

REQUEST FOR APPROPRIATION

DATE May 18, 1966



APPROPRIATION NO. 7143-1

DIVISION Armco Steel Corp.

CONS'T. ORDER NO. _____

LOCATION Middletown Works

ESTIMATE NO. 7143-1

PROGRAM 1964-70 Special Program

SHEET NO. _____ ITEM NO. _____

AN APPROPRIATION IS REQUESTED FOR \$ 15,996,000 TO COVER THE FOLLOWING "A" ORDER EXPENDITURE:

SOAKING PIT FACILITIES

Installation of Soaking Pit Facilities, consisting of 24 soaking pits with all related facilities and auxiliaries, to heat 235,000 tons of ingots per month for the new Universal Slabbing Mill.

A complete description of facilities, capabilities, and future potential is included in the Engineering Report Volume I dated May 2, 1966.

Volume II of the Engineering Report contains the scoping drawings.

Volume III of the Engineering Report contains the estimate and chart of accounts.

The Estimate Summary from the Engineering Report is attached.

The estimated rate of expenditures is:

1966 - 1st Quarter	- \$ 124,000
2nd Quarter	- 192,000
3rd Quarter	- 880,000
4th Quarter	- 2,800,000
1967 - 1st Quarter	- 3,520,000
2nd Quarter	- 3,840,000
3rd Quarter	- 2,240,000
4th Quarter	- 1,760,000
1968 - 1st Quarter	- 480,000
2nd Quarter	- 160,000

Total - \$15,996,000

NOTIFICATION OF APPROVAL

ACCOUNTING CLASSIFICATION/G. L. CLASS NO. Primary Metals 40550		RELATED REQUESTS: Capital \$ _____ Expense \$ _____ Retirement \$ _____	
APPROVED BY: <u>[Signature]</u> REQUEST ORIGINATED BY: A. M. Greco - F. W. Barnes		PROGRAM AMOUNT \$15,996,000	
PROJECT UNDER DIRECTION OF: L. R. Larson		PREVIOUS APP'NS - - - - -	
DIVISION OR SUBSIDIARY APPROVALS: WORKS MANAGER <u>[Signature]</u> DATE <u>5/25/66</u>		THIS REQUEST \$15,996,000	
DATE <u>5/25/66</u>		BALANCE - - - - -	
DATE <u>5/25/66</u>		DATE ORDER CLOSED AMOUNT \$	
DATE <u>5/25/66</u>		CORPORATE MANAGEMENT APPROVAL:	
DATE <u>5/25/66</u>		V. P. FINANCE <u>[Signature]</u> DATE <u>5/25/66</u>	
DATE <u>5/25/66</u>		V. P. MANUFACTURING <u>[Signature]</u> DATE <u>5/25/66</u>	
DATE <u>5/25/66</u>		PRESIDENT <u>[Signature]</u> DATE <u>5/25/66</u>	
DATE <u>5/25/66</u>		EXEC. VICE PRESIDENT <u>[Signature]</u> DATE <u>5/25/66</u>	

FORM 10-11A REV. 11-65

PLAINTIFF'S
EXHIBIT

ARO-152

BLUE, SMALL RED, GREEN, ORANGE

AKE-002443

FOR APPROVAL ONLY

SOAKING PITS
SPECIFICATION No. 7143(4-1)

SOAKING PIT FURNACES

FOR

MIDDLETOWN WORKS EXPANSION PROGRAM
ARMCO STEEL CORPORATION
MIDDLETOWN, OHIO

PROJECT No. 7143

APPROVED FOR
CONSTRUCTION

DATE

KAISER ENGINEERS, INC.
MIDDLETOWN, OHIO

November 26, 1965

H. H.
For your
study
Jimmie
12-8-65

	<u>PAGE</u>
1.0 SCOPE OF WORK	1
2.0 WORK BY OTHERS	1
3.0 DESIGN CRITERIA	3
4.0 REFRACTORIES AND INSULATION	8
5.0 STEELWORK	11
6.0 FURNACE CONTROLS AND INSTRUMENTATION	13
7.0 ELECTRICAL	18
8.0 PLATFORMS, WALKWAYS, AND STAIRS	21
9.0 PIPING	23
10.0 PAINTING	23
11.0 SUPERVISION, START-UP AND PERSONNEL TRAINING	24
12.0 USE OF PURCHASER'S MATERIAL OR EQUIPMENT	25
13.0 RECOMMENDED SPARES	25
14.0 SAFETY DEVICES	25
15.0 GUARANTEE	25
16.0 ALTERNATE PROPOSALS	26

SOAKING PIT FURNACES

1.0 SCOPE OF WORK

- 1.1 The Work to be performed under the terms of this Specification shall consist of furnishing all materials, transportation and labor required to design, detail, furnish, fabricate, deliver, unload, store, erect, install completely and start up six batteries consisting of four (4) Soaking Pit Furnaces each, for the Slab Mill facilities as shown on the drawings and specified herein. Sub-Contractor shall furnish and install all equipment described herein unless otherwise specifically noted.
- 1.2 The Sub-Contractor shall be responsible for the structural, mechanical, and electrical design of the furnaces and for the complete installation, and for dry-out and start-up of the furnaces.
- 1.3 The Sub-Contractor shall furnish a complete installation, including (but not limited to) all fuel, steam, water and air piping and appurtenances, furnace controls, including hydraulic system, natural draft stacks and Instrument and Control Houses.
- 1.4 The Sub-Contractor shall furnish and install all electrical equipment and wiring unless otherwise specified herein.
- 1.5 All final design drawings for construction or installation shall be subject to Contractor's approval.

2.0 WORK BY OTHERS

- 2.1 All foundations with anchor bolts, bearing plates, embedded conduit, grounding and backfill in place as shown on Sub-Contractor's foundation drawings, will be furnished by Others.
- 2.2 All permanent buildings with the exception of the instrumentation and control houses will be furnished by Others.

SOAKING PIT FURNACES

- 2.3 High bay lighting between Columns "W" and "X" will be furnished and installed by Others.
- 2.4 The following utilities for furnace operations will be furnished by Others.
- 2.4.1 440-480 Volt, 3 Phase, 60 Cycle power (Sub-Contractor shall specify requirements).
 - 2.4.2 2400 Volt, 3 Phase, 60 Cycle Power (Sub-Contractor shall specify requirements).
 - 2.4.3 Plant air at 70 P.S.I.G. Minimum - 90 P.S.I.G. Maximum cleaned and dried to -40°F dew point in a main supply header above ground extending from Column 1 to Column 39 along Column Row "Y". One take-off and shut-off valve will be furnished by Others at each battery of soaking pits, at each service area, and at each crane repair bay.
 - 2.4.4 Service water from a header above ground extending along Column Row "Y" between Columns 5 and 32 with one take-off and shut-off valve at each battery of soaking pits, each service area, cover repair area, and at Column 32.
 - 2.4.5 Well water for drinking and sanitary requirements from a header above ground, extending along Column Row "Y" between Column 5 and east end of the soaking pit building. One take-off and shut-off valve will be furnished by Others at each battery of soaking pits and at the instrument repair shop, operator's office, cover repair area and toilet areas.
 - 2.4.6 Natural gas at a pressure of 50 P.S.I.G. which will enter the soaking pit building at the northeast corner, and will extend the full length of the building at approximate elevation 140'-0".

SOAKING PIT FURNACES

One take-off and shut-off valve at each soaking pit battery will be furnished by Others.

2.4.7 Coke oven gas at a pressure of 6 P.S.I.G. which will enter the soaking pit building at the northwest corner and extend the full length of the building at approximate elevation 140'-0". One take-off and shut-off valve at each soaking pit battery will be furnished by Others.

2.4.8 Steam at a pressure of 150# and 470°F by extension of the hot strip mill header south with branch lines extending east and west along the soaking pit building Column Row "Y". One take-off and shut-off valve at each soaking pit battery will be furnished by Others.

2.4.9 #6 fuel oil at 150 P.S.I.G. and 125°F by pipeline extending along Column Row "Y" the full length of the soaking pit building with return line. One take-off and shut-off valve at each soaking pit battery will be furnished by Others.

2.4.10 Construction power and utilities described under this section as construction progress makes them available.

2.4.11 Cranes shown on drawings for limited use as erection progress permits.

3.0 DESIGN CRITERIA - GENERAL

The entire soaking pit facility shall be designed and built to conform with attached drawings and this specification and shall include the following items of equipment complete:

3.1 Six (6) batteries of four (4) pits per battery of one-way, top-fired soaking pit furnaces, complete with one (1) recuperator per pit.

SOAKING PIT FURNACES

3.1.1 Pit Size -

Length inside	26'-0"
Width inside	12'-6"
Depth from top of curb tile to top of hearth brick	17'-0"

3.1.2 Encasement - Each pit shall be encased with a 1/4" steel plate reinforced with structural steel members as required to prevent deformation. Each battery shall consist of two (2) pairs of pits and each pair shall be bound together with a top binder beam and a bottom binder beam. Each pair of pits shall be spaced apart by a septum consisting of steel "WF" buckstays providing a minimum circulating air space of 12" between side plates of these adjacent or twin pits.

3.1.3 Center Aisle - Clearance between cover carriage rail structural member's flanges at centerlines of batteries shall be a minimum of 6'-0" to allow passage for a fork-lift truck.

3.1.4 Wet Bottom - Coke breeze depth shall be 18" in the bottom of the pits. (Purchaser will be responsible for supplying coke breeze.)

3.1.5 Production Capability - The total hearth area shall be 7080 sq. ft., but for normal production only 7020 sq. ft. shall be available (equivalent to 90% availability). Burner capacity shall be 36 MM BTU/Hr. of fuel to maintain the following monthly tonnage and charging requirements. Maximum ingot temperature will be 2450°F.

SOAKING PIT FURNACES

<u>Size of Ingots</u>	<u>Number in Pit</u>	<u>Ingot Wt. Each In Pounds</u>	<u>Percent of Total Mix</u>	<u>Weight of Total Charge In Tons</u>
36 x 36 x 112	12	31,500	11.7	191.4
44 x 40 x 112	10	43,200	22.6	216.0
50 x 40 x 112	8	49,300	21.1	196.8
56 x 40 x 112	8	55,300	21.8	220.8
62 x 40 x 112	8	61,300	8.3	245.2
68 x 40 x 112	6	67,300	5.8	201.9
74 x 40 x 107	6	70,000	4.5	210.0
80 x 40 x 99	6	70,000	3.2	210.0
86 x 40 x 92	6	70,000	1.0	210.0

<u>Tons Per Month</u>	<u>Track Time in Hours</u>
145,750	4
72,800	7
<u>16,450</u>	Cold

Total 235,000 tons/Month

3.1.6 Fuel - Each pit shall be designed for firing with any one of the following:

- BF*
OGG
- (a) Coke oven gas at 500 BTU/Cu. Ft.
 - (b) Natural gas at 950 BTU/Cu. Ft.
 - (c) Standby fuel oil - #6 fuel oil at 144,000 BTU/gallon.

3.2 Six (6) unprimed steel-bound, self-supported, brick lined stacks at a minimum of 125' high.

3.3 Twenty-four (24) covers and carriages as described below:

3.3.1 Covers shall be of the turtle-back type with a minimum 2" steel frame rigidly designed. Covers shall be equipped with a 1"

SOAKING PIT FURNACES

thick steel sand seal blade. Four (4) lifting lugs shall be provided for handling and shall be located to minimize deformation of cover in handling. Cover when in sealed position shall not rest on coping tile, but shall be supported by cover carriage rails through four (4) adjustable hangers located to minimize deformation of cover.

3.3.2 One cover carriage shall be required per pit and shall consist of an all welded steel frame on which shall be mounted the drive axle and idler axle, both of which shall be equipped with antifriction bearings. Lift drive shall be motor operated with magnetic brake so operator can lift and hold, or lower and hold, cover in any position. Rate of lift shall be six (6) inches per second, and shall drive through a speed reducer and gearing. Horizontal travel motor shall be motor operated with magnetic brake and shall drive through a speed reducer and gearing. Travel rate shall not be less than 70' per minute. Carriage shall have the capability for moving cover forward three (3) feet so pit may be viewed from the burner end. Limit switches shall be included to govern extreme length of travel in either direction and to assure that cover is accurately centered over pit before the lowering mechanism can function. Cable reels shall be shielded from the heat at all times. One panel located north of Column Row "Y" and as near the centerline of each battery as possible shall include controls turning fuel on and off with light and damper switches, for light and travel of each pit cover carriage of that battery. All mounting and wiring shall be included. Remote control FEMCO system shall be provided in each pit crane cab including

SOAKING PIT FURNACES

mounting and wiring so each pit crane operator can control any pit cover carriage to roll back 1/3, 2/3 and full open. Control shall also prevent horizontal motion until cover is completely raised. Shielding shall be provided for motors and drives to protect them from furnace heat. Pyrometry tube and holes, if used, shall be located in such a manner that escaping flame or heat from these holes cannot affect motors, drives, or other equipment. Cover shall have sand seal hoppers to allow sand seal to be made remotely where operator can not walk between pits. Carriage rail beams shall be structural steel members of adequate design to resist heat present in this area. Rail girders shall have hardened steel wear strips to serve as rails.

- 3.4 Control Houses - Two (2) control houses, 9'-0" high, 10'-0" wide x 80'-0" long, one for each three pit batteries, shall be furnished and installed by Sub-Contractor. Control house shall be self-contained to mount on platform furnished by Others, and shall be designed for floor loading of

Houses shall be insulated in walls, roof, and floor. Ceiling shall be acoustical metal pan with sound absorbing pads. Door shall be 3'-0" x 7'-0" of hollow steel construction complete with steel frame, cylinder locks, door checks, and 1/4" clear, wire reinforced glass. Windows shall be 1/4" clear tempered glass (double thickness) with 1/2" air space, complete with glass stops and glazing strips. Air conditioning and heating equipment for filtered (bag type) and pressurized air shall be of such a size and design as to maintain a temperature of 75°F in each of the control houses at all times. Air conditioning units shall be complete in all respects and shall not require water for operating.

3.5 Air Blowers -

Sub-Contractor shall furnish and install twenty-four (24) heavy duty combustion air blowers with direct drive for continuous operation. Each blower shall be equipped with a pushbutton station and safety disconnect at the blower.

3.6 Couplings - All couplings between motors and gear reducers and between gear reducer, shafts, and other shafts shall be Poole or Falk flexible couplings.

4.0 REFRATORIES AND INSULATION

The refractory materials listed below shall conform to "Armco Steel Corporation Refractories Specification ACS-102/65" attached.

<u>4.1 Type of Refractory</u>	<u>Acceptable Vendors</u>
Super Duty Fireclay Brick)	Harbison & Walker
)	General Refractories
)	
High Duty Fireclay Brick)---	A. P. Green
)	Davis
)	
Medium Duty Fireclay Brick)	North American Refractories Co.
)	Kaiser Refractories
)	
Semi-Silica Fire Brick	A. P. Green
	Kaiser Refractories
Insulating Fire Brick	Johns-Manville
	Babcock & Wilcox
	Refractory & Insulation Corp.
	Kaiser Refractories
	A. P. Green

SOAKING PIT FURNACES

Super Duty Plastic	Ramtite
(Includes Super 25 Ramtite	Plibrico
and 90% Hi Alumina Ram	Kaiser Refractories
and Castable Material)	

Sub-Contractor shall furnish a complete refractory list, including quantity, quality, shapes, mortar, plastic, etc. This list must be submitted by

4.2 Covers - Soaking pit covers shall be rammed with 9" of super duty plastic.

4.3 Coping - Coping shall be "L" shaped high duty tile with two soldier courses of high duty refractory brick serving as outboard members of sand seal.

4.4 Pit Walls -

4.4.1 Soaking pit wall below coping tile and above slag section of wall shall be Detrick composite construction, 21-1/2" thick, and shall consist of 10" of super duty plastic with high duty anchors backed by 7-1/2" of high duty shapes with 2" of castable and 2" block insulation and bound by 1/4" steel plate properly reinforced to prevent deformation.

4.4.2 Slag section of wall shall extend 30" above top of hearth brick and for a distance of 6" below top of hearth brick and shall be composed of 9" of Multex 75 (hi-alumina phosphate bonded brick) backed by high duty brick with 2" of block insulation and bound by 1/4" steel plate properly reinforced to prevent deformation.

4.5 Pit Hearth - Hearth shall be 24-1/2" thick of high duty brick (modulus of rupture shall be 1500 pounds per square inch minimum).

SOAKING PIT FURNACES

4.6 Waste Gas Ports - Waste gas ports shall be as follows:

4.6.1 Arch shall be Detrick suspended type super duty rammed plastic with 1-1/2" of castable troweled over cold face.

4.6.2 Side walls to bottom of down leg shall be 9" of high duty brick backed by 4-1/2" insulating fire brick and one inch of block insulation bound by a 1/4" steel plat properly supported to prevent deformation.

4.6.3 Breast wall to break at downleg shall be 6" Multex backed by high duty brick and 2" of insulating block.

4.6.4 North wall of downleg shall be 9" super duty brick backed by 4-1/2" of 2000° insulating fire brick with one inch of block insulation and bound by 1/4" steel plate properly supported to prevent deformation.

4.6.5 Bottom of downleg shall be 7-1/2" high duty brick backed by 5" of insulating firebrick laid on 1/4" steel plate over a red brick grid for ventilation.

4.7 Waste Gas Flue from Downleg to Cross Flue -

4.7.1 Sprung arch shall consist of 9" of high duty brick backed by 4-1/2" of 2000° insulating firebrick with 1" of insulating cement.

4.7.2 Sidewalls shall be 9" high duty brick backed by 4-1/2" of 2000° IFB with 1" of block insulation and bound by 1/4" steel plate properly supported to prevent deformation.

4.7.3 Bottom shall be 7-1/2" of high duty brick backed by 5" of insulating firebrick laid on 1/4" steel plate over a red brick grid for ventilation.

4.8 Cross Flue -

4.8.1 Sprung arch and sides shall be 9" of medium duty brick backed by 4-1/2" of 1600° insulating fire brick. Sidewalls shall be bound by 1/4" steel plate properly supported to prevent deformation.

4.8.2 Bottom shall be 7-1/2" medium duty brick backed by 5" of 1600° insulating firebrick on 1/4" steel plate over red brick grid for ventilation.

4.9 Stack Lining -

4.9.1 Bell section shall be 9" medium duty brick with red brick fill.

4.9.2 Straight section shall be 4-1/2" of medium duty brick.

4.10 Hot air ducts shall be lined with 4-1/2" of 1600° insulating firebrick.

5.0 STEELWORK

5.1 General Design Criteria -

5.1.1 The steel used to support and bind the soaking pits shall be of sufficient section to withstand stresses and temperature which will occur in them.

5.1.2 The soaking pits shall be supported on a steel I-beam grillage. The steel beam grillage shall be supported on bearing plates on concrete foundations. (Foundations and bearing plates shall be furnished by Others.) All areas under pits shall be accessible insofar as possible.

5.1.3 Side and front wall casing shall be of 1/4" steel plate.

5.1.4 Burner wall casings shall be of 1/2" steel plate.

5.2 Pit Structural Steel -

5.2.1 Hearth steel shall be 3" thick steel slab supported on steel grillage beams. The grillage beams shall be designed to resist without permanent deformation the impact of a 35 ton ingot dropped from a height of one foot. The grillage beams shall be supported on bearing plates embedded in the concrete foundations. (Bearing plates shall be furnished installed, leveled, and grouted by Others.) Hearth steel shall be designed independently of wall steel so impact loads of dropped ingots shall not be transmitted to pit wall supporting steel, nor burner wall supporting steel, and so hearth steel can be replaced without removing wall. Hearth steel shall not extend under the walls.

5.2.2 Sidewall steel shall consist of vertical I-beams extending the full height of the pit wall and of such size and spacing to support the wall and prevent deformation. Vertical beams shall be tied top and bottom to horizontal binder beams or walers.

5.3 Steelwork for Downtakes and Flues - Side, top, and bottom plates shall be 1/4" thick with buckstays sized and spaced to support walls and arches to prevent deformation. Flues shall be encased in steel from soaking pit to base of stack.

5.4 Barrier Plates -

5.4.1 Barrier plates between ingot buggy track and soaking pits shall be 2" thick x 10" wide x full height (20'-0") and shall be hung 6" apart on column face toward ingot buggy track. A metal screen suitable for protecting personnel from hot scale shall be provided over the full wall area. This screen shall be installed on column face toward pit side of wall.

SOAKING PIT FURNACES

5.4.2 The brick walkway along the ingot buggy track shall be laid on a 2" supporting slab.

5.5 Cleanout Holes - Two (2) cleanout holes, 17" x 26", shall be provided in the bottom of each pit for the removal of cinders. A manual lever-operated door for cleanout hole buggy shall be provided for each cleanout. Buggy shall roll back on rail beams running lengthwise of pit bottom. One (1) cleanout sleeve and collar shall be provided for each cleanout hole as shown on Drawing No.

6.0 FURNACE COMBUSTION CONTROLS AND INSTRUMENTATION

6.1 Burners - Sub-Contractor shall furnish and install one or two combination gas or oil fired burners for each pit, suitable for use with 800°F preheated air at the burner. Total burner capacity shall be 36 MMBTU of fuel per hour, and shall be designed to fire natural gas, coke oven gas, or steam-atomized #6 fuel oil. The burner shall be capable of switching from gas to oil firing and back to gas with a minimum of maintenance time. The oil tube must be retractable and capable of being locked in the inserted or retracted positions.

6.2 Shut-Off Valves Per Burner

6.2.1 One (1) gas shut-off valve (plug cock).

6.2.2 One (1) fuel oil shut-off valve.

6.2.3 Two (2) steam shut-off valves.

6.2.4 One (1) steam purge valve.

Sub-Contractor shall state supplier and complete description of all valves.

6.3 Pit Temperature Control Per Pit -

6.3.1 One (1) L & N full size Pneumatic Indicating Recording Controller, round chart.

SOAKING PIT FURNACES

- 6.3.2 Two (2) Platinum - platinum 13% rhodium thermocouples with compensated extension wire.
 - 6.3.3 One (1) thermocouple selector switch.
 - 6.3.4 One (1) fuel selector switch.
 - 6.3.5 Hagan pilot-operated pneumatic cylinder to drive gas and oil valves.
 - 6.3.6 One (1) V-port gas flow control valve.
 - 6.3.7 One (1) fuel oil flow control valve per burner.
 - 6.3.8 One (1) steam/oil ratio control valve per burner.
- All control valves shall be complete with suitable by-pass arrangements.

6.4 Fuel/Air Ratio Control per Pit -

- 6.4.1 One (1) Askania hydraulic ratio regulator complete with impulse transfer valve, man-auto station and set point dial.
- 6.4.2 One (1) Askania hydraulic air butterfly actuator.
- 6.4.3 One (1) combustion air flow control butterfly.
- 6.4.4 One (1) measuring device for measuring hot combustion air.
- 6.4.5 One (1) double orifice arrangement for measuring coke oven gas or natural gas.
- 6.4.6 All necessary impulse piping with shut-off and by-pass valves complete.
- 6.4.7 One (1) CA thermocouple for measuring hot air temperature.
- 6.4.8 One (1) L. & N. hot air temperature compensation control with motor to adjust the Askania ratio regulator.
- 6.4.9 One (1) G.P.E. oil flow transometer.
- 6.4.10 One (1) Hagan fuel/air flow recorder with hot air temperature compensation and fuel integrator.

6.5 Pit Pressure Control per Pit -

6.5.1 One (1) Askania pit pressure controller complete with manual-auto station and set point dial.

6.5.2 One (1) Hagan pit pressure recorder.

6.5.3 One (1) hydraulic cylinder for controlling the water-cooled flue damper - complete with necessary linkage.

6.5.4 One (1) Blaw-Knox water-cooled damper with water-cooled seat complete with valves, hoses and connections to Purchaser's service water supply and drain headers. (Item 2.4.4)

6.6 Fuel and Air Pressure Control per Battery -

6.6.1 One (1) coke oven gas pressure regulator to reduce from supply header (Item 2.4.7) at 6 P.S.I.G.

6.6.2 One (1) natural gas pressure regulator to reduce from supply header (Item 2.4.6) at 50 P.S.I.G.

6.6.3 One (1) fuel oil pressure regulator to reduce from supply header (Item 2.4.9) at 150 P.S.I.G.

6.6.4 One (1) steam pressure regulator to reduce from supply header (Item 2.4.8) at 150 P.S.I.G. and 470°F.

6.6.5 Four (4) combustion air header pressure controllers to provide constant header pressure complete with mechanism to actuate fan inlet vanes.

6.7 Fuel Oil Conditioning per Battery -

6.7.1 One (1) fuel oil heater to elevate oil temperature to 200°F from supply header (Item 2.4.9) at 125°F.

6.7.2 One (1) Spence steam flow regulator to control temperature of fuel oil complete with temperature measuring element.

6.8 Fuel Shut-off Valves Per Pit -

6.8.1 One (1) plug type gas shut-off valve.

6.8.2 One (1) fuel oil shut-off valve.

6.8.3 One (1) steam shut-off valve.

6.8.4 One (1) gas safety shut-off valve with manual reset to be activated by combustion air pressure failure, gas pressure failure, or power failure.

6.8.5 One (1) fuel oil safety shut-off valve with manual reset to be activated by combustion air pressure failure, fuel oil pressure failure or power failure.

6.9 Fuel Shut-Off Valves per Battery -

6.9.1 One (1) coke oven gas header plug type shut-off valve downstream from coke oven gas regulator.

6.9.2 One (1) natural gas header plug type shut-off valve downstream from natural gas regulator.

6.10 Recuperators per Pit -

6.10.1 One (1) Hazen metallic tube recuperator designed for heating combustion air to 800°F at the burner with a flue gas inlet temperature of 2200°F. Recuperators shall be designed for 80% of maximum requirements.

6.11 Recuperator Protection Control per Pit -

6.11.1 One (1) L. & N. hot air bleed controller with motor to actuate hot air bleed control valve.

6.11.2 One (1) hot air bleed control elliptical butterfly valve.

6.11.3 One (1) Askania differential pressure controller to proportion air flow through the Hazen recuperator complete with Askania cylinder for positioning cold air butterfly.

SOAKING PIT FURNACES

6.11.4 One (1) cold air butterfly control valve.

6.11.5 One (1) L. & N. Speedomax "H" Cleertrend six-point temperature recorder.

6.11.6 All thermocouples required for hot air temperature recording and controlling.

6.12 Combustion Air Blowers and Motors Per Pit -

6.12.1 One (1) combustion air blower to be sized 20% above theoretical requirement for pressure and 25% above theoretical requirement for volume. Additional capacity must be added to conform with Hazen's requirement for hot air bleed. Blower unit shall be complete with inlet vanes for controlling constant header pressure.

6.12.2 One (1) combustion air blower motor.

6.13 Controls and Instrumentation Drawings - Sub-Contractor shall submit a schematic drawing of pit combustion and recuperator protection control systems. This drawing shall be complete with relative location of all gas, oil, combustion air, steam, compressed air, and hydraulic pipelines and valves. All control units, including regulators, valves, sensors, impulse lines, switches, and set point stations shall be shown with a brief description of each unit (including manufacturer's name and model no.).

6.14 Combustion Piping -

6.14.1 Hot combustion air piping shall be lined with 4-1/2" of 1600°F insulating firebrick.

6.15 Oxygen Analyzer - Sub-Contractor shall furnish and install one (1) oxygen analyzer capable of processing samples from 2 adjacent pit

flues. Installation shall occur at one (1) batter to be selected by Contractor.

7.0 ELECTRICAL

Sub-Contractor shall furnish and install all electrical equipment required for complete soaking pit facilities (except for the high bay lighting in soaking pit building, high bay lighting in lean-to building, lighting and electrical equipment in the cinder-handling coke-breeze-service area, and the lighting of the longitudinal material handling tunnel beneath the ingot buggy track, all of which shall be by others).

7.1 Sub-Contractor shall furnish and install all lighting fixtures, switches, panelboards, and accessory equipment required for illumination at the furnace control houses, walkways, stairs, and for all equipment furnished or installed by Sub-Contractor.

All lighting shall conform with Armco Electrical Distribution Standard _____.

7.2 All motors 1/4 hp up to and including 200 hp shall be 220/440 volt, 3 phase, 60 cycle. All motors, 1 hp and above, shall be totally enclosed, fan cooled, continuously rated, with Class B insulation, 55°C rise. Motors below 1 hp can be TENV with Class B insulation, 55°C rise, and 1.15 service factor.

7.3 Temperature controls and auxiliaries shall use 120 volt, 60 cycle, single phase power.

7.4 All wiring shall be designed for operating environment. All grounding, wiring, and electrical equipment shall conform to Purchaser's Electrical Design and Construction Standards where applicable (Exhibit A).

7.5 Pit Cover Cable Reels -

7.5.1 Vendor shall furnish each pit cover with one (1) "Aero-Motive Mill-Duty Pow-R-Matic Electrical Cable Reel" complete with the required number of collector rings properly selected for soaking pit service and equipped with series "MD" spring motors.

7.5.2 Flexible Cable for Pit Cover -

(a) Cable shall be constructed of the required number of individual conductors cabled around an asbestos core, with asbestos fillers, overall wraps of mylar tape, asbestos tape, and #30 AWG stainless steel 90% basket weave armor.

(b) Individual conductor gauges shall be as required with extra flexible stranding. Insulation shall be 45 mils silicon rubber with a glass braid jacket. Individual conductors shall be color coded per IPCEA Method 1.

7.6 Limit Switches - Each limit switch shall be of heavy duty steel mill design and shall be specifically designed for environmental conditions.

7.6.1 Soaking pit cover lift limit switches shall be the rotating cam type in gasketed enclosures and shall be directly coupled to the carriage drive through gear reduction.

7.6.2 Soaking pit cover travel limit switches shall be the hatchway type with steel rollers.

7.7 Motor Control Centers - Motor Control Centers shall be in accordance with ACS-570-01 and shall be manufactured by the General Electric Company.

7.7.1 Each motor control center shall be rated at 600 amperes load and the initial demand loading per center shall not exceed 500 amperes.

SOAKING PIT FURNACES

7.7.2 Starters shall be grouped so that individual battery motor loads are in the same center.

7.8 Safety Disconnect Switches - All 3-pole, 600 volt safety disconnects shall be Square D mill and foundry switches.

7.9 Lighting Panelboards - All 120/240 volt lighting panelboards shall be Square D, Type NQOB, in NEMA 12 enclosures.

7.10 Master Switches - Master switches for console mounting for manual/automatic and cover "open-close" shall be General Electric Company or equal.

7.10.1 Each master switch when operated in the "open" position shall lift cover, traverse cover to the extreme open position and stop all operations (even though the master switch may still be in the open position). Similar reverse operation shall follow when the master switch is operated to the "close" position. Either of the two motions shall be interrupted by throwing the master switch to the "off" position, but will continue automatically in either direction by operating the master switch.

7.10.2 Each battery shall be equipped with a "Remote"- "Local" selector station for remote control by soaking pit crane operator through a "FEMCO" or equal control system.

7.11 Pushbutton Stations - Pushbutton stations shall be the three (3) element, oil tight, heavy duty type for combustion air motor, dilution air motor, Askania pump units and air conditioning system.

7.12 Brakes - Cover lift motor and cover travel motors shall be General Electric or equal with Class "B" insulation.

8.0 PLATFORMS, WALKWAYS, AND STAIRWAYS

8.1 All platforms, walkways, and stairways shall be furnished, fabricated, and installed, complete with handrails and kickplates by Sub-Contractor. The Work shall conform with Armco Standard Drawing No. SK-1041-M and SK-1042-M for Stairways and Handrail, and shall include (but shall not be limited to) the following.

8.2 All operating platforms at elevation 124'-0" (except the 40 ft. section of Service Area which will be by Others). Operating platforms shall be designed for a 600 lb/sq. ft. live load.

8.2.1 Those areas over which the hot pit covers will be retracted shall be paved with 4-1/2" (Rowlock) Low Duty refractory brick or castable refractory supported by structural steel.

8.2.2 The passage (approximately 6'-0") between twin pits shall be constructed of 4-1/2" (Rowlock) load bearing refractory brick, supported by structural steel members. The passage shall be designed to carry a live load of 600 lbs. per sq. ft.

8.2.3 The platforms directly over the burner or burners (at elevation 124'-0") shall consist of a heavy steel removable grid to provide ventilation for the area around the burners. Grid bars shall be 3/4" x 3" steel spaced at 2-1/4" O.C. Removable grid shall be approximately 2'-0" wider than each side of burner.

8.2.4 The Control House Platform (at elevation 124'-0" and north of Column Row "Y") shall be steel grating supported with structural steel. Platform shall be designed to carry a live load of 150 lbs. per sq. ft.

SOAKING PIT FURNACES

- 8.2.5 The walkway at elevation 124'-0" on the ingot buggy side of the pits shall be constructed of 4-1/2" Rowlock, load-bearing refractory brick placed on a 2" thick slab, supported by structural steelwork.
- 8.3 Burner maintenance platform at an elevation of approximately 114'-0" shall be steel grating designed to carry a live load of 300 lbs./sq. ft.
- 8.4 Thermocouple access platforms on the ingot buggy side of the pits and the access platforms between pits at this level shall be steel grating designed to carry a live load of 150 lbs./sq. ft.
- 8.5 Platforms over the soaking pit cross-flues, and platforms connecting with burner access platforms shall be grating, adequately supported to carry a live load of 300 lbs./sq. ft.
- 8.6 All stairways shall be designed for a live load of 150 lbs./sq. ft.
- 8.7 The remainder of platform at elevation 124'-0" from Column Row "Y" to refractory lined section shall be paved with reinforced concrete designed to carry a live load of 600 lbs./sq. ft.

9.0 PIPING

All piping and piping insulation shall conform to the following attached Armco Corporate Standards:

- 9.1 PIPING - GENERAL - ACS-400-01
- 9.2 PIPING - STEAM - 150 P.S.I.G. AT 500°F - ACS-400-03
- 9.3 PIPING - STEAM SUPERHEATED - 425 P.S.I.G. AT 750°F - ACS-400-04
- 9.4 PIPING - WATER - DRINKING - 150 P.S.I.G. - ACS-400-05
- 9.5 PIPING - OIL - FUEL - ACS-400-22
- 9.6 PIPING - OXYGEN - ACS-400-13
- 9.7 PIPING - COKE OVEN GAS - 150 P.S.I.G. AT 200°F - ACS-400-15
- 9.8 PIPING - GAS - NATURAL - ACS-400-14
- 9.9 PIPING - AIR - COMPRESSED - ACS-400-12
- 9.10 PIPING - WATER CONTAMINATED 150 P.S.I.G. - ACS-400-06
- 9.11 PIPING - INSULATION - ACS-400-35

10.0 PAINTING

All gears, shafts, and other machined parts shall be rust protected.

All surface preparation, paint, and paint application shall conform to Armco Paint Standards. All structural and other unfinished parts shall be cleaned and painted as follows:

	<u>Primer</u>	<u>Finish Coat</u>
10.1 Electrical (Motors and Controls)	Armco Standard No. 3 (iron oxide-zinc chromate)	Armco Standard No. 15-6 (red enamel)
10.2 Machinery Guards	Armco Standard No. 3 (iron oxide-zinc chromate)	Armco Standard No. 5-13 (beige enamel)
10.3 Structural Parts of Equipment	Armco Standard No. 17 (Epon Modified Purpose Primer)	Armco Standard No. 17A9 (green enamel)

SOAKING PIT FURNACES

	<u>Primer</u>	<u>Finish Coat</u>
10.4 Hydraulic Parts	Armco Standard No. 3 (iron oxide-zinc chromate)	Armco Standard No. 15 (white enamel)
10.5 Structural Steel	Armco Standard No. 3 (iron oxide-zinc chromate)	Armco Standard No. 15-4 (lt. gray enamel)
10.6 Walkways and Stairs	Armco Standard No. 3 (iron oxide-zinc chromate)	Armco Standard No. 15-5 (dk gray enamel)
10.7 Handrails	Armco Standard No. 3 (iron oxide-zinc chromate)	Armco Standard No. 20-1 (yellow enamel)
10.8 Soaking Pits (and other equipment exposed to high temp.)	Silicone Base Aluminum Pigment	Silicone Base Aluminum Pigment
10.9 Piping	As primed by pipe manufacturer	As shown on Armco Standard Specification ACS-400-02
10.10 Instrumentation and Electrical Controls in the Instrument Control Houses		Gray as received from manufacturer
10.11 Instrument Control Houses		Colors shall be specified by Owner
10.12 Stacks (steel, insulated)	Armco Standard Paint No. 2A	Armco Standard Paint No. 5C

11.0 SUPERVISION, STARTUP, AND PERSONNEL TRAINING

- 11.1 Erection and/or Service Representative(s) - Sub-Contractor shall provide complete supervision for the dry-out, start-up and operational tests to be performed on the job site. Sub-Contractor shall provide all necessary assistance until all soaking pits are performing acceptably in the opinion of the Purchaser.

11.2 OPERATION AND MAINTENANCE - TRAINING AND DATA

Sub-Contractor shall provide all the necessary operation and maintenance training and data required for Purchaser's personnel to successfully maintain and operate the soaking pits. A minimum of _____ () sets of operation and maintenance manuals shall be furnished by Sub-Contractor.

12.0 USE OF PURCHASER'S MATERIAL OR EQUIPMENT

The Sub-Contractor shall utilize, where applicable, Armco manufactured materials or equipment in the design, fabrication, and installation of the facilities specified herein.

13.0 RECOMMENDED SPARES

Sub-Contractor shall provide a list of recommended spares, clearly indicating the pieces of equipment. List shall indicate type, part number, manufacturer's name, size, unit price, and any other information required for replacement, and the recommended number of spares.

14.0 SAFETY DEVICES

Sub-Contractor shall equip the Work covered by this Specification with all proper safety devices for the protection of workmen and shall provide suitable, removable safety guards for all exposed moving parts, such as gears, roller chains, belts, brake wheels, couplings, and the like.

Sub-Contractor warrants that such work shall meet the requirements of, and be in conformity with, any and all applicable Federal and local laws, rules, regulations, and ordinances.

15.0 GUARANTEE

The Sub-Contractor shall and does hereby guarantee the installation and equipment furnished by the Sub-Contractor under the terms of the Contract will be well designed, manufactured, and installed, will perform

SOAKING PIT FURNACES

successfully the operation for which it is purchased at the speed, rating, and capacity stated in this specification, and that all materials used will be of first class quality and suitable for their respective purposes.

16.0 ALTERNATE PROPOSALS

16.1 Alternate A - Battery-Type Recuperator - Sub-Contractor shall quote as Alternate A, the Soaking Pit Furnaces as specified herein but with the following additions, deletions, and/or changes.

16.1.1 Page 3 of 31, Item 3.1; change to read:

3.1 Six (6) batteries of four (4) pits per battery of one-way, top-fired soaking pit furnaces, complete with one (1) recuperator per battery.

16.1.2 Page 11 of 31, Item 4.8.1; change the first sentence to read:

Sprung arch and sides shall be 9" of high duty brick backed by 4-1/2" of 2000° insulating fire brick.

16.1.3 Page 11 of 31, Item 4.8.2; change to read:

Bottom shall be 7-1/2" of high duty brick backed by 5" of 2000° insulating firebrick on 1/4" steel plate over red brick grid for insulation.

16.1.4 Page 11 of 31, add new Item 4.8.3:

4.8.3 Flue section from cross flue to base of stack shall be the same as specified in Item 4.8.2 above.

16.1.5 Page 15 of 31, Item 6.6.5; change to read as follows:

One (1) combustion air header pressure controller to provide constant header pressure complete with mechanism to actuate fan inlet vanes.

16.1.6 Page 16 of 31, Item 6.10; change to read:

6.10 Recuperators Per Battery - One (1) thermal transfer metallic tube recuperator designed for heating combustion air to 800°F at the burner with a flue gas inlet temperature of 1850°F. Recuperator shall be designed for 75% of maximum firing rate of four pits.

16.1.7 Page 16 of 31, Items 6.11 and 6.11.1; change to read:

6.11 Recuperator Protection Control Per Battery -

6.11.1 One (1) dilution air system to control flue gas inlet temperature to the recuperator to a maximum temperature of 1850°F. System shall include a dilution air fan with motor, hot air temperature controller with temperature sensor, dilution air flow control butterfly (or fan inlet vane control) with actuator and required ductwork to connect to point of inlet to flue.

16.1.8 Page 16 of 31, delete the following Items:

Item 6.11.2

Item 6.11.3

Item 6.11.4

16.1.9 Page 17 of 31, Item 6.12, change to read as follows:

6.12 Combustion Air Blowers and Motors Per Battery

16.1.10 Page 17 of 31, Item 6.12.1; change second sentence to read:

Combustion air volume requirement must be based on the maximum firing rate of four pits.

16.1.11 Page 17 of 31, add new Item 6.14.2 to read as follows:

6.14.2 Combustion air headers for three (3) batteries shall be connected with shut-off gates between batteries in order to operate either with one fan supplying air to one battery (with

SOAKING PIT FURNACES

gates closed) or two fans supplying air to three batteries (with gates open).

- 16.2 Alternate B - Direct Fired - Sub-Contractor shall quote as Alternate B the Soaking Pit Furnaces as specified but with the following additions, deletions, and/or changes:

16.2.1 Page 3 of 31, change Item 2.4.8 to read as follows:

2.4.8 Steam at a pressure of 150 P.S.I.G. and 470°F by extension of the hot strip mill header south with branch lines extending east and west along the soaking pit building Column Row "Y". One take-off with shut-off valve shall be provided at each control house.

16.2.2 Page 3 of 31, Item 2.4.9; change first sentence to read as follows:

2.4.9 No. 2 fuel oil at 50 P.S.I.G. and ambient temperature by pipeline extending along Column Row "Y" the full length of the soaking pit building with return line.

16.2.3 Page 3 of 31, Item 3.1; change to read:

Six (6) batteries of four (4) pits per battery of one-way, top-fired soaking pit furnaces designed for direct firing with cold air.

16.2.4 Page 4 of 31, Item 3.1.5; change second sentence to read:

Burner capacity shall be 40 MMBTU/Hr. of fuel to maintain the following monthly tonnage and charging requirements.

16.2.5 Page 5 of 31, Item 3.1.6 (c) change to read:

Standby fuel oil - No. 2 fuel oil at 128,000 BTU/gallon

SOAKING PIT FURNACES

16.2.6 Page 8 of 31, add new Item 3.5.2 as follows:

3.5.2 Sub-Contractor shall provide atomizing air for #2 fuel oil and state what air pressure is required at the burner and what percent of total combustion air is needed for atomization.

16.2.7 Page 11 of 31, Item 4.8.1; change first sentence to read: Sprung arch and sides shall be 9" of high duty brick backed by 4-1/2" of 1600°F insulating fire brick.

16.2.8 Page 11 of 31, Item 4.8.2, change to read: Bottom shall be 7-1/2" high duty brick backed by 5" of 2000°F insulating firebrick on 1/4" steel plate over red brick grid for ventilation.

16.2.9 Page 11 of 31, delete Item 4.10.

16.2.10 Page of , Item 6.1, change the first and second sentence to read:

Sub-Contractor shall furnish and install one or two combination gas or oil fired burners for each pit, designed for firing with cold combustion air. Total burner capacity shall be 40 MMBTU/Hr of fuel per hour, and shall be designed to fire natural gas, coke oven gas or air-atomized No. 2 fuel oil.

16.2.11 Page 13 of 31, Item 6.2.3; change to read:

6.2.3 Two (2) atomizing-air shut-off valves.

16.2.12 Page 13 of 31, Item 6.2.4; change to read:

6.2.4 One (1) air purge valve.

16.2.13 Page 14 of 31, Item 6.3.8, change to read:

One (1) atomizing air/oil ratio control valve per burner.

16.2.14 Page 14 of 31, add new Item 6.3.9 to read:

6.3.9 One (1) I&N "Speedomax H Cleertrend six-point temperature recorder"

SOAKING PIT FURNACES

16.2.15 Page 14 of 31, Item 6.4.4; change to read:

One (1) measuring device for measuring combustion air.

16.2.16 Page 14 of 31, delete Item 6.4.7 and 6.4.8.

16.2.17 Page 14 of 31, Item 6.4.10; change to read:

One (1) Hagan fuel/air flow recorder with fuel integrator.

16.2.18 Page 15 of 31, Item 6.6.3; change to read:

One (1) fuel oil pressure regulator to reduce from supply header
(Item 2.4.9) at 50 P.S.I.G.

16.2.19 Page 15 of 31, delete the following:

Item 6.6.4

Item 6.7

Item 6.7.1

Item 6.7.2

Item 6.7.3

16.2.20 Page 16 of 31, Item 6.8.3; change to read:

6.8.3 One (1) atomizing air shut-off valve.

16.2.21 Page 16 of 31, delete the following:

Item 6.10

Item 6.10.1

Item 6.11

Item 6.11.1

Item 6.11.2

Item 6.11.3

Item 6.11.4

16.2.22 Page 17 of 31, add new Item 6.12.3 to read as follows:

6.12.3 Sub-Contractor shall furnish additional blowers for
atomizing air if his combustion system requires a higher pressure
for atomizing air than for combustion air.

SOAKING PIT FURNACES

16.2.23 Page 17 of 31, Item 6.13; change first and second sentences to read:

Sub-Contractor shall submit a schematic drawing of pit combustion control systems. This drawing shall be complete with relative location of all gas, oil, combustion air, compressed air, and hydraulic pipelines and valves.

16.2.24 Page 17 of 31, delete Item 6.14 and 6.14.1 in its entirety.

* * * * *

SOAKING PIT FURNACES

Specification No. 7143(4-1)

DESIGN DRAWINGS

<u>Number</u>	<u>Title</u>
PR-3297-1560	Substructure and Column Arrangement Plans
PR-3297-1561	Superstructure - Roof Framing Plans and Cross Sections
PR-3297-1562	Typical Sections Elevations and Details
PR-3297-1563	Elevated Platforms - Plans and Sections
PR-3297-1564	Building Elevations - Roof Plan
PR-3297-1565	Building Sections
PR-3297-1566	General Arrangement
PR-3297-1567	General Arrangement
PR-3297-1568	General Arrangement
PR-3297-1569	Longitudinal Sections
PR-3297-1570	Cross Sections
PR-3297-1558	Existing Ingot Family Setting Diagram
PR-3297-1559	New Ingot Family Setting Diagram
PR-3297-1571	Schematic Diagram
PR-3297-1572	480 Volt Unit Substation One Line Diagram
PR-3297-1573	250 Volt DC Rectifier One Line Diagram
PR-3297-1574	Communications
PR-3297-1596	Plot Plan

ARMCO STEEL CORPORATION
MIDDLETOWN, OHIO

PURCHASER'S INFORMATION SHEETS
(To Be Completed and Returned with Proposal)

SOAKING PIT FURNACES

Specification No. 7143(4-1) Job No. 7143
Date November 26, 1965

The data called for below is to be furnished by the bidder, and in case the bidder becomes the Sub-Contractor, the data shall form part of the contract covering the work.

1. Name of Bidder _____
2. Date of Proposition _____
3. Is it the bidder's intention, if awarded the contract, to comply fully and in all respects with Contractor's specifications covering the work? If not, bidder shall state exceptions in detail _____
4. Time in which Sub-Contractor will agree to deliver or complete work covered by these specifications _____
5. Hearth Grillage Beams
(Reference Item 5.2)
Size _____
Number _____
Length _____ ft.
Total Weight _____ tons

6.	Hearth Steel Slab		Tons
	(Reference Item 5.2)		
7.	Pit Binding Steel	Size	
	(Reference Item 5.3)	Number	
		Length	Ft.
		Total Weight	Tons
8.	Binder Beams	Size	
	(Reference Item 5.3)	Number	
		Total Weight	Tons
9.	Weight of 1/4" Plate	Total Weight	Tons
	(Reference Item 5.3)		
10.	Vertical Columns forming the	Size	
	ingot barrier wall	Number	
	(Reference Item 5.4.1)	Length	Ft.
		Total Weight	Tons
11.	The 2" supporting Slab	Total Weight	Tons
	(Reference Item 5.4.2)		
12.	Supporting Steel - platforms, stairs, and walkways.	Total Weight	Tons
	(Reference Item 8.1.1)		

13. State Manufacturer and Complete
Description of Valves
(Reference Item 6.2)

14. State Manufacturer and Complete
Description of Pit Temperature
Control Valves
(Reference Item 6.3)

15. Combustion Air Pipe
(Reference Item 6.14.1)

O.D. _____ Inches
Wall Thickness _____ Inch

	<u>Schedule</u>	<u>O.D.</u>
16. Fuel gas Piping	_____	_____ Inch
Fuel oil piping	_____	_____ Inch
Steam piping	_____	_____ Inch

(Reference Item 6.1.4.2)

17. Electrical Requirements
440-480 Volt
(Reference Item 2.4.1)

Total _____ Amps

18. Plant Air Requirements at
70-90 P.S.I.G.
(Reference Item 2.4.3)

_____ SCFM

19. Service Water Requirements
Including Water-Cooled Dampers
and Seats
(Reference Item 2.4.4)

_____ Gallons

20. Potable Water Requirements
(Reference Item 2.4.5)

_____ Gallons

21. Steam Requirements
(For Atomizing No. 6 Fuel
Oil and Other)
(Reference Item 2.4.8)

_____ Lbs/Hr
at 710°F and 400 P.S.I.G.

22. Total Weight of Steel
in Soaking Pit Cover
(Reference Item 3.3.1)

_____ Tons

23. Total Weight of Soaking Pit
Cover With Lining
(Reference Item 3.3.1)

_____ Tons

24. Carriage Rail Beams
(Reference Item 3.3.2)

Size _____

Length _____ Ft.

Total Weight _____ Tons

25. Recuperator
(Reference Item 6.10.1)
Number of Tubes _____

Diameter of Tubes _____ Inches

Wall Thickness of Tubes _____ Inches

Length of Tubes _____ Ft.

Types of Steel
(in different tubes)

Type of Steel _____

Range _____

Of _____ Of

Of _____ Of

Of _____ Of

Total Weight of Complete
Recuperator _____ Tons

26. Pipe Insulation
Steam Piping

Type _____

Manufacturer _____

Thickness _____ Inches

Page 5 of 8

26. Pipe Insulation (Continued)
Fuel Oil Piping

Type	_____
Manufacturer	_____
Thickness	_____ Inches

27. Buckstays Size _____

Number	_____
Spacing	_____ Inches
Total Weight	_____ Tons

28. Furnish heating curves from
"Finish Charge" to "Ready to
Roll" for each ingot size

	Ingot Size	Curve No.
(1)	_____	_____
(2)	_____	_____
(3)	_____	_____
(4)	_____	_____
(5)	_____	_____
(6)	_____	_____
(7)	_____	_____
(8)	_____	_____
(9)	_____	_____

29. Holding fuel rate with full pit of ingots (220.8 Ton Ingot Charge) (Reference Item 3.1.5)	_____	BTU's/Hr
30. Holding fuel rate with empty pit at 2300°p (Reference Item 3.1.5)	_____	BTU's/Hr
31. Stack (Reference Item 3.2)	Ht. _____	Ft.
	I.D. of brickwork _____	Inches
	Total Draft Loss _____	Inches W.C.
32. Soaking Pit Cover Drives (Reference Item 3.3.2)	Acceleration _____	
	Lift _____	Ft/Sec/Sec
	Horsepower _____	
	R.P.M. _____	
	Travel _____	
	Horsepower _____	
	R.P.M. _____	
33. Cover Carriage Lubrication System (Include Diagram) (Reference Item 3.3.2)	Manufacturer _____	

34. Combustion Air System
(Reference Item 3.5.1)

_____ Horsepower
_____ R.P.M.
_____ SCFM at _____ Inches of W.C.

35. Sub-Contractor shall provide sketch of proposed cleanout holes, liners, doors, and operating mechanisms.
(Reference Item 5.5)

36. Temperature Control System shall be:
(Reference Item 6.3.5)

_____ Fuel Lead
or _____ Air Lead

37. Steam/Oil Ratio Control Valve
(Reference Item 6.3.8)

_____ Manufacturer
and description _____

38. Sub-Contractor shall provide schematic showing recommended location of main fuel headers.
(Reference Item 6.6.5)

| * * * *