

Plant Descriptions of

Penn-Dixie Cement Corp.

Plant No. 9, West Winfield, Pa.

By J. C. McGrath, Supt.

Medusa Portland Cement Co.

Wampum, Pa. Plant

By W. B. Hanlon, Director of Engg.

**Universal Atlas Cement Division of
United States Steel Corp.**

Universal, Pa. Plant

By E. F. Harchelroad, Plant Mgr.

**Green Bag Cement Division of
Pittsburgh Coke & Chemical Co.**

Neville Island Plant

By H. J. Haffner, Supt.

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**PORTLAND CEMENT ASSOCIATION
Research and Development Laboratories**

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GENERAL TECHNICAL COMMITTEE

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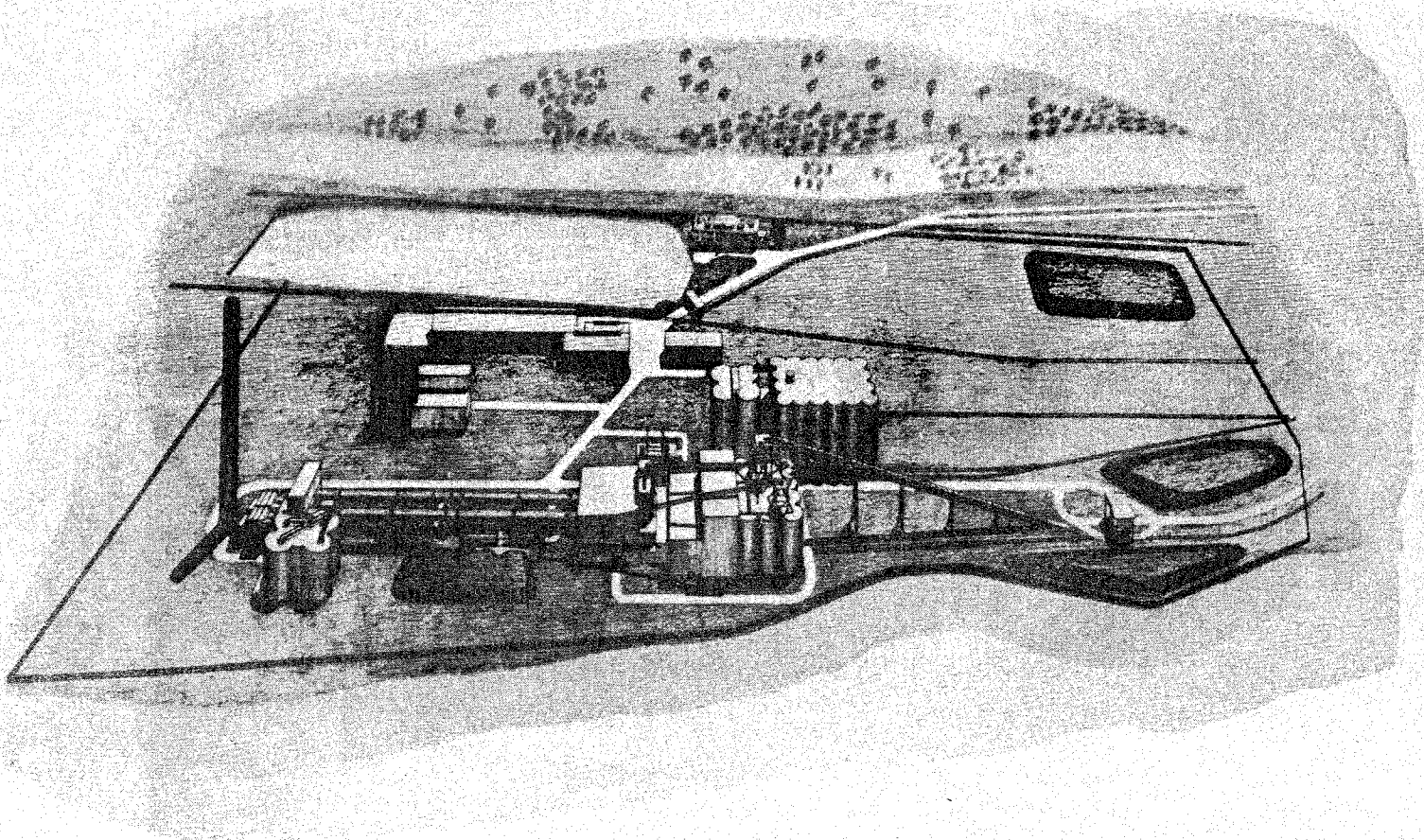
Sept. 22-25, 1958, Pittsburgh, Pa.

MEDUSA PORTLAND CEMENT CO.

DESCRIPTION OF PLANT

AT

WAMPUM, PA.



DESCRIPTION OF OPERATIONS

*MEDUSA PORTLAND CEMENT COMPANY
WAMPUM, PENNSYLVANIA, PLANT*

by

*W. B. Hanlon
Director of Engineering*

*Cleveland, Ohio
September, 1958*

GENERAL

The Wampum Plant of the Medusa Portland Cement Company is situated on the Beaver River about midway between New Castle and Beaver Falls in Pennsylvania.

The Wampum Plant is one of the historic plants of the cement industry. In 1874, the Shinn Brothers operated the Wampum Cement and Lime Co., Ltd., where they produced Shinn Brothers Portland Cement. At the Centennial Exhibition which opened in Philadelphia in May, 1876, the cement received the medal and certificate of award; the product was re-named Centennial Portland Cement.

The plant now being superseded was built as the Crescent Portland Cement Company in 1909, and improved at various times up to a few years ago. The Crescent Portland Cement Company was purchased by Medusa in 1929. Actual construction of the present plant was started in October, 1956; the plant was placed in operation in April, 1958. In rebuilding the plant, only the cement storages, office building, and other auxiliary buildings have been retained.

The new plant has a capacity of two and one-half million barrels and continues the use of the dry process. Raw materials and clinker are stored in concrete storage silos. The quarry and crushing plant are about two and one-half miles from the plant, with the stone and shale being transported by truck.

GEOLOGY

Three raw material components are used in the manufacture of portland cement at Wampum: Limestone, shale, and pea gravel.

Limestone, the major raw material component used in the manufacture of portland cement, is derived from the Vanport limestone formation in the Wampum area. The Vanport limestone is part of a series of strata of Pennsylvanian age. The sediments which make up the rocks of the Pennsylvanian age were deposited some 250 million years ago.

The Vanport limestone in the Wampum - New Castle area is a nearly horizontal bed which ranges from 18 to 22 feet thick. It contains many shells (fossils) of animals which lived in the ancient sea at the time the limestone was deposited. In the vicinity of Beaver Falls, the limestone bed is only about one foot thick.

The strata above and below the limestone (also of Pennsylvanian age) are made up of sandstone, shale, and coal beds. The shale which immediately overlies the limestone is also used by Medusa as another component in the manufacture of portland cement.

Pea gravel, the third component at Wampum, is obtained from a gravel deposit of Pliocene (glacial) age. The gravel was transported to the Wampum area by glaciers and glacial streams and was deposited as the glaciers melted. The gravel deposits are less than one million years old.

NOTE: Drawings of plant at back of book.

QUARRY

As the limestone occurs in the hills, the strata are exposed or shallowly covered along the hillsides. The quarrying is conducted along the stone outcrops, going back into the bank as far as economical stripping will permit - at present, up to 60 feet. The stripping is done under contract with an earth-moving contractor. Drilling of the stone is done with wagon drills using 2" and 1 3/4" bits. For blasting, 40% dynamite is used, the rate of stone to explosive being 4.0 tons per pound. The stone is dug with a Diesel-powered shovel, then hauled to the crushing plant by trucks.

EQUIPMENT

Drills	2 - Gardner-Denver Wagon Drills
Compressors	1 - Chicago Pneumatic rotary with G. M. Diesel
	1 - Chicago Pneumatic reciprocating with Caterpillar Diesel
Shovels	2 - No. 3500 Manitowoc, 2 1/2 yd.
Trucks	3 - P-15 Autocar Diesels
Bulldozer	1 - D-4 Caterpillar

CRUSHING PLANT

At the crushing plant, the stone is dumped into a concrete dumping hopper over an apron feeder which discharges the shovel-sized stone into the primary jaw crusher. The crusher discharges onto a mechanical vibrating conveyor which transports the stone horizontally to the secondary crusher, an impact type mill. By belt conveyor system, the crusher product is closed-circuited with two vibrating screens. Oversize is returned to the secondary crusher; the sized product is discharged onto a belt conveyor for delivery to the loading station.

All of the crushing plant operations are controlled from the operator's control room located above and to one side of the primary feeder from which point many of the operations are visible. By meters and indicating lights, the operator is informed of the flow of materials.

Limestone and shale are processed through these facilities.

EQUIPMENT

Apron Feeder	60" Stephens-Adamson Style 7 Amsco
Jaw Crusher	48" x 60" Allis-Chalmers, 200 HP
Vibrating Feeder	48" x 15'9" x 38' Hewitt-Robins Eliptax
Impactor	50-66 HyTon, 600 HP
Belt Conveyor No. 1	36" Barber-Greene
Vibrating Screens	Tyler Ty-Rock 5' x 12', two surface
Belt Conveyor No. 2	36" Barber-Greene
Belt Conveyor No. 2A	30" Barber-Greene
Dust Control	Johnson-March Chem-Jet 1 1/4", Type S, Style A
Crane	25-Ton, Mechanical Equipment Co.

LOADING STATION

The loading station provides facilities for the storing and loading of stone and shale into trucks for transportation to the cement plant. A concrete silo having a capacity of 900 tons above the truckway opening is used for stone. A steel tank with a capacity of 150 tons is used for shale. Each tank is equipped with two electrically operated gates for rapid loading of trucks.

EQUIPMENT

Bin Gates	18" x 18" clam type, motor operated, Webster
Sub Station	23.0 KV primary, 4.16 KV secondary, Westinghouse and Allis Chalmers

POWER

Power for the crushing and loading equipment is supplied by a utility system through a 1500 KVA 23.0 KV/4.16 KV transformer sub-station. The 600 HP motor at the secondary crusher operates on 4160 volts; all other power is at 440 volts from a 500 KVA 4160/480 transformer load center at the crushing plant.

TRANSPORTATION

Stone and shale are transported to the plant, a distance of two and one-half miles, in 20-ton tractor-trailers with bottom dumping gates.

EQUIPMENT

Tractors	4 - Model 4000-T, White (new)
	4 - White tractors (older models)
Trailers	8 - No. 4HL-SW, Tandem axle, Truck Engineering

UNLOADING STATION

At the plant the raw materials are received and started toward their proper destination at a two-section unloading station. The East hopper is equipped to handle either trucks or railroad cars and to receive coal, gypsum, and pea gravel. The West hopper is presently arranged to receive only truck loads of stone and shale. The stone and shale are dumped from the trucks into a steel hopper over an electric vibrating feeder which feeds the material onto belt conveyor No. 3.

The facilities for the other materials are similar except that a crusher is included between the feeder and the belt conveyor. The crusher is equipped with a by-pass spout and diverting gate. The crusher is used on coal only; gypsum and gravel by-pass the crusher and go directly to the belt conveyor. At the head end of the conveyor are turnheads and spouts for directing the materials to the storage bins.

EQUIPMENT

Car Shaker	National Conveyor & Supply
Vibrating Feeder	36" x 84", Jeffrey, #5HM4, for coal, gypsum, gravel
Vibrating Feeder	48" x 72", Jeffrey, #5HM4, for stone
Hammer Mill	Pennsylvania Crusher, Type TKB, Size 4-30, for coal
Belt Conveyor No. 3	30" x 526', Barber-Greene, inclined, 375 FPM, for stone
Belt Conveyor No. 4	24" x 537', Barber-Greene, inclined, 325 FPM, for gypsum, coal, and gravel
Belt Conveyor No. 5	24" x 148', Barber-Greene, horizontal, 294 FPM, for coal
Distributing Head	for Nos. 3 and 4 belts, Barber-Greene

STORAGE and PROPORTIONING

Twelve concrete storage silos, 30 feet diameter x 50 feet, arranged in four rows of three, are provided for storage of raw materials and clinker.

Four tanks are assigned to limestone, one to shale, one to gravel, four to clinker, and two to gypsum.

A feature of the tanks is the concrete cones which were constructed by spraying the concrete against an outside form. One gypsum tank and the shale and gravel tanks are provided with double outlet hoppers. Under each row of tanks is a mechanical oscillating conveyor. Two rows are assigned to raw materials for kiln feed, and two to clinker and gypsum. The materials are withdrawn from the tank hoppers by constant weight feeders and deposited on the collecting conveyors for delivery to the mill feed elevators. Cross-over conveyors are required for the shale and gravel handling to permit one tank to supply two materials to two systems.

The controls for the proportioning feeders are in "chemist's panels" located in the labrotory. At these panels, the chemist can set the feeder delivery rates to give the correct proportions. The mill operator controls the rate of feed to the mill, but cannot alter the composition of the feed.

EQUIPMENT

Feeders	4 - 330 Type MC Waytrols, Jeffrey, for stone
Feeders	2 - 220 Type AC Waytrols, Jeffrey, for shale
Feeders	2 - 220 Type AC Waytrols, Jeffrey, for gravel
Feeders	4 - 330 Type MC Waytrols, Jeffrey, for clinker
Feeders	2 - Type 118 Waytrols, Jeffrey, for gypsum
Conveyors	Natural Frequency Conveyor, Carrier, for raw materials and clinker

GRINDING

The raw and finish grinding units are grouped into one grinding department adjoining the storage tanks. There are four grinding mill units, two for kiln feed and two for cement. Each Unit comprises a Ball mill operating in closed circuit with an air separator, the over-size returning to the mill and the finished product going to a pump and transport line. Having individual pumps, each mill can operate entirely independently of the others.

For the raw units, hot air from a coal-fired furnace is circulated through the air separator to remove moisture from the raw material, then exhausted through a bag-type dust collector. The feed enters the system at the separator elevator so it passes through the separator before going to the mill. The hot air ducts, separators, and dust collectors are insulated to reduce heat radiation. Kiln feed is pumped to the homogenizing tanks.

At the finish grinding units, atmospheric air is circulated through the air separator for cement cooling. The cooling air is exhausted through a bag-type dust collector. The feed is brought directly to the mill by means of a mill feed elevator. Cement is pumped to the storage silos.

All of the controls, indicators, and recording instruments for complete operation of the four units are contained in a mill control panel which is housed in a room-type enclosure.

The mill room is equipped with a travelling overhead crane which spans the mills to assist in maintenance in the area. A vacuum cleaning system is to be installed to serve the grinding department and the adjoining burning and cooling department.

EQUIPMENT

Elevators	2 - Rex #1627-01 Centrifugal Discharge Bucket Elevators, Chain Belt Co., for raw and finish
Elevators	2 - Rex #1612-01 Centrifugal Discharge Bucket Elevators, Chain Belt Co., for clinker, mill feed
Elevators	2 - Rex #1624-01 Centrifugal Discharge Bucket Elevators, Chain Belt Co., for clinker, separator
Separators	4 - 16'0" diameter, single whizzer Raymond mechanical separators, Combustion Engineering, for raw and finish mills
Ball Mills	2 - 11' 6" diameter x 17'0", one compartment, 1250 HP, Allis Chalmers, for raw grind
Ball Mills	2 - 13'0" diameter x 16'0", one compartment, 1500 HP, Allis Chalmers, for finish grind
Airslides	2 - 19" Fuller-Huron, Fuller Company, raw mill to separator elevator
Airslides	2 - 16" Fuller-Huron, Fuller Company, finish mill to separator elevator
Dust Collector	4 - #864-A Norblo, Series 54, automatic bag type, 40'0" long, Northern Blower, raw and finish
Conveying Systems	for Raw Grind: 2 - 9" Type H Fuller-Kinyon pumps, Fuller Company 2 - C-250 Fuller-Kinyon rotary compressors, Fuller Company 2 - 8" transport lines
Conveying Systems	for Finish Grind: 2 - 7" Type H2SF Fuller-Kinyon pumps, Fuller Company 2 - C-200 Fuller-Kinyon rotary compressors, Fuller Company 2 - 6" transport lines
Furnaces	2 - Hot Air Furnaces, Bigelow-Liptak, 10,000 BTU/hr. for Raw Grind
Stokers	2 - Riley Stokers, 2 units per furnace

HOMOGENIZING and KILN FEED

After preparation in the grinding units, the kiln feed is blended to even out any variations which might be present. Four tanks, 40 foot diameter, capacity 4000 bbls. each, with conical aerated bottoms are provided for this purpose. Air for blending is provided by non-lubricated reciprocating air compressors. After a tank has been filled, the material is agitated in one 90° sector at a time, moving in steps of 45°. The completed kiln feed is withdrawn from the tanks through valves to a surge hopper and a system of screw conveyors. Here the feed is circulated over the kiln feed screws which are co-ordinated electrically with the kilns. The feed screws discharge to individual bucket elevators which elevate the feed to the kiln feed pipe. The controls for the homogenizing system are mounted in panel boards located at the homogenizing tanks. A third screw feeder and elevator is included to serve as a stand-by for either of the two regular feeders.

Dust is continually returned from the precipitators by screw conveyors which deliver to the kiln feed elevators.

EQUIPMENT

Plates, tank bottom	Porous concrete, G. Rackle & Son
Compressors	2 - Size 20 x 13, Type HBB, single, horizontal double acting, Worthington
Dust Collector	1 - #5924, 2-section, oval bag, continuous, Parsons
Conveyors	24" screw conveyors, Material Handling & Equipment Co.
Proportioning Feeders	for kiln feed, Material Handling & Equipment Co.
	2 - 24" screw conveyors, 23' 4 1/2" long, variable speed
	1 - 24" screw conveyor, 28'5" long (stand-by), variable speed
Elevators	2 - Rex #1612-02 Centrifugal Discharge Bucket Elevators, Chain Belt Co.
	2 - Rex #1612-02 Centrifugal Discharge Bucket Elevators, Chain Belt Co.

BURNING and COOLING

The two kilns are 12 foot diameter x 390 foot, mounted on five support mechanisms. Each kiln has a dual drive, that is, each has two motor-gear reducer units which drive two pinions against one ring gear. The speed adjustment is obtained through couplings of the eddy-current clutch type.

The kilns are fired with pulverized coal from bowl mill type unit pulverizers. Coal for the kilns is contained in two 500-ton steel tanks which are filled with the conveying system mentioned under "Unloading Station". Coal is fed to the coal pulverizer by weighing type feeders.

The gases from the kilns are cooled to 650° F by water sprays in the feed end of the kiln and in the feed end housing which also serves as a spray chamber. The gases then pass to an electrostatic precipitator for removal of the dust. The dust hopper discharges through motor-operated gates to screw conveyors which return the collected dust to the kiln feed elevators.

At the discharge end of the kilns, the clinker is discharged into grate-type air-quenching coolers. Part of the heated air from the cooler is used for combustion in the kilns while the surplus is vented from the cooler through low-efficiency dust collectors and exhausters. The coolers are equipped with hammer-mill type clinker breakers. The cooled clinker is discharged into a drag conveyor which delivers it to an inclined belt conveyor system. The clinker can be transported to the roll type breaker and to the storage tanks, or diverted to outside storage for surplus.

EQUIPMENT

Kilns	2 - Allis Chalmers, 12'0" dia. x 390' 0", 5 supports
Coolers	2 - 741 Air quenching, inclined grate, Fuller Company
Clinker Breakers	2 - Type E, Fuller Company
Coal Mills	2 - Raymond #533 Bowl mills, Combustion Engineering
Clinker Drag	Rex 18" wide, horizontal, 46 FPM, Chain Belt Co.
Conveyor Belts	Nos. 6 & 7 for clinker 24" wide, Barber-Greene, inclined, 295 FPM
Clinker Crusher	Double roll 12 3/4" O.D. rolls, Ohio Machine & Boiler Co.
Distributor Head	Barber-Greene
Pumps	3 - IVP-5, Ingersoll-Rand, 43 GPM @ 650' head
Sprays	Spraying Systems, Inc., Research-Cottrell
Gas Analyzers & Cabinets	Bailey Meter
Precipitators	Research-Cottrell
Fan (draft)	2 - #66 M.C. 5438 double inlet, Green Fuel Economizer Co.

REGRIND

BrikseT, Medusa's masonry cement, and High Early Strength Cement are produced in a "regrind" plant. The four concrete silos formerly used as kiln feed storage and blending tanks are used for storage of cement, raw materials, and "High Early base" (H. E. S. clinker ground to about normal fineness). The regrinding is done in two tube mill - separator units using equipment which was previously used for production of kiln feed.

CEMENT STORAGE

Cement is stored in concrete silos which were built prior to the recent construction program. Four 40 foot diameter x 100 foot silos with capacity of 109,500 bbls. have flat bottoms with draw-out openings and spouts to four screw conveyors. Two portable pumps have just been installed to transport cement from the conveyors to the loading facilities. Twenty-four 26 foot diameter x 100 foot silos with capacity of 264,000 bbls. have conical hopper bottoms. Under each row of six hoppers is a portable pump. These four pumps with the two at the first-described silos all pump through a hose switch station which gives complete flexibility of operation. A separate pump under the two silos assigned to BrikseT is used exclusively for this product. The operation of the transport system is controlled from a panel located in a control room at the silos.

EQUIPMENT

Pumps	7 - 7" Type H2, Fuller-Kinyon, 100 HP, 1165 RPM, Fuller Company
Air Compressors	7 - C175 Rotary, 100 HP, 1165 RPM, Fuller Company

PACKING and SHIPPING

At present, packaging of cement is being continued in the existing out-dated packhouse with BrikseT being handled at a separate loading point. Plans are in process for packing facilities which will replace the existing equipment entirely.

Bulk railroad cars are loaded on a platform scale from two steel tanks located above the scale. All of the loading operation is controlled from a room at car-top level.

Bulk trucks are loaded at two platform scales from two three-section concrete tanks elevated above the scales. A control room between the scales and at truck-top level houses the controls for the loading and weighing equipment.

All scales are equipped with printers which record the "empty" and "loaded" weights to insure accuracy.

A new shipping office will be located where the trucks have convenient access when arriving and leaving.

EQUIPMENT

Truck Scales	2 - #6512-CA55-12047, Type S, 50-ton capacity, Heavy duty, platform size 60'0" x 10'0", Fairbanks Morse Co.
Valves	6 - 14" x 14" motor-operated rotary valves, Fuller Company
Silos	2 - 3-compartment concrete silos, 23' dia. x 41'
Dust Collectors (trucks)	2 - Dynaclone Dust Filters No. 7, Type A, W.W. Sly Co.
Railroad and Truck	1 - #6812-CA-12047, Type S, 300,000 lb. capacity, heavy duty, platform size 60'0" x 10'0", Fairbanks Morse Co.
Dust Collector (railroad and trucks)	1 - Dynaclone No. 6, Type A, W.W. Sly Co.
Silos	2 - 12' dia. x 28' steel tanks with hopper bottoms

POWER

The power for the operation of the plant is obtained from a public utility, entering at 69.0 KV through a 10,000 KVA transformer sub-station where it is reduced to 4.16 KV. The switch gear of the main sub-station is located between the grinding building and the burner building. It comprises eight sections, two of which are for the incoming power and six for distribution to the plant departments. Unit power sub-stations are located near the departments to provide 480 V. power. All motor control equipment is in control centers. The large motors operate at 4160 V.

EQUIPMENT

Main sub-station	2 - Westinghouse transformers 5000/6250 KVA 3 ph. 60 cycle 69.0 KV Delta to 4.16 KV Wye.
	8 - Units Westinghouse metal clad switchgear with type 50-DH-250 air circuit breaker, 1200 amp.
Unit sub-station	6 - Westinghouse transformers 1000 KVA type SL 3 ph. 60 cycle 4160/480 with fused primary disconnect and metal enclosed low voltage switchgear.

CHEMICAL LABORATORY

A modern laboratory building is located near the proportioning and grinding department. In addition to the usual laboratory equipment, this building houses the panels for control of the proportioning of raw materials, clinker, and gypsum.

SHOPS and STOREROOM

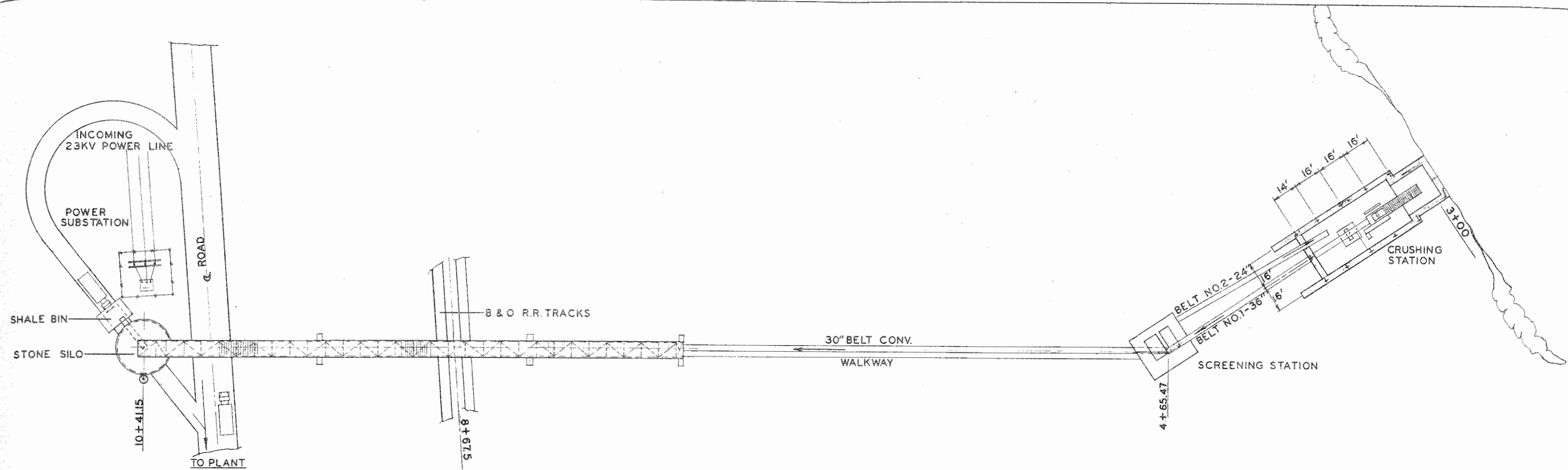
The building which previously was used as the power house is to be converted into offices for plant supervisory staff, storeroom, and shops.

GENERAL EQUIPMENT

Air Compressors	2 - 13-1/2, 8 1/2 x 7 Type YC2, vertical angle, stationary, Worthington Corp.
Pumps, Service Water	3 - Vertical turbine pumps, 1500 GPM, 158 TDH, Worthington Corp.
Pump, Portable Water Sewage Disposal	1 - Submersible pump, Model 17A18E, Clayton Mark Equipment and steel tank, Chicago Pump Co., air treatment

CONCLUSION

With this new plant, Medusa continues the history of growth and improvement which started at Wampum nearly a century ago.



ITEM	DESCRIPTION	MANUFACTURER
STEEL FEEDER	60"x18'-STYLE Y AMSCO CAST MN.	STEPHANS-ADAMSON
JAW CRUSHER	48"x60" 200 H.P.	ALLIS-CHALMERS
VIBRATING CONV.	48"x15"x36"-850RPM. STYLE E-13	HEWITT-ROBBINS
CRANE	25 TON-ELECTRIC HAND OPERATED TRAVEL	MECHANICAL EQUIP.
IMPACTOR	50-66 HY-TON. REVERSIBLE 600H.P. 450TPH	CRUSHER ENGINEERING CO.
NO.1 AND NO.2 BELT CONVEYORS	36" 341 FPM.	BARBER-GREENE
SCREENS	5'x12' TWO SURFACE TYPE F-600 TY-ROCK SCREEN	W.S. TYLER
NO.2A BELT CONVEYOR	30"x580' 340 FPM.	BARBER-GREENE
DUST CONTROL EQUIPMENT	CHEM-JET 1 1/4" TYPE-S STYLE-A SUBSTATION, MOTORS AND CONTROLS	JOHNSON-MARCH AND WESTINGHOUSE
		ALLIS-CHALMERS

