 3.2, including basic and detailed engineering and bulk material is estimated (1988) at 12,000,000 US \$, F.O.B. European port.

3.4 ERECTION COSTS (EX-EUROPE)

The costs for the assembling and erection of the equipment and machinery listed in para 3.2, including also the construction of utilities distribution network and the assistance of specialists of the machinery and equipment suppliers are estimated at 1,500,000 US \$ (1988).

3.5 LAY-OUT AND CIVIL WORKS

The general lay-out is shown in Fig. 2. The areas covered by the various building are as follows (fig. 3):

- Production shop	8,400 m ²
- Coil storage	1,440 m ²
- Final storage	3,360 m ²
- Office building	500 m ²
- Maintenance and tooling shop	500 m ²
- Warehouse	500 m ²

The structural characteristics of the buildings are as follows :

- Office building :

. Pillars and beams	- Steel construction
. Walls	- Corrugated iron sheets, brick lined
. Floors	- Pvc-paved
. Roof	- Steel construction with metal sheeting

- Production and storage areas :

. Pillars and beams	- Steel construction
. Walls	- Corrugates iron sheets
. Floor	- Concrete
. Roof	- Metal sheeting on sawtooth roof construction

4. REQUIREMENTS OF RAW MATERIALS, CONSUMABLES AND UTILITIES AND THEIR COSTS

4.1 REQUIREMENT AND COSTS OF RAW MATERIALS AND CONSUMABLES

The materials required for one working year are approx as follows :

- Steel coils	55,000 ton
- Zinc	1,260 ton
- Hydrochloric acid	460 ton
- Zinc-Ammonium chloride	70 ton
- Zinc-Aluminium (5% AL)	7 ton
- Caustic Soda	15 ton

- Consumption materials :

- . Acetylene
- . Oxygen
- . Lubricants
- . Tools for finishing machines
- . Various additional materials

- Production materials

- . Couplings (black or zinc-coated)
- . Thread protectors

The average prices on the European market of the main items out of those listed above, F.O.B. European Port, are approximately the following ones (1988) :

- Carbon steel	392.60 + 400.00 US \$/ton
- Zinc	1,851.85 US \$/ton
- Hydrochloric acid	148.15 US \$/ton

4.2 UTILITY REQUIREMENT

- Electric power

. Machines and equipments	2,205 KW
. Crane	350 KW
. Water plant	120 KW
. Compressed air shop	160 KW
. Steam generation and miscellanea	105 KW
. Maintenance and tooling shop	150 KW

Total installed capacity 3,090 KW

Total power consumption during simultaneous use	2,320 KW
. Lightening equipments and various services	300 KW

Total power consumption	2,620 KW

- Fluids

. Industrial water	100 cu/hr
. Steam (10 ÷ 12 bar)	1,200 Kg/hr
. Compressed air (7 bar)	2,500 Std cu/hr
. Natural gas (8500 Kcal/Std cu, 2 bar)	160 cu/hr

5. MAINTENANCE COST

- Spare part, sea packed F.O.B. European Port (1988)	500,000 US \$
- Maintenance yearly cost inclusive of spare parts (1988)	200,000 US \$

6. MANPOWER REQUIREMENTS

- Workers

. Production	74
. Final storage	6
. Fluid and power services	2
. General services	8
. Maintenance	18
. Warehouse	2

Subtotal	110

This total can be considered subdivided as follows :

. Master skilled workers	14%
. Skilled workers	62%
. Semiskilled workers	24%

Foreman :

. Production	6
. Final storage	2
. Maintenance	4

Subtotal	12

The above mentioned direct manpower has been calculated on these basis :

- production capacity	50000 t/y
- working days per year	235
- shifts per day	2
- effective working hours per shift	7.5

Management staff

. Manager	1
. Clerks and secretaries	5
. Administration and purchasing dep.	4
. Production and maintenance	6
. Personnel department	3
. Arrival and shipping materials	2

Subtotal	18

Grand Total	140

7. PREPRODUCTION PERIOD AND COSTS

7.1 CONSTRUCTION PERIOD (EX-EUROPE)

- Material and equipment supply, FOB 12 months from the project approval
- Erection time (building excluded) 8 months

7.2 PREPRODUCTION EXPENSES

- Training in the Country of the technology supplier (16 people for 2 months) 140,000 US \$
- Commissioning (3 months) 370,000 US \$

In the commissioning cost evaluation the following costs have been considered : manpower, electrical and fluid power, raw materials, foreign and local assistance.

8. PRODUCTION PROGRAMME

Considering an availability of all the materials, of direct and indirect manpower, of all uninterrupted energy supplies in the required quantities, the max

plant production capacity can be reached withing twelve months after the commissioning completion.

9. COSTS AND PRICES OF THE EUROPEAN PRODUCTS

On the basis of statistical data the average production costs in Europe are as follows, expressed in US \$/ton (1988) :

	3/8"	1/2"	3/4÷2"	3"	4"	6"
Black	629.63	570.37	555.56	570.37	577.78	540.74
Galvanized	866.67	740.74	681.48	688.89	-	-

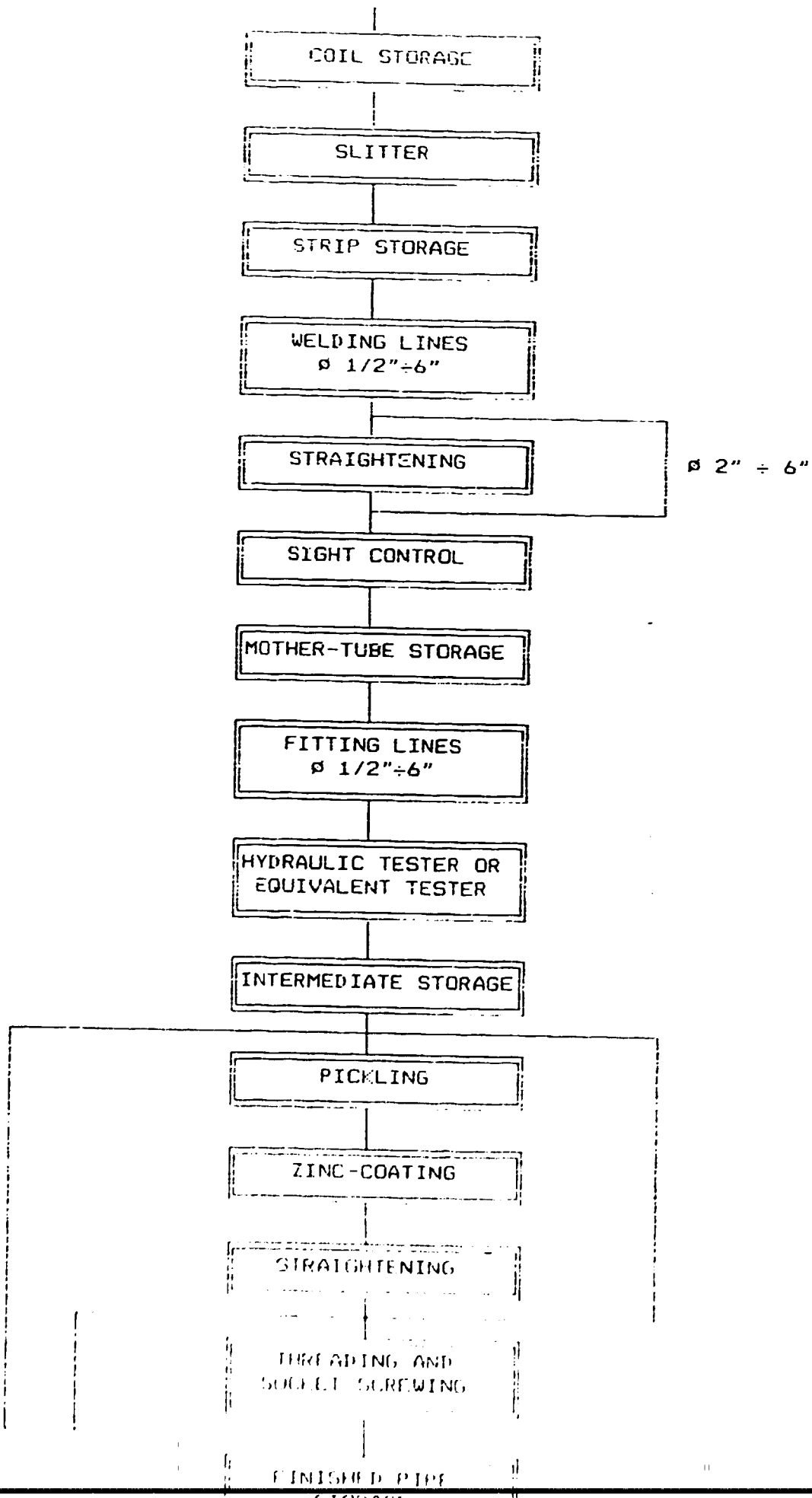
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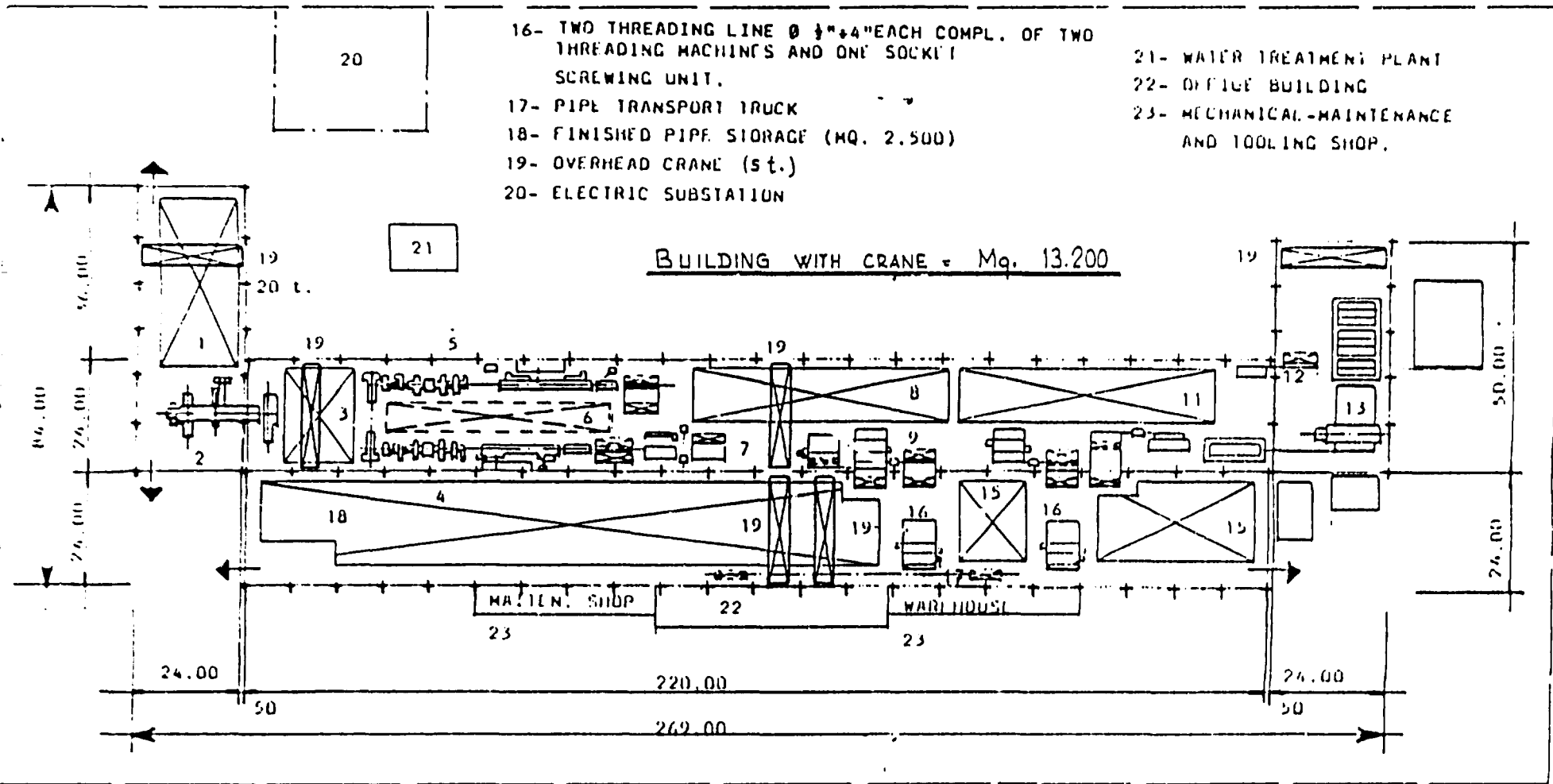
3/8 ÷ 3" with threaded ends
 4 ÷ 6" with plain ends

The corresponding selling prices are :

	3/8"	1/2"	3/4÷2"	3"	4"	6"
Black	851.85	718.52	666.67	688.89	666.67	614.82
Galvanized	1088.89	888.89	792.59	800.00	-	-

E.R.W. MILL LINE FOR DIAM. 1/2" - 6" PIPES
Fig. 1





- 16- TWO THREADING LINE $\emptyset \frac{1}{2}'' + 4''$ EACH COMPL. OF TWO THREADING MACHINES AND ONE SOCKET SCREWING UNIT.
- 17- PIPE TRANSPORT TRUCK
- 18- FINISHED PIPE STORAGE (MQ. 2.500)
- 19- OVERHEAD CRANE (st.)
- 20- ELECTRIC SUBSTATION

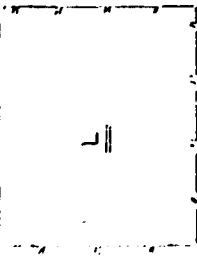
- 21- WATER TREATMENT PLANT
- 22- OFFICE BUILDING
- 23- MECHANICAL-MAINTENANCE AND TOOLING SHOP.

- COIL STORAGE (MQ. 600)
- COMPLETE CUTTING LINE TYPE LT. 1500 x 6.
- STRIP STORAGE (MQ. 300)
- WELDING LINE $\emptyset \frac{1}{2}'' + 1\frac{1}{4}''$
- WELDING LINE $\emptyset 1\frac{1}{2}'' + 6''$
- WELDING LINES TOOL STORAGE
- ROLL STRAIGHTENING MACH. AND PIPE DROPPER WITH CRUSH TEST

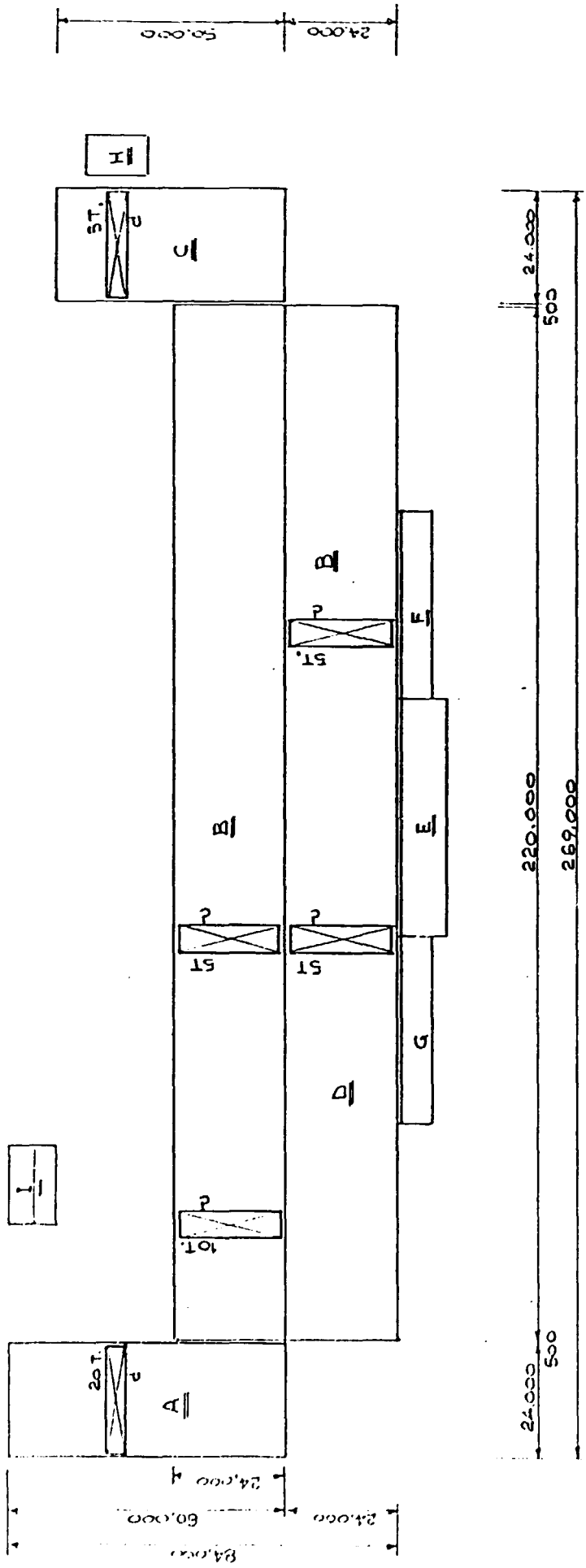
- 8-MOTHER-TUBE STORAGE FITTING LINE $\emptyset \frac{1}{2}'' + 6''$ (COMPL. OF: TWO END FACING)
- 9-MACHINE $\emptyset \frac{1}{2}'' + 4''$ ONE LATHE $\emptyset 5'' + 6''$ ONE NDT MACHINE $\emptyset \frac{1}{2}'' + 6''$
- 10-FITTING LINE $\emptyset \frac{3}{8}'' + 2''$ COMPL. OF: TWO END FACING MACH. $\emptyset \frac{3}{8}'' + 2''$

- ONE NDT MACHINE $\emptyset \frac{3}{8}'' + 2''$
- 11- PIPE STORAGE FOR ZING COAT. LINE (MQ. 600).
- 12- TRANSFER EQUIPMENT
- 13- COMPL. ZING COATING-LINE $\emptyset \frac{1}{2}'' + 4''$.
- 14- ROLL STRAIGHTENING MACH. $\emptyset \frac{1}{2}'' + 4''$
- 15- PIPE STORAGE FOR THREADING LINE MQ. 720.

E. R. W. MILL LINE FOR $\emptyset \frac{1}{2}'' + 6''$ PIPES 50000 TONS / YEAR (LAY-OUT)	1250 fig. 2
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- A. COIL STORAGE AND SLITTING
- B. PRODUCTION AND FINISHING LINES
- C. GALVANIZING PLANT
- D. FINISHED PIPE STORAGE
- E. OFFICE BUILDING
- F. WAREHOUSE
- G. MAINTENANCE SHOP
- H. GALVANIZING PLANT SERVICES
- I. WATER TREATMENT PLANT
- L. ELECTRIC SUBSTATION



REMARKS:

- 20 T. CRANE (HOOK TYPE)
- 10 T. " (" ")
- 5 T. " (BEAM AND HOOK TYPE)

Fig. 3

BUILDING AND CRANE LAYOUT