

KOPPERS COMPANY, INC.
Freyr Department

PENGAD-Bayonne, N.J.

PLAINTIFF'S
EXHIBIT
BEA-36

SPECIFICATIONS
FOR
SINTERING PLANT EXPANSION

WEIRTON STEEL COMPANY
WEIRTON, WEST VIRGINIA

CONTRACT #2036

FEBRUARY 1, 1956
REVISED - DECEMBER 3, 1956

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201 GENERAL:

- . 1 These specifications define the work to be performed in engineering, furnishing and constructing the No. 2 sintering plant, rated at 5290 net tons per day, at the Weirton, West Virginia plant of Weirton Steel Company.
- . 2 The existing ore handling, crushing, and screening facilities of No. 1 sintering plant will be altered to supply ore for both sintering plants. The ore handling system for the sintering plant connects with the ore conveying system along the ore yard being furnished under Koppers Contract 2037.
- . 3 The plant is based on screening and sintering the fines from Labrador, Hanna, and Weir ores, current blast furnace flue dust and filter cake. The minus 3/8 in. fines to be screened from the ores are assumed to be as follows:

	<u>Uncrushed Condition</u>	<u>Crushed to 2 in.</u>
Labrador	70%	75%
Hanna .	60%	70%
Weir	40%	60%

- . 4 Equipment, other than conveyors, including the sintering machine, sintering fans, sinter cooler, drum pug mill, balling drum, screens, and auxiliaries will be based on a sintering rate of 3.0 net tons product sinter per sq. ft. sintering machine grate area per day.
- . 5 The conveyors and other material handling equipment will be based on a sintering rate of 3.5 net tons product sinter per sq. ft. sintering machine grate area per day and upon 22 hour-per-day operation.
- . 6 It is understood that the Weirton Steel Company is referred to herein as the PURCHASER; and Koppers Company, Inc., Freyn Department, as the CONTRACTOR.

202 SCOPE OF WORK:

- . 1 CONTRACTOR will provide the engineering, equipment, materials, labor and supervision to perform the work and construct the sintering plant as defined by these specifications.

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SECTION C

BUILDINGS

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409 ELECTRICAL CONTROL HOUSE - SOUTH END: (continued)

- . 7 One (1) unit heater will be provided.
- . 8 The air filter equipment is described elsewhere in this specification.

410 CAR HAUL HOUSE:

- . 1 CONTRACTOR will design, furnish and erect one (1) car haul house substantially as shown on drawing 2036-3L165.
- . 2 This building will be of structural steel construction, approximately 13 ft. 0 in. wide by 18 ft. 6 in. long center to center of columns. The building will be one (1) story and will house the car haul engine and controls.
- . 3 The walls will be insulated steel panels. One (1) service door and lift beam will be provided. Two (2) personnel access doors will be provided.
- . 4 Roof will be Koppers 4 ply built-up roofing applied over a steel deck.
- . 5 Ground floor will be concrete paved.

411 DUST COLLECTOR SUPPORT STRUCTURE:

- . 1 CONTRACTOR will design, furnish and install one (1) uncovered heavy steel structure to support the dust collectors, suction system breeching, ducts, and electric control house. This structure will be approximately 66 ft. 10 in. long by 34 ft. 0 in. wide center to center of columns, and will be framed integrally with the main sintering building.
- . 2 Structure will be substantially as shown on drawings 2036-7L45, rev. 2, and 2036-7L46, rev. 2, and will consist chiefly of heavy structural columns and beams. Stairways and walkways will be provided for access to dust collector panels.
- . 3 Structure will provide support for the electric control room suspended over the roadway. Roadway clearance of 14 ft. 0 in. in elevation will be maintained.

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SECTION G

SINTER MACHINE FAN AND DUST COLLECTING SYSTEM

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COLLECTING MAINS:

- . 1 CONTRACTOR will furnish and install two (2) unlined, tapered, rectangular dust collecting mains to conduct waste gas from the sintering machine. The mains will be substantially as shown on drawings 2036-7L43, -7L44, and -7L46, and will be welded construction, fabricated from 5/16 in. steel plate. They will be designed for a maximum gas velocity of 2000 ft. per minute. Stiffeners will be provided to enable plates to withstand the external pressure. Mains will be supported with provision for expansion by cast steel rockers on steel beams.
- . 2 One (1) expansion joint for each main will be provided at connection of main to breeching to dust collectors. Expansion joint will be for rectangular duct and will be a special bellows type made of stainless steel.
- . 3 Continuous hoppers will be provided in the bottom of the mains. The hoppers will be fabricated from 5/16 in. steel plate, unlined and suitably stiffened. The hoppers will terminate in cast iron spouts that will discharge from counterweighted flapper valves onto dust belts located under each main.
- . 4 Access doors will be provided in each main at approximately 21 ft. 0 in. centers.
- . 5 Twenty-eight (28) downcomer pipe assemblies will be provided. Each assembly will consist of pipe and elbow, butterfly damper and operating mechanism, and expansion joint. Pipe and elbow will be fabricated of 1/2 in. steel plate with flanges. Butterfly valves will be of cast iron and complete with control mechanisms operable from the building operating floor. Expansion joints will be special double bellows, stainless steel, with 42 in. O.D. steel pipe sleeves. Asbestos gaskets will be furnished as required.

802

DUST COLLECTORS:

- . 1 CONTRACTOR will furnish and install eight (8) American Ore Reclamation centrifugal type dust collectors, rated at 64,000 c.f.m. each. Collectors will be of welded steel construction, having a cylindrical shell 10 ft. 7 in. inside diameter and conical top and bottom sections. The bottom conical section will be provided with a 6 in. flange connection. The collectors will have side tangential inlets 2 ft. 5 in. wide by 6 ft. 8 in. long, and circular top outlets 4 ft. 11-1/2 in. diameter. The top outlet connection will extend inside the cylindrical shell.

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802 DUST COLLECTORS: (continued)

- . 2 The collector shell, top and bottom sections, will be fabricated of 5/16 in. steel plate. Shelf angles will be provided on the inside of collector for support of 4-1/2 in. thick lining. Lining will consist of carbo-frax brick at severe wear points and duro-brick in remainder of collector. Lining will be furnished and installed by CONTRACTOR. The tangential inlets will be provided with 3/8 in. abrasion-resistant steel wearing plates.
- . 3 Eight (8) Western Precipitation, type R1, or equal, 6 in. dust valves will be provided. Valves will be equipped with 1/6 hp. drives and 12 in. dutchman to provide larger dust holding capacity. One (1) dust valve will be provided for each dust collector.

803 BREECHING:

- . 1 CONTRACTOR will design, furnish and install breeching duct from collector mains to dust collectors. This breeching will be substantially as shown on drawings 2036-7L45 and -7L46.
- . 2 Breeching will be fabricated from 5/16 in. steel plate suitably stiffened. A 2-1/2 in. thick carbo-frax brick lining will be provided in vertical riser where gas stream changes direction. Lining will be held in place by suitable steel retainers. A guiding vane, fabricated of steel plate, will be provided in the elbow at the connection to the collector main. Take-off outlets will be provided for connection to each dust collector. Outlets will be designed for 3600 FPM gas velocity.
- . 3 The following expansion joints will be provided for each duct. One (1) rectangular, neoprene asbestos, insulated seal expansion joint will be provided in the vertical riser. Four (4) rectangular, neoprene asbestos, insulated seal, expansion joints will be provided for connection to dust collectors.
- . 4 CONTRACTOR will design, furnish and install two (2) breeching ducts from the dust collectors to the main sintering fans. Each duct will connect to four (4) dust collectors and to one (1) fan. Breeching will be substantially as shown on drawings 2036-7L45 and -7L46.
- . 5 Breeching will be fabricated from 5/16 in. steel plate suitably stiffened, and will be designed for a gas velocity of 3000 FPM.
- . 6 Three (3) slip sleeve packed expansion joints will be provided in each duct.

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1101 GENERAL:

- . 1 CONTRACTOR will furnish and install air, gas, steam, water, and industrial drain piping for the sintering plant as hereafter described and generally as shown on flow diagrams 2036-7A16, -7A17, -7A18, and -7A53. All piping will be equipped with valves, fittings, drains, traps, and supports in accordance with CONTRACTOR'S standard specifications for the particular service.

1102 COMPRESSED AIR PIPING:

- . 1 CONTRACTOR will furnish the following above ground compressed air piping:
- . 2 One (1) 3 in. line from PURCHASER'S supply to a point at the north end of the sinter machine building with connection to the new compressor.
- . 3 One (1) 2 in. line from north end of sinter machine building to loading out bins for operation of quadrant gates.
- . 4 One (1) 2 in. line to run the length of the sinter machine building along the west wall at the ground floor.
- . 5 One (1) 2 in. line to run the length of the sintering machine building along the east wall at the operating floor.
- . 6 One (1) 2 in. line to run the length of the sintering machine building along the east wall at the machinery floor.
- . 7 One (1) 2 in. line to run the length of the sinter cooler to the mixer building.
- . 8 Connections will be provided from these headers to points requiring service.

1103 COKE OVEN GAS:

- . 1 CONTRACTOR will furnish and install a coke oven gas line from PURCHASER'S supply main to the ignition furnace, with shut-off valve and pressure indicator.

1104 STEAM PIPING:

- . 1 CONTRACTOR will furnish and install the following above ground steam piping to supply unit heaters throughout the plant:

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1104 STEAM PIPING: (continued)

- . 2 One (1) 4 in. steam header from PURCHASER'S source of supply to a pressure reducing station.
- . 3 Steam headers from the pressure reducing station with connections to the areas requiring unit heaters.
- . 4 Connections from the headers to unit heaters in the north control center, south control center, substation, control panel area, and mixer building.
- . 5 Two (2) return line headers, each of which will discharge to a flash tank.

1105 FRESH WATER PIPING:

- . 1 CONTRACTOR will furnish and install the following above ground fresh water piping for the sintering plant:
- . 2 One (1) 2 in. supply line from PURCHASER'S source of supply.
- . 3 3/4 in. connections from the 2 in. supply line to drinking water fountains. One (1) fountain will be located at the north control center, one (1) at the operating floor, one (1) at the machinery floor and one (1) at the ground floor.

1106 SERVICE WATER PIPING:

- . 1 CONTRACTOR will furnish and install the following service water piping for the sintering plant. All piping will be above ground unless otherwise specified.
- . 2 One (1) 10 in. underground supply line from PURCHASER'S source of supply to a strainer located near the fan motor house.
- . 3 One (1) header varying in size from 10 in. to 1-1/2 in. to supply various items of equipment throughout the sintering plant. Header will extend from the strainer to the mixer building.
- . 4 One (1) 6 in. line from header to rectifier in existing substation.
- . 5 Connections from header to water-cooled bearings at sintering fans.
- . 6 Connection from header to air compressor.
- . 7 Connection from header to ignition furnace.

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1106 SERVICE WATER PIPING: (continued)

- . 8 Connection from header to rod mill bearings.
- . 9 Connections from header to outlets at the sinter screens.
- . 10 Connections from header to emergency cooler sprays.
- . 11 Connection from header to the primary pug mill.
- . 12 Connection from header to the secondary balling drum.

1107 INDUSTRIAL DRAIN SYSTEM:

- . 1 CONTRACTOR will furnish and install an industrial drain system for the sintering plant consisting of the following:
- . 2 Drains from fan bearings, air compressor, flash tank, ignition furnace, rod mill bearings, air duct sumps, and skip hoist pit to covered floor trenches in the sintering machine building.
- . 3 Drains from water tank overflow and rectifier to a sump. Floor trenches will also drain to this sump.
- . 4 An overhead drain line from this sump to existing manhole No. 2.

1108 RELOCATION OF PIPING:

- . 1 CONTRACTOR will dismantle, move or alter existing water, steam, gas or sewer lines which interfere with CONTRACTOR'S operations in the construction of the new sinter plant.

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1201 GENERAL:

- . 1 CONTRACTOR will furnish and install all electrical equipment, power, light, interlock and grounding wiring for the plant as covered in this specification. Electrical equipment throughout the plant will be Westinghouse as far as possible.
- . 2 CONTRACTOR will obtain 6900 volt, 3 phase, 60 cycle power from dead end tower on top of existing sinter building.

CONTRACTOR will provide new dead end tower on top of sinter building for existing transmission lines as required due to building changes. Six (6) 650 MCM cables are presently dead ended on this tower. PURCHASER shall relocate overhead line, connecting them to the new tower, and shall provide all new insulators and connections. CONTRACTOR will provide new feeders to present and new sinter plant switchgear from this tower. Two (2) 4 in. steel conduits, each containing three (3) 750 MCM 1/0 cables shall be run to each sinter plant H. V. switchgear. Tower strength shall be based on 4000 lb. pull on each conductor. Conductors shall be installed to 2000 lb. pull with strain cage, leaving 2000 lb. for ice and wind load. Calculate breakage strength assuming one-half the total conductors on the tower breaking at once.

CONTRACTOR will inform PURCHASER if enough gain is made in length of cable by relocating tower to offset increase in height, or if additional length is required on cable. PURCHASER shall send CONTRACTOR drawings of present tower on building and previous tower, and relative locations to enable CONTRACTOR to make these calculations.

- . 3 CONTRACTOR will connect new tie breaker to present 6.9 KV switchgear on second floor of substation. CONTRACTOR will extend bus and provide conduit box for connection on end of present switchgear. Present switchgear is G. E. Co., ordered on PBG 194341. Two (2) 750 MCM cables shall be provided for tie.

1202 SUBSTATION:

- . 1 CONTRACTOR will furnish new substation for the plant. This substation will consist of the existing building of three (3) floors located between column Nos. 6A and 12 on the west side of present sinter machine building. The second floor of this building contains sinter plant No. 1 substation.
- . 2 Substation will be separated from main building by a concrete block wall without doors or windows except present door on second floor, which will

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1218 SINTER MACHINE, SINTER COOLER AND SINTER BREAKER CONTROLLERS: (continued)

- b) Line and accelerating contactors.
 - c) Will be wired for remote mounted start-stop pushbutton and test pushbutton and one indicating light to be energized with motor at rest and one energized with motor running.
 - d) Sinter machine, sinter breaker and sinter cooler will be interlocked so that sinter machine cannot run unless sinter breaker and cooler are running.
 - e) Sinter machine will be stopped by a photo-electric cell unit, if the pallets are not in correct position for engagement by the sprocket drive.
- . 6 Sinter machine roll feeder shall have controller similar to above, and shall be controlled by a magamp regulator to keep its speed the same as the sinter machine. Tachometer generator mounted on sinter machine drive shall give controlling impulse to magamp.
- . 7 Sinter cooler shall be provided with a drag generator and magnetic brake to prevent pallets from separating at discharge end.

1219 WIRING:

- . 1 CONTRACTOR will furnish and install all power, light, interlock and grounding wiring required for the operation of the plant covered in this specification.
- . 2 Wiring will in every respect comply with the National Board of Fire Underwriters National Electric Code, 1956 edition, and any other local or PURCHASER'S rules governing this type and location.

1220 CONSTRUCTION AND INSTALLATION:

The following PURCHASER'S rules shall govern the work. (Adapted from Weirton Steel Company "Standard Electrical Installation Specifications". Parts not applicable to this contract have been omitted).

. 1 Material and Workmanship:

- a) All materials used will be the best of their representative classes unless specifically noted to the contrary.

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CONSTRUCTION AND INSTALLATION: (continued)

3. 10 to 100, conduits inclusive - add 20% of total conduit as spares.
4. All spare conduits will be 1- 1/2 in. in size.
- h) Control cable through six (6) conductor will be installed in 1 in. conduit. Control cable of eight (8) conductor and above will be placed in 1-1/2 in. conduit.

. 3 Conduit Fittings, Pull Boxes, and Cable Trays:

- a) Where necessary, approved threaded conduit fittings with steel covers will be used.
- b) In damp places, or places where the conduit run is likely to be subjected to steam or vapor, cast iron covers and gaskets will be used.
- c) Pull boxes will be used where necessary to insure the safe pulling of conductors.
- d) A maximum of 200 ft. between boxes is permitted for wire #2 AWG and larger.
- e) Pull boxes will be of at least 10 gauge steel bent and welded and provided with gasketed screw covers of the same thickness.

. 4 Wire and Cable:

- a) Cable feeders to individual motors and generators will have a capacity of not less than 125% of the full load nameplate current of the motor or generator.
- b) Control cable will be used for motor and generator power where it will safely carry the full load current of the motor or generator.
- c) Six hundred (600) volt insulated power cables size No. 1/0 and smaller will be type TW, minimum, 3/64 wall insulation, size limited to Nos. 12 - 10 - 8 - 6 - 4 - 2 and 1/0.
- d) Six hundred (600) volt insulated cable size 3/0 and larger will be varnished cambric, size limited to 3/0 - 300 M, 500 M, 750 M, and 1000 M.

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CONSTRUCTION AND INSTALLATION: (continued)

- e) The above wire will be used on installations where the total temperature of the conductor will not exceed 60°C. On installations where the total temperature of the conductor will exceed 60°C., AVC insulated wire or other insulation suitable to the particular temperature conditions will be used.
- f) All 6900 volt cable circuits will be single conductor, varnished cambric, double braid, with 13/16 varnished cambric wall thickness, 9000 volt insulation and 300,000 circular mill will be the minimum size.
- g) All 6900 volt circuits will be run in conduit.
- h) All circuits 600 volts and less may be run in conduit, cable trays and in roof trusses where conditions permit.
- i) Control cables will consist of multi-conductor, NEMA standard, color coded conductors. Each conductor will be 19 strands of No. 25 tinned wire, Anaconda Densheath with plastic filler, or equivalent, and will be limited to the following number of conductors: 2, 3, 4, 6, 8, 10, 12 and 14 conductors only.
- j) Ammeter shunt leads will consist of two conductor, 19 strands of No. 22 tinned conductor.
- k) Spare control wires will be installed on the following basis:
 - 1. 1 to 3, inclusive - no spare wire.
 - 2. 4 to 7, inclusive - add one spare wire.
 - 3. 8 to 12, inclusive - add two spare wires.
 - 4. Where more than 14 conductors are required, two (2) cables of half the number plus spares will be used.

.5 Cable Bushings and Tags:

- a) At the switchboard end, the CONTRACTOR will furnish and install the insulated bushings for power and control conduits.
- b) For power conduit 1-1/4 in. and larger, the CONTRACTOR will supply and install an insulated washer drilled with the correct size holes for the individual power conductors.

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