1954

The First Step of Great Northern's Expansion at East Millinocket, Maine

Great Northern Paper Company

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THE FIRST STEP OF GREAT NORTHERN'S EXPANSION AT EAST MILLINOCKET, MAINE

One Group Of The New Buildings
(1) Train Shed  (2) Finishing Room  (3) Paper Machine Room
(4) Machine Shop  (5) Offices, First Aid & Entrance

GREAT NORTHERN PAPER COMPANY
Aerial view showing new Paper Room, Finishing Room and Train Shed in the foreground, with the new Grinder Room, Power House and Chemi-Groundwood Pulp Mill in the center, and the new Wood Room and Wood Yard in the background.
EAST MILLINOCKET MILL EXPANSION

For a number of years the Great Northern Paper Company, both through its Research and Control Department and with outside assistance, conducted an exhaustive investigation into the possibilities of expanding its production on the basis of the natural resources of Northern Maine. The Company owns over two and a quarter million acres of timberlands, and the wood produced by another five million acres is accessible to its mills. Millions of cords of Northern hardwoods (beech, birch and maple) as well as poplar stand side by side in these forests with spruce, fir, hemlock and cedar. The Company has developed hydro and hydro-electric installations with a rated capacity of 130,000 horsepower on the Penobscot River (one of the State's principal rivers) and, in addition, has approximately 60,000 horsepower of undeveloped sites still available on this same river.

All phases of wood utilization were considered, both in and outside the pulp and paper field. Ultimately, in the Spring of 1952, the management decided that the best choice under all the circumstances was to expand its existing mill at East Millinocket, Maine, by the installation of two wide, high-speed machines designed primarily to make newsprint, and by the construction of a pulp mill designed to make pulp from hardwoods by the chemi-groundwood process, and other required facilities such as an entirely new wood room, wood yard, grinder room, screen room, filtered water plant, high pressure steam power plant, etc.
Chemi-Groundwood

This choice was dictated by a number of considerations. The most important was that, although the chemi-groundwood process had not previously been used commercially in any volume, the Company's management was satisfied that this method of pulping hardwoods was economically and technically sound and offered the tremendous advantage of capitalizing on the skill and know-how incidental to fifty years of experience in making groundwood pulp. The fundamental process which was developed in the laboratories of the Syracuse University of New York for the Empire State Research Paper Associates, Inc., was thoroughly investigated and checked by the Company’s Research and Control Department by designing and constructing a laboratory-size pilot plant. From the outset, the tests were extremely encouraging. It was found that the hardwoods available to the Company could be pulped at a substantial saving of power, and that this pulp, when mixed with regular spruce and fir groundwood and sulphite pulps, would produce a paper at least equal in every respect to that currently being made in the Company’s mills.

On the basis of these laboratory tests, the Company, at a cost of approximately $325,000, designed and installed at the East Millinocket Mill a 50-ton per day commercial pilot chemi-groundwood pulp mill. This unit, which went into full scale operation in the early Spring of 1953, demonstrated conclusively that the laboratory successes could be projected into commercial operation. In the meantime, the Company’s engineering department, now considerably enlarged, had gone to work preparing plans, specifications and details for the expansion of the East Millinocket Mill. At the same time, Stone & Webster Engineering Corporation of Boston was engaged as general constructors, and for the design of the high pressure power plant and the chemi-groundwood pulp mill.
The Expansion

The expansion, scheduled for two steps, was designed to add 500 tons of daily capacity to the existing mill with all equipment, pipe lines, pumps, etc., sized for a future ultimate of 800 tons of new daily capacity when the machines attained the maximum speed of 2500 feet per minute for which they were designed. In the first step, a 276” Beloit paper machine trimming 256” would be installed, together with a chemi-groundwood mill of entirely original design with two digesters capable of pulping a minimum of 150 tons of hardwoods per day. Other supporting facilities would be a complete new wood room, wood yard, grinder room, screen room, paper room, finishing room, train shed, machine shop, filtered water plant, high pressure steam power plant, and offices. The completion of the first step, which included all of the necessary new buildings for the entire expansion, was scheduled for late Fall of 1954. In the second step, another new Beloit machine with 290” wire trimming 270” would be added by the Fall of 1955, with necessary additional digesters in the chemi-groundwood plant, additional grinders, additional screening capacity, an additional high pressure boiler and other supporting facilities.

Construction

On March 2, 1953, four men from Stone & Webster started work. Soon the work forces, multiplied a hundred fold, had built temporary buildings for offices, warehouses, shops, etc., as well as a huge silo for storing cement, a batching plant for mixing concrete and a pipe fabricating shop. In order to provide for the great influx of workmen, a camp area consisting of a commissary, bakery and barracks for the feeding and housing of hundreds of workers was built. In addition to the barracks, housing 400 men, the
Company built a modern trailer park a few miles from the construction site where at one time 89 families were housed.

Before very long all available labor from this rather sparsely settled area of Northern Maine had been recruited and the call for additional men was sent out. Bricklayers came from all over New England, pipefitters from as far as Pennsylvania and supervisory personnel from California, Texas, Washington and Canada. At one time a peak of 1800 employees were on the job.

By the Fall of 1953, the new wood room and conveyor system had been completed and were used in barking and piling out the winter pulpwod piles. Work on the brick walls of the new grinder room and machine room was continued throughout the winter by protecting the walls in heated temporary enclosures. Frozen ground was thawed with live steam so concrete foundations for grinders and motors and the big chemi-groundwood plant could be poured. Meanwhile the steel and aluminum boiler house had been erected and enclosed, and the intricate work of assembling the boiler begun. The old wood room was rebuilt into a new and modern enlarged water treatment plant and the south half of the old screen room was reconstructed. At the same time the existing mill, barricaded behind temporary structures, criss-crossed by temporary air, steam and stock lines, welding cables, etc., and hampered by the large crews of carpenters, masons and engineers, struggled successfully to maintain its regular production. The winter snow melted away, leaving the mud of the Spring thaw. Through this and the wettest summer in the memory of the old timers, 55 trucks, 14 cranes, 7 bulldozers, dozens of welders, compressors and pumps, hundreds of men pushed, scraped, lifted and hauled for four and a half million man hours without a fatal or permanent disability accident. In June of 1954 the filter plant was placed in operation. In August the new boiler was fired. In September the 12,500 KVA high pressure turbine went on the line.
In Beloit, Wisconsin, meanwhile, the first of the new paper machines was being made, piece by piece, assembled, disassembled, crated and shipped to East Millinocket. First came some of the dryer rolls, cast one by one specially to dry a roll of paper 256" wide. Day by day the different parts and assemblies arrived and were put in place. Finally, on October 11, 1954 (only a week behind the schedule that had been pulled out of a hat two years before) the whole machine, the first in the world designed to make newsprint at 2500 feet a minute, was turned over. Two days later stock, made in the new grinder room, was put on the Fourdrinier wire and the first paper taken off the machine's dry end. A few weeks later the new vertical chemi-groundwood digesters began operating on a regular basis. Step I of the program was complete. Step II is already under way.

The following pages cover flow diagrams, pictures of general interest, and data on the construction and installation of all facilities.
DATA ON EAST MILLINOCKET MILL EXPANSION
GREAT NORTHERN PAPER COMPANY

GENERAL CONSTRUCTION DATA

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation</td>
<td>183,410 Cu. Yds.</td>
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<tr>
<td>Fill</td>
<td>98,880 Cu. Yds.</td>
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<tr>
<td>Concrete</td>
<td>48,401 Cu. Yds.</td>
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<tr>
<td>Steel (Struct.)</td>
<td>5,788 Tons</td>
</tr>
<tr>
<td>Steel (Reinf.)</td>
<td>1,690 Tons</td>
</tr>
<tr>
<td>Conduit (Elect.)</td>
<td>53.9 Miles</td>
</tr>
<tr>
<td>Wiring (Elect.)</td>
<td>209.7 Miles</td>
</tr>
<tr>
<td>Bearing Piles</td>
<td>1.5 Miles</td>
</tr>
<tr>
<td>Log Conveyors</td>
<td>1.4 Miles</td>
</tr>
<tr>
<td>Underground Piping</td>
<td>4.5 Miles</td>
</tr>
<tr>
<td>Log Storage Area</td>
<td>1,050,000 Sq. Ft.</td>
</tr>
<tr>
<td>Railroad Spur Track</td>
<td>1.7 Miles</td>
</tr>
<tr>
<td>Siding (Building)</td>
<td>88,265 Sq. Ft.</td>
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<tr>
<td>Oil Storage Tank</td>
<td>55,000 Bbl.</td>
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<tr>
<td>Brick</td>
<td>2,787,000</td>
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<tr>
<td>Concrete Block</td>
<td>32,875 Sq. Ft.</td>
</tr>
<tr>
<td>Instrument Piping</td>
<td>10.4 Miles</td>
</tr>
<tr>
<td>Instrument Valves</td>
<td>1,000</td>
</tr>
<tr>
<td>Instrument Air Piping</td>
<td>2.5 Miles</td>
</tr>
<tr>
<td>Instrument Fittings</td>
<td>25,000</td>
</tr>
<tr>
<td>Transite Pipe (Installed)</td>
<td>4.5 Miles</td>
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<tr>
<td>Total Man Hours Step I</td>
<td>4,275,000 Hours</td>
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WOOD & GENERAL YARD

Construction

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<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Cut</td>
<td>74,100 Cu. Yds.</td>
</tr>
<tr>
<td>Fill</td>
<td>41,550 Cu. Yds.</td>
</tr>
<tr>
<td>Concrete</td>
<td>3,450 Cu. Yds.</td>
</tr>
<tr>
<td>Bearing Piles</td>
<td>7,650 Lin. Ft.</td>
</tr>
<tr>
<td>Log Conveyors</td>
<td>7,000 Lin. Ft.</td>
</tr>
<tr>
<td>Underground Piping</td>
<td>4.5 Miles</td>
</tr>
<tr>
<td>Log Storage Area</td>
<td>1,080,000 Sq. Ft.</td>
</tr>
<tr>
<td>Railroad Spur Track</td>
<td>8,715 Lin. Ft.</td>
</tr>
<tr>
<td>Conduit (Elect.)</td>
<td>13.4 Miles</td>
</tr>
<tr>
<td>Wiring (Elect.)</td>
<td>25.9 Miles</td>
</tr>
<tr>
<td>Total Graded Area</td>
<td>50 Acres</td>
</tr>
</tbody>
</table>

Installed Capacities — Step I

Woodyard

Double wing Link-Belt travelling stacker for 70 ft. piles; woodyard to hold about 70,000 cords in two piles. 80 cords per hour capacity of system. 1900 feet of 36” flat belt conveyor serves the stacker and the mill grinder.
room. 150 foot, 2 strand chain conveyor loads the belts from the woodroom. Reclaiming from piles by crane and grapple onto portable chain conveyors feeding the belts.

Hardwood
Single wing Jeffrey travelling stacker, rated capacity 50 cd/hr, for 60 ft. pile. Woodyard size to be determined by deliveries. 900 ft. cable and button car unloading conveyor.
150 ft. two chain transfer conveyor.
416 ft. single chain digester feed conveyor.
Both woodyards served by a buried system of fire protection piping (all transite pipe) and monitor nozzle towers.

Major Suppliers
Wood Yard
Link Belt – Double Stacker, Conveyor A & B.
Bancroft & Martin Rolling Mills Co. – Conveyors.
F. N. McIntire – Brass Fittings Fire Protection System.
Johns Manville – Transite Pipe.
Goodyear Tire & Rubber Co. – Belts for Conveyors.
Jeffrey – Stacker Hardwood.

WOOD ROOM
Construction
Excavation ...........................................4,000 Cu. Yds.
Fill ......................................................380 Cu. Yds.
Cubature .............................................426,000 Cu. Ft.
Concrete ................................................3,020 Cu. Yds.
Steel (Struct.) .......................................160 Tons
Steel (Reinf.) ........................................25 Tons
Conduit (Elect.) ......................................2.8 Miles
Wiring (Elect.) ........................................4.8 Miles
Building Size ........................................130'8" x 85'8½"

Installed Capacities — Step 1
Woodroom
1 – Welded Barking Drum, 2 section, 12' diameter x 45' overall.
1 – Solid Shell Riveted Drum, 4 section, 10' diameter x 44' overall.
Log Haul-up Conveyor from river – 8 strand chain.
Drum feed and discharge conveyors – 54" flat rubber belt.
Return conveyors, recycling wood to drums – single strand chain.
Bark dewatering – perforated plate scraper conveyor.
Bark to truck loading – 36" troughed rubber belt.
Capacity of Woodroom on river driven softwoods is 50-75 cords per hour depending on wood condition. Provision is made for a third drum on softwood or hardwood.
2000 g.p.m. vertical turbine type water pump installed in a basement sump to serve the building.
Major Suppliers

Wood Room
Canadian Ingersoll Rand — Welded Barking Drum.
Goodyear Tire & Rubber — Belts.
Falk Company — Conveyor Drives.
Fairbanks, Morse & Company — Pumps.
Bancroft and Martin Rolling Mills Co. — Steel Frames & Supports.
I.T.E. Company — Switch Gear 550 Volts.
Westinghouse — Control Center.
Maine Cement Products Co. — Pre-cast Roof Slabs.
Bangor Sheet Metal & Roofing Co. — Roofing & Insulation.
General Electric Co. — Motors 550 Volt.

CHEMI-GROUNDWOOD PLANT

Construction

Excavation ........................................19,925 Cu. Yds.
Fill ..................................................6,865 Cu. Yds.
Cubature ...........................................1,623,975 Cu. Ft.
Concrete ............................................11,150 Cu. Yds.
Steel (Struct.) ................................. 1,200 Tons
Steel (Reinf.) ........................................627 Tons
Siding ...............................................48,200 Sq. Ft.
Conduit (Elect.) ......................................10.1 Miles
Wiring (Elect.) ........................................20.9 Miles
Concrete Block .....................................8,600 Sq. Ft.
Building Sizes
Digester Building.................................197'0" x 113'0"
Stream Barker Bldg. ......................... 95'0" x 44'0"
White Liquor Bldg. ......................... 65'0" x 60'0"

Installed Capacities — Step I

Chemi-Groundwood Plant:
Digester Plant
2 — 10'6" diameter x 60 ft. steel vertical digesters with full size flat bottom
hinged door. Door operation controlled by hydraulic lifting cylinders
and cylinder actuating bolts. Rated capacity, 25 cords; on 8 hour cycle,
75 cords per day.
1 — 17' diameter x 48 ft. vertical cooking liquor accumulator.
Complete liquor charging, circulating and heating system, cycle-controlled
from a graphic instrument panel.
White Liquor Plant
1 — 40' diameter x 34' steel slurry storage tank and slurrying system,
including vacuum car unloading, for soda ash.
1 — 30' diameter x 56' concrete sulphur storage silo, with car unloading
hopper and elevator.
2 — C. I. L. sulphur meters.
1 – Chemical Construction Corporation spray sulphur burner, 8' diameter x 19'.
1 – 3'6" diam. x 13'2" high absorption tower, tray type.
2 – 12' diameter x 13' high sulfiting tanks.
1 – 25' diameter x 18' high white liquor storage tank.

**Major Suppliers**

Link Belt Company – Conveyors.
William Neill Company – Sulphur Silo.
Tower Iron Works – Weigh Hopper.
Fairbanks Morse Co. – Scale.
Chemical Linings – Tank Linings.
Eastern Industries – Fuel Oil Pump.
Schutte & Koerting Co. – Fuel Oil Burner.
New England Lead Burning – Quench Section.
Artisan Metals Inc. – Absorption Section.
Ingersoll Rand – Pumps, etc.
Diamond Alkali – Slurry Handling Auxiliaries.
Nash Engineering Co. – Vacuum Pump.
Bethlehem Steel Co. – 2 Digesters.
Worthington Corporation – Precharge Pumps.
Air Royal Company – High Pressure Tanks.
Dollinger Corporation – Filters.
Lithcote Corporation – Fluid Receiver Tank.
Pathon Manufacturing Company – Hydraulic Cylinders.
Barksdale Valves – Valves.
Greer Hydraulics, Inc. – Hydraulic Accumulators.
Struthers-Wells Corp. – Cooking Liquor Heaters, etc.
Elliott Company – Cooking Liquor Twin S.rainers.
Dean Brothers Pumps, Inc. – Purge Water Pump.
Yoeman Brothers Co. – Sump Pump.
Buffalo Forge Co. – Waste Gas Exhaust Fan.
W. L. Blake Co. (Ohio Injector Co.) – Motor Operated Valves.
Alloy Steel Products Co. – Motor Operated Valves.
Nordstrom – Motor Operated Valves.
Croll Reynolds Co. – Hogging Jet.
Philadelphia Gear Co. – Limitorque Operators.
Whiting Corporation – Grapple Crane.
Colson Service Co. – Digester Service Crane.
Foxboro Company – Instrumentation.
Minneapolis-Honeywell – Instrumentation.
Mason-Neillan – Instrumentation.
Westinghouse (Sturtevant) – Air Supply Fans.
Buffalo Forge Co. – Waste Gas Exhaust Fan.
Hirschman-Pohle Company – Exhaust Fans.
Automatic Sprinkler Corp. – Fire Protection System.
Otis Elevator Company — Elevator.
Allis Chalmers Company — Stream Barker Pumps.
Chemical Construction Company — Molten Sulphur Pump.
General American Transportation Corp. — White Liquor Storage Tank.
Double A Products Co. — Check Valves.

**GRINDER ROOM**

**Construction**

<table>
<thead>
<tr>
<th>Construction Item</th>
<th>Quantity/Unit</th>
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<tbody>
<tr>
<td>Excavation</td>
<td>34,100 Cu. Yds.</td>
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<tr>
<td>Fill</td>
<td>5,550 Cu. Yds.</td>
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<tr>
<td>Cubature</td>
<td>1,228,450 Cu. Ft.</td>
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<tr>
<td>Concrete</td>
<td>7,850 Cu. Yds.</td>
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<tr>
<td>Steel (Struct.)</td>
<td>486 Tons</td>
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<tr>
<td>Steel (Reinf.)</td>
<td>156 Tons</td>
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<tr>
<td>Brick</td>
<td>515M</td>
</tr>
<tr>
<td>Siding</td>
<td>2,565 Sq. Ft.</td>
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<tr>
<td>Conduit (Elect.)</td>
<td>5.7 Miles</td>
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<tr>
<td>Wiring (Elect.)</td>
<td>17.6 Miles</td>
</tr>
<tr>
<td>Building Size</td>
<td>305’0” x 123’2”</td>
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</tbody>
</table>

**Installed Capacities — Step 1**

Grinder Room:

6 — Great Northern Waterous 67” x 54” grinders for softwood arranged in three lines driven by 6000 HP motors of Westinghouse manufacture. 40 tons per day rating.

2 — Similar grinders in one line for pretreated hardwood. 75 tons per day rating.

6 — Jonsson Type ¾” perforated bull screens, half on hardwood, half on softwood. 100 tons per day rating.

3 — 36 x 24 Jeffrey bull screen reject shredders.

Double softwood block tanks of 150 cord capacity feeding grinders through a water trough conveyor.

Hardwood fed to grinders by a dual, single strand chain conveyor.

**Major Suppliers**

Montague Machine Co. — Waterous Great Northern Grinders and Governors.
Ingersoll Rand Co. — White Water Booster Pump.
Goulds Pump Co. — Reject Stock Pumps.
Jeffrey Manufacturing Co. — Shredders.
Westinghouse Electric Corp. — Grinder Motors, 6900 Volt Transformers and Switchgear.
Whiting Corp. — 30 Ton Crane.
J. O. Ross Engineering Corp. — Ventilating System (All Units Sturtevant).
Foxboro Company — Process Instrumentation.
Penn. Transformer Co. — 550 Volt Transformer.
G.E. Company — 550 Volt Motor Control Centers and Motors.
Chemical Linings, Inc. — Tile Work.
Artisan Metal Products Co. — Fabricated Stainless Steel Pipe.
Bancroft & Martin Rolling Mills Co. — Structural and Miscellaneous Steel.
Link Belt Company — Dewatering Screens.

**SCREEN ROOM**

**Construction**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Excavation</td>
<td>1,315 Cu. Yds.</td>
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<tr>
<td>Fill</td>
<td>630 Cu. Yds.</td>
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<tr>
<td>Cubature</td>
<td>1,032,550 Cu. Ft.</td>
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<tr>
<td>Concrete</td>
<td>1,695 Cu. Yds.</td>
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<tr>
<td>Steel (Struct.)</td>
<td>304 Tons</td>
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<tr>
<td>Steel (Reinf.)</td>
<td>116 Tons</td>
</tr>
<tr>
<td>Brick</td>
<td>246M</td>
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<tr>
<td>Conduit (Elect.)</td>
<td>2 Miles</td>
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<tr>
<td>Wiring (Elect.)</td>
<td>18.9 Miles</td>
</tr>
<tr>
<td>Building Size</td>
<td>193'0&quot; x 108'0&quot;</td>
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**Installed Capacities — Step I**

Screen Room

- 2 — 11'6" diameter x 20 ft. Valveless Deckers for groundwood, rated at 100 tons per day.
- 3 — 9'6" diameter x 12 ft. Vacuum Deckers for chemi-groundwood, rated at 60 tons per day.
- 8 — Cowan rotary lithcoted pulp screens; 5 on groundwood (1 being a secondary), 3 on chemi-groundwood (1 being a secondary).
- 3 — Double disc Bauer reject refiners, 2 on groundwood, 1 on chemi-groundwood. Dual 300 HP motors installed.
- 3 — Allis Chalmers LoHed vibrating screens pre-thicken rejects for refiners.

**Major Suppliers**

Improved Machinery Corp. — Deckers, Agitation.
Montague Machine Company — Cowan Screens.
Bauer Bros. — Refiners, Centrifugal Cleaners.
Stebbins Engineering Co. — Tile.
Bancroft and Martin Rolling Mills — Structural and Misc. Steel.
Ingersoll-Rand Company — Water Pumps.
Goulds Pump Co. — Stock Pumps.
Warren Steam Pump Company — Stock Pumps.
DeZurik Shower Company — Consistency Regulators, Cont. Valves.
Fabri-Valve Company — Stock Valves.
Crane Company — Stock Valves.
Taylor Instrument Company’s Process Instrumentation and Panel.
Mixing Equipment Company — Agitator.
Artisan Metal Products Company — Stainless Pipe and Flow Boxes.
Portland Copper and Tank Works — Stainless Pipe Fittings.
Penn. Transformer Company — Electrical Transformers.
I.T.E. — Electrical Switchgear.
General Electric Company — Motor Control Centers, AC Motors.

### PAPER MACHINE ROOM

#### Construction

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<tr>
<th>Material</th>
<th>Quantity</th>
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<tr>
<td>Excavation</td>
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<tr>
<td>Fill</td>
<td>19,850 Cu. Yds.</td>
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<td>Cubature</td>
<td>4,938,480 Cu. Ft.</td>
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<tr>
<td>Concrete</td>
<td>10,540 Cu. Yds.</td>
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<tr>
<td>Steel (Struct.)</td>
<td>1,421 Tons</td>
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<td>Steel (Reinf.)</td>
<td>479 Tons</td>
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<tr>
<td>Brick</td>
<td>1,273M</td>
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<tr>
<td>Conduit (Elect.)</td>
<td>9.5 Miles</td>
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</table>
Installed Capacities — Step 1

Paper Room:
Beloit Paper Machine:
Rated 256” trim, 2500 ft./min., 400 tons/day.
Air cushioned headbox.
137 foot fourdrinier.
Vacuum transfer system.
Three vacuum presses, two conventional, one inverse.
54 dryers (60”) in three sections.
Midwest Fulton Dryer drainage system. Bowser forced feed lubrication.
9 roll calender stack.
Horizontal reel.
Beloit winder, rated 5000 ft./min.
Mechanical differential drive by Beloit with Westinghouse electric helper drive; through line shaft steam turbine driven; helper drive power by line shaft generators.


**Major Suppliers**

Beloit Iron Works — Paper Machine 256” trim, Winder, Drive, Head Box.
Chemical Linings, Inc. — Liebeck Pulper Tank.
Roots-Connersville Blower Co. — Vacuum Pumps, Couch Roll.
Fischer & Porter Co. — Stock Proportioning System.
Improved Machinery, Inc. — Agitators.
General Electric Co. — Steam Turbine, Motor Control Centers, All A-C Motors.
Goulds Pump Co. — Pumps.
Ingersoll-Rand Co. — Pumps.
Nash Engineering Corp. — Vacuum Pumps.
Whiting Corp. — Cranes.
Artisan Metal Products Co. — Stainless Steel Pipe.
Portland Copper & Tank Works — Stainless Steel Fittings.
Midwest Pipe & Supply Co. — Fabricated Steel Pipe.
Bird Machine Co. — Jonsson Reject Screen, Selfconditioners.
DeZurik Shower Co. — Automatic Valves.
Taylor Instrument Co. — Process Instrumentation.
Bancroft & Martin Rolling Mills Co. — Structural & Miscellaneous Steel.
Allis Chalmers Co. — 2300 Volt Switchgear.
Pennsylvania Transformer Co. — Transformers—5000 KVA, 3-1000 KVA.
Lapp Insulator Co. — Color Metering Pump.
Foxboro Co. — Process Instrumentation.

**FINISHING ROOM & TRAIN SHED**

**Construction**

Finishing Room
Excavation ........................................ 2,970 Cu. Yds.
Fill .................................................... 2,085 Cu. Yds.
Cubature .................................. 738,700 Cu. Ft.
Concrete .................................. 2,125 Cu. Yds.
Steel (Struct.) .................................. 333 Tons
Steel (Reinf.) .................................. 32 Tons
Brick .................................. 196M
Conduit (Elect.) .................................. 1 Mile
Wiring (Elect.) .................................. 10.2 Miles
Concrete Block .................................. 380 Sq. Ft.
Building Size .................................. 11'4" x 14'4"
Train Shed
Excavation .................................. 4,100 Cu. Yds.
Fill .................................. 8,400 Cu. Yds.
Cubature .................................. 965,600 Cu. Ft.
Concrete .................................. 2,640 Cu. Yds.
Steel (Struct.) .................................. 194 Tons
Steel (Reinf.) .................................. 30 Tons
Brick .................................. 300M
Conduit (Elect.) .................................. 2 Miles
Wiring (Elect.) .................................. 1.4 Miles
Building Size .................................. 31'8" x 11'2"

Major Suppliers

Finishing Room
Conveyors, heading and wrapping machines, scales, lowerator, and roll upender bought as a completely engineered unit from Lamb-Grays Harbor Company, Inc. Rolls conveyed on troughed belts, stored on and fed from handling tables to the various stations by pushbutton control of the operators.
Clark gas powered trucks with Bartel clamp device are used for car loading.

POWER PLANT

Construction

Excavation .................................. 14,200 Cu. Yds.
Fill .................................. 12,200 Cu. Yds.
Cubature .................................. 1,822,000 Cu. Ft.
Concrete .................................. 3,100 Cu. Yds.
Steel (Struct.) .................................. 1,392 Tons
Steel (Reinf.) .................................. 158 Tons
Siding .................................. 37,500 Sq. Ft.
Oil Storage Tank .................................. 55,000 Bbl.
Conduit (Elect.) .................................. 8.1 Miles
Wiring (Elect.) .................................. 39.0 Miles
Concrete Block .................................. 10,234 Sq. Ft.
Building Size .................................. 191'11½" x 14'4"
Installed Capacities — Step 1

Boiler House

Boiler — Capacity of 300,000 #/hr. at 1300 psi and 855°F.
Boiler is approximately 36’ wide, 24’ deep and 56’ high.
Is so designed that it will burn either coal or oil. Is now being set up for oil burning only. Present oil storage capacity will be increased by addition of one 55,000 bbl. tank.

At full rating, boiler will consume 21,750# of oil per hour or approximately 2750 gal. of oil 1 hr.

Turbine

One 12,500 KW, non-condensing extraction turbine and generator 2,400 rpm, 6,900 volts, 3 phase, 40 cycle, hydrogen cooled steam supply 1250 psi, 855°F.

Will normally have 175,000 pounds extracted at 210 psi.
Will exhaust normally at 40 psi.

Water Treating Plant
Consists of two essential steps.
1st step consists of color reduction, clarifying and filtering.
2nd step consists of demineralizing the water from step one.
Plant has a continuous combined capacity of approximately 250 gpm.
Plant is used to supply the make-up water for two 1300 #/hr. boilers.

Major Suppliers

Combustion Engineering Inc. — Boiler.
General Electric Company — Turbine Generator and Motors.
Cochrane Corp. — Deaerating Feed Water Heater Equipment, Blow Down Equipment, Deionizing Equipment.
Ingersoll-Rand — Boiler Feed Pumps, Pumps.
I.T.E. Circuit Breaker Co. — Station Service Unit Substation.
Midwest Piping Co. Inc. — Steel Piping Fabricated.
Bailey Meter Co. — Combustion Control.
Milton-Roy Co. — Chemical Pumps.
Infilco, Inc. — Water Clarification Equipment.
Whiting Corp. — 20 Ton Turbine Room Crane.
The Ohio Injector Co. — Miscellaneous Valves.
American Locomotive Co. — Fuel Oil Heaters.
Chicago Pneumatic Tool Co. — Instrument Air Compressor.
Pennsylvania Pump and Compressor Co. — Miscellaneous Pumps.
The Portland Co. — Welded Steel Tanks.
Copes-Vulcan — Boiler Feed Water Regulating Equipment, Steam De-superheating.
Edward Valves Inc. — Small High Pressure Steel Valves, Instrument Valves.
Manning Maxwell and Moore Co. — Hancock Valves.
Bowser, Inc. — Turbine Lubrication.
Atwood and Morrill — 40# Relief Valves.
Farris Engineering Corp. — Safety and Relief Valves.
Carpenter and Paterson — Pipe Hangers.
Hagan Corp. — Flow Meters.
Mason Neilan Co. — Level and Temperature and Pressure Controls and Indicators.
The Swartwout Co. — Steam Pressure Reducing and Desuperheating Control Equipment.
Armstrong Co. — Traps.
Minneapolis-Honeywell Regulator Co. — Temperature Recording Instruments.

FILTER PLANT

Construction

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation</td>
<td>1,140 Cu. Yds.</td>
</tr>
<tr>
<td>Fill</td>
<td>200 Cu. Yds.</td>
</tr>
<tr>
<td>Cubature</td>
<td>203,900 Cu. Ft.</td>
</tr>
<tr>
<td>Concrete</td>
<td>675 Cu. Yds.</td>
</tr>
<tr>
<td>Steel (Struct.)</td>
<td>42 Tons</td>
</tr>
<tr>
<td>Steel (Reinf.)</td>
<td>50 Tons</td>
</tr>
<tr>
<td>Conduit (Elect.)</td>
<td>2.8 Miles</td>
</tr>
<tr>
<td>Wiring (Elect.)</td>
<td>8.0 Miles</td>
</tr>
<tr>
<td>Building Size</td>
<td>118'0” x 48'0”</td>
</tr>
</tbody>
</table>

Installed Capacities — Step I

Water Filter Plant

2 — Raw Water Pumps, 15000 g.p.m. (I-R Company).
2 — Fire Pumps, 2500 g.p.m., 125 lbs. (Peerless).
2 — Filtered Water Pumps, 15000 g.p.m., 40 lbs. (I-R Company).
1 — Wash Water Pump (I-R Company).
Wallace and Tiernan 4000 #/hour chlorinator.
1 — Link Belt Travelling intake trash screen, 3/8” mesh.
9 — Green Bay North Water Screens, 14 x 88 mesh.

Major Suppliers

Peerless Pump Division — Fire Pumps.
Green Bay Foundry & Machine Co. — North Water Filters.
General Electric Co. — All Motors, 600 Volt Motor Control Centers.
Westinghouse Corp. — One 600 Volt Motor Control Center.
Chapman Valve Co. — Intake Gates.
Kennedy Valve Co. — Motor Operated Raw Water Pump Discharge Valves.
Link-Belt Co. — Trash Screen.
Foxboro Co. — Instruments and Panel.
Wallace & Tiernan Co. — Chlorinator.
Midwest Pipe & Supply Co. — Wrought Iron and Steel Fabricated Pipe.
Allis Chalmers Co. — 2300 Volt Switchgear and Transformer.

MACHINE SHOP

Construction

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Excavation</td>
<td>1,200 Cu. Yds.</td>
</tr>
<tr>
<td>Fill</td>
<td>595 Cu. Yds.</td>
</tr>
<tr>
<td>Cubature</td>
<td>581,700 Cu. Ft.</td>
</tr>
<tr>
<td>Concrete</td>
<td>1,390 Cu. Yds.</td>
</tr>
<tr>
<td>Steel (Struct.)</td>
<td>185 Tons</td>
</tr>
<tr>
<td>Steel (Reinf.)</td>
<td>8 Tons</td>
</tr>
<tr>
<td>Brick</td>
<td>220M</td>
</tr>
<tr>
<td>Conduit (Elect.)</td>
<td>9.6 Miles</td>
</tr>
<tr>
<td>Wiring (Elect.)</td>
<td>9.6 Miles</td>
</tr>
</tbody>
</table>

Building Size: 178'0" x 176'3"

Major Suppliers

Kearney & Trecker Corp. — American 4'9" Radial Drill.
Samuel G. Rogers Co. — CC-4 Slitter Grinder.
Whiting Corporation — 60 Ton Crane.

STORE ROOM, OFFICE & LOCKER ROOMS, OIL AND PAINT SHOP AND GENERAL EQUIPMENT

Construction

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office &amp; Locker Rooms</td>
<td></td>
</tr>
<tr>
<td>Excavation</td>
<td>900 Cu. Yds.</td>
</tr>
<tr>
<td>Fill</td>
<td>500 Cu. Yds.</td>
</tr>
<tr>
<td>Cubature</td>
<td>183,600 Cu. Ft.</td>
</tr>
<tr>
<td>Concrete</td>
<td>653 Cu. Yds.</td>
</tr>
<tr>
<td>Steel (Struct.)</td>
<td>64 Tons</td>
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<tr>
<td>Steel (Reinf.)</td>
<td>9 Tons</td>
</tr>
<tr>
<td>Brick</td>
<td>37M</td>
</tr>
<tr>
<td>Conduit (Elect.)</td>
<td>9 Mile</td>
</tr>
<tr>
<td>Wiring (Elect.)</td>
<td>9 Mile</td>
</tr>
<tr>
<td>Building Size</td>
<td>116'0&quot; x 53'11&quot;</td>
</tr>
</tbody>
</table>

Oil & Paint Shop

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Excavation</td>
<td>600 Cu. Yds.</td>
</tr>
<tr>
<td>Fill</td>
<td>75 Cu. Yds.</td>
</tr>
<tr>
<td>Cubature</td>
<td>15,200 Cu. Ft.</td>
</tr>
</tbody>
</table>

18
Concrete .............................................. 113 Cu. Yds.
Steel (Struct.) ...................................... 6.8 Tons
Steel (Reinf.) ......................................... 2 Tons
Concrete Block ..................................... 1,570 Sq. Ft.
Conduit (Elect.) ..................................... .1 Mile
Wiring (Elect.) ........................................ 4 Mile
Building Size ....................................... 36'0" x 32'0"

Installed Capacities — Step I

General Equipment
1 — 1900 c.f.m., 100 p.s.i.g. Ingersoll-Rand Co. Air Compressor, After Cooler.

Whiting Cranes:
1 — 2, 30 ton hooks, 104 ft. span, Machine Room.
1 — 2, 30 ton hooks, 70 ft. span, Machine Shop.
1 — 1, 30 hook, 80 ft. span, Grinder Room.
1 — Single hook 15 ton gantry serving Machine Winder.
1 — Single hook 20 ton crane serving main steam turbo-generator.

Electric Distribution System; 33000/6900/2300/575 volt.
Transformers: 33000/6900 — 1 rated 18/24000 KVA.
6900/2300 — 3 rated 5000 KVA.
6900/575 — 7 rated 1000 and 2000 KVA.

Major Suppliers

Store Room
Lyon Metal Products, Inc. — Shelving and Bar Racks.
Toledo Scale Co. — Model #2151 Toledo Scale.

FLOW DIAGRAMS OF MILL SYSTEMS
WOOD ROOM SYSTEM

GRINDER SYSTEM
NO. 5 PAPER MACHINE SYSTEM

FINISHING SYSTEM