ASARCO INCORPORATED
ORE HANDLING AND SINTER PLANT

JOB NO. 7635

ADDENDUM NO. 2
July 14, 1978
TO
SPECIFICATION
FOR
PIPING - SUPPLY AND INSTALL

Spec. No. CM-030 October 10, 1977

Prepared by
KAISER ENGINEERS, INC.

Approved for KAISER ENGINEERS:

Approved by _____ Date 7/14/78

Approved by _____ Date 7-14-78

Approved for Central Engineering - ASARCO:

Approved by _____ Date 7/28/78

HER 0000125

ADDENDUM NO. 2
July 14, 1978
TO
SPECIFICATION
FOR
PIPING - SUPPLY AND INSTALL

Spec. No. CM-030 October 10, 1977

THIS SPECIFICATION AS AMENDED BY ADDENDUM NO. 1 SHALL BE FURTHER AMENDED AS FOLLOWS:

1. Paragraph 1.1.1 Piping Systems (Contractor-Furnished)

   Sub-paragraph a., Identification, Add the following: "EGS - Ethylene Glycol Solution - Specification B"

2. Paragraph 1.1.2 Connections for Owner Furnished Equipment

   Sub-paragraph (d), item (24), Addendum No. 1

   Delete in its entirety and substitute the following:

   "The contractor shall supply, fabricate, and install the piping system and any accessories supplied with Owner-furnished equipment as shown on Drawing No. 23084-M.

   Equipment installation shall include the intake filter/silencer only"

3. Attachment I

   Addendum No. 1

   Delete Drawing No. 23348-P and substitute Drawing No."23084-M"

4. Piping Material Specification

   Under Specification No. B, Add "Ethylene Glycol Solution (EGS)"

5. Valve List

   Valve V-110, Change "Crane No. 448" to "Crane No. 488"

ASARCO INCORPORATED
ORE HANDLING AND SINTER PLANT
EL PASO, TEXAS

JOB NO. 76035

ADDENDUM NO. 1
June 12, 1978
TO
SPECIFICATION
FOR
PIPING - SUPPLY AND INSTALL

Spec. No. CM-030 October 10, 1977

Prepared by
KAISER ENGINEERS, INC.

Approved for KAISER ENGINEERS:

Approved by _____ Date 6-15-78

Approved by _____ Date 6-16-78

Approved for Central Engineering - ASARCO:

Approved by _____ Date 6/16/78

HER 0000127

ADDENDUM NO. 1
June 12, 1978
TO
SPECIFICATION
FOR
PIPING - SUPPLY AND INSTALL

Spec. No. CM-030 October 10, 1977

THIS SPECIFICATION SHALL BE AMENDED AS FOLLOWS:

1. Paragraph 1.1.1 Piping Systems (Contractor-Furnished)

   Sub-paragraph a., under "Symbol", Change "HF" to "HYD"

   Sub-paragraph b., item (1), item v, Add the following:

   "Including classifier sand discharge chute, vacuum filter cake discharge chute, and thickener feed launder as shown on the drawings."

2. Paragraph 1.1.2 Connections for Owner Furnished Equipment

   Sub-paragraph b. Vertical Sump Pumps

   Add "(14) Washdown Sump Pump (50250)"

   Sub-paragraph c. Horizontal Pumps (With Motors)

   Item (4) Vacuum Pump (10808) Add the following:

   "And water trap silencer"

   Sub-paragraph d. Miscellaneous Equipment

   Item (2) 1200 gallon slurry tank, Add the following:

   "(10830)"

   Item (14) Delete

   "This item in its entirety" and Substitute therefore:

   "Dust supression spray water at conveyor and feeder transfer points in the unloading building (typ of 14) and emergency spray water at apron feeder 51250 at Sinter Plant."

   Item (21) Change the word "drawings" to read "Vendor drawings"

   Add the following new items:

"(23) Dust Supression spray system at direct charge hopper"

(24) Plant air compressor No. 302185 and accessories"

3. Attachment I

Attachment I has been revised to include new drawings indicated with symbol ⚠1 and revision numbers deleted.

4. VALVE LIST

Valve - V110, Change Crane #472 to "Crane #448"

ATTACHMENT I

CONSTRUCTION DRAWING LIST

Drawing No.	Title
23316-100-P	Piping Legend & General Notes
25222-100-P	General Plant Water System Diagram
23346-100-P	Water Treatment System P&ID Sheet 1
23347-100-P	Water Treatment System P&ID Sheet 2
25348-100-P	General Arrangement
25349-100-P	Washdown Transfer Sump Piping Plan & Sections
25350-100-P	Washdown & Clarified Water Piping Plan
25351-100-P	Washdown & Clarified Water Piping Section
25352-100-P	Washdown & Clarified Water Piping Details
25353-100-P	Bedding Sumps Miscellaneous Details
1 25354-100-P	Piping Sect. & Det.
23317-302-P	Ore Unloading & Bedding Area P&ID
23321-302-P	Piping Plan, Lower Level
23322-302-P	Piping Plan, Upper Level
23323-302-P	Washdown Sump Pumps Piping Plan & Sections
23324-302-P	Piping Sections
23325-302-P	Miscellaneous Details
23326-302-P	Bedding Plant Piping Plan
23327-302-P	Bedding Plant Piping Section
23328-302-P	Bedding Plant Piping Section & Details
25223-302-P	Delivery Conveyor Washdown Piping
25224-302-P	Front End Loader Washdown
25225-302-P	Dust Collector Piping

ATTACHMENT I

CONSTRUCTION DRAWING LIST

	Drawing No.	Title
	25355-302-P	Reclaim Area Washdown Piping Plan & Section
	23318-512-P	Sintering Plant P&ID
	23330-512-P	General Piping Plan
	23331-512-P	Sinter Machine Piping Plan Sheet 1
	23332-512-P	Sinter Machine Piping Plan Sheet 2
	23333-512-P	Sinter Machine Piping Sections
	23334-512-P	Sinter Machine Piping Section & Details
	23335-512-P	Direct Charge Dust Suppression Piping
	23337-512-P	Corrugated & Smooth Roll Crusher, Ross Rolls & Sinter Bins Piping Plan
	23338-512-P	Piping Sections
	23341-512-P	Pellet Drum & Mixer Piping Plan
	23342-512-P	Pellet Drum & Mixer Piping Section
	23345-512-P	Spiked Roll Crusher & Washdown Water Return Piping Plan & Section
	25221-512-P	Storage Tank Spray System Piping Plan & Section
1	23339-P	Recuperators & Fans Piping Plan
1	23340-P	Piping Sect. & Det.
1	23348-P	Compressor Piping Plan & Sect.

ASARCO INCORPORATED
ORE HANDLING AND SINTER PLANT
EL PASO, TEXAS

JOB NO. 76035

SPECIFICATION
FOR
PIPING - SUPPLY AND INSTALL

Spec. No. CM-030 October 10, 1977

Prepared by
KAISER ENGINEERS, INC.

Approved for KAISER ENGINEERS:

Approved by _____ Date 12-15-77

Approved by _____ Date 12-29-77

Approved for Central Engineering - ASARCO:

Approved by _____ Date 1/4/78

HER 0000132

I N D E X

TO

SPECIFICATION

FOR

PIPING - SUPPLY AND INSTALL

SPECIFICATION
FOR
PIPING - SUPPLY AND INSTALL

1. SCOPE

This Specification covers the requirements for furnishing all labor, materials, equipment (other than materials and equipment furnished by Owner), tools, transportation and services required to perform the piping work and accessories as shown on the drawings and as specified herein at the ASARCO Incorporated Plant located at El Paso, Texas.

1.1 Work Included

Piping shall include furnishing, fabricating and installing complete piping systems as designated herein and the furnishing and installing piping system for equipment installed by Others.

1.1.1 Piping Systems (Contractor-Furnished)

a. Identification

The Contractor shall furnish all materials and perform all the work required to install the following piping systems. Each piping system is identified on the drawings by a symbol. Symbols for the various services are listed on the Piping Legend. The letter designation that follows the symbol and service in the listing identifies the applicable Piping Materials Specification.

Symbol	Service	Specification
CLW	Clarified Water	B
CW	City Water	B
CWR	City Water Return	B
IA	Instrument Air	A
NTW	Neutralized Water	B
PA	Plant Air	A
WDW	Washdown Water	B
FO	Fuel Oil	C
HF	Hydraulic Fluid (Valves per Seller's recommendations)	C
NG	Natural Gas	D
SL	Slurry	B

H_2	Hydrogen	D
FLT	Filtrate	B
FLOC	Flocculant	B

Other miscellaneous piping materials and equipment such as air dryers, level gages and level control valves as specified on the piping layout drawings.

b. Work to be Performed to Install Piping System

(1) Materials

Contractor shall furnish all piping materials for each piping system consisting of the following:

i. Pipe, fittings, flexible hoses and valves

ii. Piping anchors, guides, sleeves, supports including secondary steel supports and spring hangers

iii. Piping specialties including filter-lubricator-regulator units, moisture traps, strainers and sight flow indicators as shown on the drawing

iv. Tubing, fittings and valves

v. Miscellaneous hardware including mesh screens, bolts, nuts, gaskets, grout shims and hardware required for a complete installation

(2) Fabricate and Install

Fabricate and install piping systems complete, including making connection to equipment as shown on the drawings, and making connections of anchors, hangers, and supports to structural steel, including drilling holes for mounting bolts, field welding, concrete foundation and grouting. Contractor shall install hangers, supports and anchors as required. Where the design for supports is not indicated on the drawings, the Contractor shall provide the design and submit drawings to the Engineer for approval.

(3) Testing

Testing of piping and instrumentation systems, including furnishing of test equipment and materials. Contractor shall furnish and install high point vents and low point drains for piping system testing. Vents and drains shall have permanent valves.

(4) Cleaning

Cleaning of piping systems, including the furnishing of cleaning equipment and materials.

(5) Pipe and Valve Identification

Furnish and apply pipe and valve identification. Prefabricated pipe shall be metal stamped with identifying letters and numbers not less than 3/8 inch high. The stamped I.D. shall be circled with paint and I.D. shall also be painted on pipe separate from stamp.

(6) Tagging of Valves

Each valve shall be permanently tagged with its specification number. Tag shall also show type of valve packing, if applicable.

(7) Pipe Insulation

Furnish and install pipe insulation for thermal and personnel protection.

(8) Heat Tracing

Furnish and install electric heat tracing for lines as indicated on drawings. Leads shall be terminated in junction boxes for connection to power source by Others.

1.1.2 Connections for Owner-Furnished Equipment

The Contractor shall be responsible for making all piping connections only to the equipment installed by Others as listed below and also as indicated in the drawing.

a. Air Receivers

(1) Eq. No. 30268

(2) Eq. No. 30269

(3) Eq. No. 30270

(4) Eq. No. 30271

(5) Eq. No. 40547

(6) Eq. No. 40568

(7) Eq. No. 40569

(8) Eq. No. 512141

(9) Eq. No. 10809

b. Vertical Sump Pumps (With Motors)

(1) Settling pump (30240)

(2) Settling pump (30241)

(3) Washdown sump pump (30242)

(4) Washdown sump pump (30243)

(5) Washdown sump pump (405101 thru 405107

(6) Washdown sump pump (405108), (405111) and (10829)

(7) Main washdown sump pump (51273)

(8) Main washdown sump pump (51274)

(9) Washdown sump pump (50238)

(10) Washdown sump pump (512181)

(11) Washdown sump pump (512182)

(12) Washdown sump pump (512173)

(13) Washdown sump pump (512174)

c. Horizontal Pumps (With Motors)

(1) Clarified water pumps (10823) and (10824)

(2) Thickener underflow pumps (10803) and (10804)

(3) Thickener feed pumps (10826) and (10827)

(4) Vacuum pump (10808)

(5) Filtrate pump (10807)

(6) Front end loader pumps (40598), (40599) and pump boxes.

(7) Clarified water supply pumps (512171) and (512172)

(8) Clarified water spray pumps (512169) and (512170)

(9) Cooling water return pump (512200) and pump box.

(10) Flocculant transfer pump (10819)

d. Miscellaneous Equipment

(1) Classifier (10812)

(2) 1200 gallon slurry tank

(3) Thickener (10801)

(4) Clarified water tank-90,000 gallon (10822)

(5) Water storage tank-20,000 gallon (512143)

(6) Vacuum filter (10805)

(7) Bedding slurry tank (10833)

(8) Filtrate receiver (10807.A)

(9) Flocculant mixing tank (10815)

(10) Flocculant storage tank (10810)

(11) Flocculant day tank (10816)

(12) Air piping to dust collectors (30230 A & B), (30234 A & B), (30244), (40566 A & B), (40567 A & B)

(13) Spray water at conveyors (51209), (51213), (51214) and (51251)

(14) Cooling water supply and return connections to pneumatic conveying system compressors (302164) and (302165)

(15) Air piping to soda ash unloading system equipment -- pneumatic pac blower, bin vent filters, differential pressure switch, and others

(16) Air piping to pekay mixer (30228) air cylinders

(17) External spray water connection to pekay mixer (30228), spray system to pelletizing drum (51217) and shaft mixer (51216)

(18) Cooling water connections to sinter machine water cooled shields. claw breaker, process gas fan bearings, crusher bearings, hydraulic power unit as indicated on drawings.

(19) Air piping to dust collector dampers, process gas dampers, flop gates, slide gates with grizzley and track switch operator as indicated on drawings

(20) Plant air and instrument air piping to air dryers actuators, positioners and I-P converters as indicated on the drawings

(21) Hydraulic fluid piping from hydraulic power unit to cylinders as indicated on the drawings

(22) External connection to sinter machine burner system manifold as indicated on the drawings

1.2 Work Not Included

a. Owner-furnished equipment

b. Building structural steel and maintenance platforms

c. Concrete foundations, including anchor bolts, except as specified under the work included

d. Electrical work associated with equipment installation

e. Storm louvers in exterior walls

f. Dust collection ductwork

g. Painting

h. Installation consisting of rough set and final alignment of equipment listed in paragraph 1.1.2

i. Pneumatic additive and soda ash systems covered under mechanical specification

j. Plumbing

k. Lube systems for impactor, smooth roll crusher, corrugated roll crusher, spike tooth roll crusher and screening rolls

2. SUPPLEMENTARY SPECIAL CONDITIONS

2.1 Reference Documents

2.1.1 Applicable Publications

All work performed and all materials furnished under this Specification shall conform to the applicable publications and standards of the organizations listed below. Latest editions and revisions, as of the date of this Specification, of the publication or standards listed or referred to herein are by such listing, reference, or notation made a part hereof.

American National Standards Institute (ANSI)

American Society of Mechanical Engineers (ASME)

American Society for Testing and Materials (ASTM)

American Water Works Association (AWWA)

Factory Mutual Laboratories (FM)

International Standards Organization (ISO)

Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)

National Fire Protection Association (NFPA)

Occupational Safety and Health Administration (OSHA)

Pipe Fabrication Institute (PFI)

Underwriters Laboratories (UL)

2.1.2 Attachments and Data

The following attachments are included herein and made a part of this Specification:

Attachment I - Construction Drawings

Attachment II - Equipment Drawings

Piping Material Specifications

Valve Lists

2.1.3 Codes and Regulations

The Contractor is responsible for compliance with any applicable Federal, State and Local laws and codes, and the regulations of governmental agencies having jurisdiction over any construction phase of the work. The Contractor shall provide any additional material and labor required for compliance with local laws, codes and regulations without extra cost even though the work is not specified herein or indicated on the drawings.

2.2 Drawings

2.2.1 Construction Drawings

The drawings and construction details listed on the ATTACHMENT 1 and referred to in this Specification are, by such reference, made a part hereof. Where a conflict occurs between drawings and specifications, the Contractor shall promptly notify the Owner, the decision of the Owner will govern.

2.2.2 Equipment Supplier Drawings

Equipment supplier drawings listed are representative only to show general appearance, approximate size, and to some extent the degree of assembly required. Final certified drawings and instruction manuals will be supplied to the Contractor.

2.3 Contractor Drawings

2.3.1 Drawings for Approval

Drawings required to be submitted by the Contractor for fabrication work, and any proposed modification shall include all information necessary for design of foundation and for connections to other equipment and for other information requested. Drawings shall be submitted for review.

2.3.2 Approvals

Shop and erection drawings shall be submitted in compliance with this Specification and will be reviewed by Owner and returned to the Contractor in accordance with "Contractor's Data" attached.

2.4 Construction Reference Drawings

The Contractor shall maintain one set of "Approved for Construction" drawing prints, marked up concurrently with red pencil to show any deviations required for field conditions. When requested by Owner, the Contractor shall turn over his marked set of prints, for preparation of "Construction Reference Drawings" by the Owner.

2.5 Examination of Site

The Contractor by examination of the site shall determine whether any obstruction or existing facility creates any difficulty in moving in or maneuvering equipment and transporting or storing of material.

2.6 Protection of Existing Facilities

The Contractor shall protect existing facilities within the work area and shall be responsible for any damage to existing facilities resulting from performance of the work under this Specification. Where work is performed which requires cutting into existing facilities or structures, the work shall be approved by the Owner and shall be done in a manner so as to avoid damage to the surrounding area. Upon completion of the work patching shall be done with materials which match the existing or adjoining work to the satisfaction of the Owner.

2.7 Inspection of Work

The Owner shall at all times have access to the work wherever it is in preparation or progress and facilities for such access and inspection shall be provided. If any work should be covered up without approval or consent of the Owner, it shall be uncovered for inspection if so ordered by the Owner.

2.8 Protection of Work

The Contractor shall be held responsible for the care, protection and condition of all his work and material until final completion and acceptance thereof, and shall be required to make good at his own expense any damage occurring from any cause.

2.9 Plant Site Conditions

2.9.1 Elevation

Plant site is located at approximately 3800 feet above sea level.

2.9.2 Temperature

Minimum	:	16°F
Maximum	:	100°F

Dry bulb: (Design)

Summer	:	98°F
Winter	:	25°F

Wet bulb: (Summer) : 68°F

2.9.3 Precipitation

Rainfall	:	10 inches (average)
Snowfall	:	10 inches (average)

2.9.4 Seismic

Requirements based on Uniform Building Code, Zone 2

2.9.5 Wind Load

Uniform Building Code, Wind Pressure Map

2.10 Lines and Grades

The Owner will establish base lines and level bench marks only. The Contractor shall lay out all work from established base lines and bench marks and shall furnish and place all additional stakes, templates and bench marks necessary for making and maintaining points, lines and elevations. Contractor shall be totally responsible for the accuracy of all lines and grades established by his employees.

2.11 Inspection of Surfaces, Structures and Openings

Existing surfaces and structure elements which will receive work under this Specification shall be inspected and any defects found shall be reported in writing to the Owner prior to proceeding with the affected work covered hereunder. Starting of work implies acceptance of surfaces, structural elements, and structural openings as being adequate for proper installation of the work covered hereunder.

2.12 Named Products and Substitutions

Where products or materials are specified by manufacturers, trade name, or brand, such designations are intended to indicate the quality required, type, utility and finish. Any request for proposed substitution shall include complete specifications and descriptive data to prove the equality of proposed substitutions. Substitutions shall not be made without the written approval of the Owner.

2.13 Manufacturer's Directions

Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as recommended by the manufacturers.

2.14 Workmanship and Single Responsibility

All work shall be performed by skilled, qualified tradesmen working at their trade under experienced supervision. The format of this Specification is for convenience only, and the Contractor is not required to so divide the work, nor is the Owner bound to define the limits of any contract between the Contractor and his employees or between others acting under his direction and control.

2.15 Disposal of Waste Material

Debris and excess materials resulting from construction of the work shall be removed from the area of work and disposed in areas away from the plantsite area or as directed by the Owner.

3. PIPING

Piping shall include furnishing, fabricating and installing complete piping systems as designated herein and the furnishing and installing piping system for equipment installed by Others.

3.1 Piping Systems (Contractor-Furnished)

The Contractor shall furnish all materials and perform all the work required to install the piping systems listed in Scope of Work. Each piping system is identified on the drawings by a symbol. Symbols for the various services are listed on the Piping Legend. The letter designation that follows the symbol and service in the listing identified the applicable Piping Materials Specification.

3.2 General Piping Requirements

Piping shall include furnishing of all materials (except the material furnished by Others as noted in the Specification), fabricating and installing piping system as shown on the drawings and specified herein.

3.2.1 Dimensions

Dimensions shall be verified at the work site and shall be the responsibility of the piping Contractor performing the installation.

3.2.2 Piping Materials

a. General

All piping materials shall be new and shall conform to the requirements specified herein and on the Piping Material Specification forms, Valve Lists and Piping Specialties forms. The use of manufacturer's proprietary names, trade names or catalog designations of particular manufacturers is for the purpose of specifying type, quality, capacity and utility. Equivalent materials of other manufacturers may be supplied subject to Engineer's approval.

b. Steel Pipe

(1) General Requirements

All steel pipe shall conform to the requirements of ANSI B36.10 (ISO R64). Weights and schedule numbers specified herein or on the drawings shall be as defined therein.

(2) Pipe Threads

Unless otherwise specified, all pipe threads shall be standard tapered NPT conforming to ANSI B2.1. Dry-seal, if specified, shall conform to ANSI B2.2.

(3) Buttwelding Ends

Buttwelding ends shall conform to the requirements of ANSI B16.25 and the Welding Section of this Specification.

(4) Socket Welding

Socket welding fittings shall conform to the requirements of ANSI B16.11.

c. Flanges

All steel pipe flanges and steel bodied flanged valves and fittings shall conform to the requirements of ANSI B16.5 for the pound-class specified unless flat faced MSS flanges are specified, and except where flange will mate with flat faced valve or equipment flange. ANSI B16.5 flanges shall not be mated with flat faced flanges. Where steel pipe flanges or steel bodied fitting flanges are to mate with ANSI 125 lb. Class cast iron or flat faced MSS flanges, the flanges shall be ANSI B16.5 flanges with the raised face removed or shall be an equivalent flat faced flange with the same or greater ANSI B16.5 Pressure-Temperature Rating. Cast iron flanged valves and fittings shall conform to the requirements of ANSI B16.1 for the pound-class specified. Brass and bronze flanged valves and fittings shall conform to the requirements of ANSI B16.24 for the pound-class specified. Unless otherwise specified, all flange, fitting and valve threads shall conform to the requirements of ANSI B2.1.

d. Flanged Fittings

Flanged fittings shall conform to the requirements specified above under flanges.

e. Screwed Fittings

Unless otherwise specified, all screwed fittings for steel pipe systems shall be banded malleable iron fittings conforming to the requirements of ANSI B16.3 for the pound-class specified; black if the pipe is black, and galvanized if the pipe is galvanized. Where cast iron fittings are specified, they shall conform to the requirements of ANSI B16.4 for the pound-class specified for such fittings or for the next pound-class heavier than the pound-class specified for steel flanges. Steel couplings shall conform to the requirements of ANSI B16.18 for the pound-class specified for steel flanges. Pipe plugs and bushings shall conform to the dimensional requirements of ANSI B16.14.

f. Butt Welding Fittings

All steel butt welding fittings shall conform to the requirements of ANSI B16.25. Factory made wrought steel butt welding fittings shall conform to the requirements of ANSI B16.9 (ISO R285).

g. Valves

(1) Valve List

The Valve List indicates types of valves required. Finish, rating, size and type of connection of valves shall be as specified in Valve List. Manufacturer of valves shall be as specified in Valve Vendor List. Valves have been assigned identifying tag numbers as shown in Valve List.

(2) Tagging of Valves

Each valve shall be permanently tagged with its valve number. Tag shall also show type of valve packing, if applicable. Contact faces of flanges for valves shall be finished in accordance with MSS Standard Practice SP-6. Valves that require pneumatic, electric or chain operators will be noted on the Piping Drawings.

(3) Requirements

The face-to-face or end-to-end dimensions of all ferrous valves except UL and FM pattern valves, shall conform to the requirements of ASTM B16.10 for the size, type and pound-class specified. All fire water valves and accessories shall be FM or UL pattern unless otherwise specified herein.

h. Gaskets and Bolts

Gaskets and bolts shall be as specified on material specifications.

3.2.3 Storage, Handling and Distribution of Materials.

Storage and handling shall be Contractor's responsibility and shall be performed in a manner to prevent damage to pipe, fittings, fixtures and equipment, including coatings, identification markings and tags. All materials shall be protected from the weather and foreign matter until acceptance of the installation.

3.3 Carbon Steel Piping

3.3.1 Fabrication

a. General

All steel piping fabrication shall conform to the requirements of applicable sections of the ANSI B31 Pressure Piping Code, and to the requirements specified herein and on the piping drawings. All welding for both pipe and pipe supports shall conform to the requirements of "Welding" in this Specification.

b. Layout, Cutting and Fitting Up

Layout, cutting and fitting shall be performed in such a manner that accurate cutting and proper fitup is obtained and that fitting of components into final position during installation can be accomplished without alteration or improper straining of piping components. All cutting shall be by cutting tools or by sawing or other Engineer approved means. All burrs and irregularities shall be removed by filing or grinding.

c. Templates

Templates shall be used for laying out details such as headers, miters and fabricated laterals. All cutting shall conform to outline of the template.

d. Bevels

Bevels for forming welding grooves shall be by machine cutting; or by smooth, clean, slag-free flame-cut beveling. Butt welding end preparation and bevels shall conform to the dimensional requirements of ANSI B16.25.

e. Spacers

Spacers shall be used during fitting-up of details preparatory to final welding. To obtain proper gap and root openings for full penetration welds, spacers shall be used during the welding and shall be removed after tack welding is completed. Only small tack welds which penetrate to the bottom of the welding groove and shall be used; such tack welds may become part of the finished weld. Tack welds that are too large and fill the welding groove, that lack penetration, or that are otherwise defective, shall be chipped out.

f. Back-Up Rings

Permanent welded-in type back-up strips and rings that remain in place after welding shall not be used, except where permanent welded-in back-up rings are specified on the Piping Material Specification and are absolutely necessary and approved by the Engineer.

g. Alignment and Weight Change

Alignment between adjacent pipe lengths shall be such as to minimize the offset between surfaces of the abutting pipe ends. For pipe of the same diameter and the same nominal wall thickness, offset shall not exceed 1/16-inch. For abutting pipes of different nominal wall thicknesses, the pipe shall be centered such that offset will be equal around the entire circumference of the pipe, and the heavier walled pipe shall be reamed at 30° maximum angle to match the lighter walled pipe.

h. Bending

Completed steel pipe bends shall be full area, free from wrinkles, buckles, corrugations, thin spots and flat spots, and shall be true to dimensions. Bends shall be completed prior to beveling, flanging or cutting to length. Minimum tangent length for pipe bends shall best be suited for the type joint and shall be of a length suitable for aligning and joining to adjacent pipe. A minimum tangent length of not less than the nominal pipe diameter is preferred. Bending shall be by cold bending or hot bending.

(1) Cold Bending

Steel pipe bends fabricated by cold bending to a radius of less than five times the nominal pipe diameter shall be stress relieved. Stress relieving of bends shall be performed by uniformly heating to $1200^{\circ}F$, holding at this temperature, and then slow cooling in still air. Bends shall be held at the stress relieving temperature for a period proportioned at the rate of one hour per inch of wall thickness. Stress relieving of bends fabricated by cold bending to a radius of five times the nominal pipe diameter or larger will not be required. Material for cold bending shall be ASTM A53, Grade A, or ASTM A106, Grade A.

(2) Hot Bending

Hot bending of steel pipe shall be done at a temperature between 1200°F and 1600°F with the pipe filled with tamped sand. Following bending, bend shall be allowed to cool slowly in still air before the sand is removed.

i. Welding

All welding on pipe shall be by the metallic arc process.

(1) Qualification of Welders

All welders for work covered by this Specification shall be qualified (by testing) in accordance with the requirements of ANSI B31.3.0, ANSI B31.1.0 and ASME Boiler Construction Code, Section IX and shall have certificates that are current.

(2) Position

The welding shall be performed with the pipe in the horizontal rolled, horizontal fixed and vertical fixed positions, thus involving the application of the weld in the flat, vertical, overhead and horizontal positions. The entire root bead shall be made with the pipe in a stationary position.

(3) Preparation of Base Material

The edges of surfaces of the parts to be joined by welding shall be prepared by machining, flame cutting, chipping, grinding or a combination of these.

(4) Preheating

No welding shall be performed when the edges to be joined are below a temperature of 32°F. When such conditions exist, it shall be necessary to preheat to a temperature of at least 70°F. Welded joints in carbon steel having a carbon content in excess of 0.35 percent with a nominal pipe wall thickness of ½-inch or greater shall be preheated adjacent to the welding zone to a temperature of not less than 400°F. Preheating may be accomplished by any suitable method providing that preheating is uniform and that the temperature is maintained during the actual welding operation. When resistance or induction heat is used, current shall be discontinued during actual time that welding is taken place. The minimum preheat temperature shall be maintained during deposition time. If the joint is not completed at one time, it shall be reheated to the required temperature before welding is started again. Brazing shall not be used for attaching thermocouples.

(5) Welding Process

The welding technique, number of beads, sequence and the diameter of electrode for each bend shall be submitted by the Contractor and approved by the Engineer.

The welding beads shall be deposited in a manner that will assure proper penetration and fusion of the base material. Each bead deposited shall be thoroughly cleaned and all slag or flux remaining on any bead of welding shall be removed before depositing the next successive bead. Any cracks or blowholes that appear on the surface of any bead shall be removed by chipping or grinding before depositing the next successive bead of welding.

The weld root pass shall be with the 1/8-inch diameter or smaller electrodes and the electrode size shall be increased as the welding groove is filled up.

The welding may be interrupted provided the following sequence of operations is adhered to:

At least one-half of the thickness of the pipe wall has been welded.

Where preheating is being used, heating may be shut off and the joint heavily wrapped with asbestos blanket and allowed to cool slowly to ambient temperature.

To proceed with the welding, the pipe shall be preheated to 400°F.

Stress relieving may be performed immediately after the completion of the welding or the heater may be shut off and the welded area heavily wrapped with asbestos blanket and allowed to cool slowly to ambient temperature. Stress relieving shall be performed in accordance with the applicable code.

(6) Weld Inspection

All welding performed under this Specification shall be given a visual inspection. One or more of the following defects shall be cause for rejection of the defective portion of the weld.

The presence of porosity, slag inclusions or overlaps

Lack of fusion

Oxidation around welds

Cracks

Cold lapping

Evidence of peening

Undercutting adjacent to completed weld or evidence or removal of undercutting by grinding or polishing

Welds not reasonably uniform in appearance

Failure to meet required tests

Welding performed by unqualified personnel

(7) Repair of Defects

Defects in the metallic arc weld shall be removed by chipping, grinding, flame gouging or air arc until sound metal is reached. The resulting cavity shall be rewelded employing the same procedure as required for the original weld. Peening shall not be employed to alter the quality of a weld deposit. Welding performed by unqualified personnel shall be brought to the attention of the Engineer for his disposition.

3.3.2 Installation of Carbon Steel Piping Systems (Above Ground)

All materials and equipment shall be fabricated into a complete, operating system or systems and all apparatus, parts, materials, and accessories which are necessary to accomplish this result shall be furnished and installed. All piping shall follow the general arrangement shown on the drawings.

Piping shall be installed without springing or forcing, except where indicated on the drawings. The methods and workmanship of the installation shall be in accordance with ANSI B31.3, ANSI B31.1 and ASME Code Section 1. Piping shall be kept clean and free of foreign materials, both inside and outside. Open ends shall be plugged at all times during installation. Installation of piping shall be in accordance with all applicable codes governing the type of materials or the piping system.

Where lines installed by Contractor require making closure to lines being installed concurrently by Others, the Contractor shall make the interface or final closure as directed by the Engineer.

a. Provision for Expansion and Contraction

Provision for expansion and contraction of pipelines shall be made by expansion bends, offsets, swing joints or expansion joints as indicated on the drawings and approved by the Engineer.

b. Unions or Flanges

Unions or flanges shall be provided as indicated on drawings and where necessary to facilitate dismantling the piping, valves and equipment. Each valved branch connection from a main supply line shall have a union or flanges on the branch side of the valve.

c. Bolt Stresses

The stresses applied to studs or bolts in the assembly of flanged connections or pipe hangers shall provide a reasonable factor of safety over the yield point of the stud or bolt material and assure a tight joint.

d. Anchoring, Guiding and Supporting Piping

All piping shall be anchored and supported in accordance with ANSI B31.3 and ANSI B31.1 in a manner that expansion and contraction and operating reaction shall take place without damage to the pipelines. Vibration shall be minimized by use of vibration dampeners. Undue strains on connections to equipment served shall be prevented. Wall brackets may be used where pipes are adjacent to walls or other vertical surfaces which may be used for supports. Supports shall be installed to carry adequately the weight of the lines and maintain proper alignment. Pipe guides and anchors shall be provided at points where necessary to keep pipes in accurate alignment, to direct the expansion movement and to prevent buckling, swaying or undue strain.

(1) Pipe Hangers

All pipe hangers, supports, stanchions and anchors required shall be furnished, unless otherwise noted, and shall be installed by the Contractor. Some of the support requirements are shown and detailed on the drawings. Hangers, supports, stanchions and anchors which are necessary but not located or detailed on the drawings shall conform to MSS Standard Practice SP-69 or pipe manufacturer's recommendations and shall be furnished and located by the Contractor at spacings not in excess of those indicated on Table I.

TABLE I

PIPE SIZE IN INCHES	HORIZONTAL SPAN IN FEET BETWEEN STEEL-PIPE SUPPORT CENTER LINES	
	Water Service	Steam or Air Service
1	7	9
2	10	13
3	12	15
4	14	17
6	17	21
8	19	24
10	22	27
12	23	30
14	25	32
16	27	35

(2) Temporary Supports

Adequate temporary supports shall be installed during erection and during hydrostatic testing of compressible fluid piping so as not to overstress piping or equipment to which piping is connected. Perforated strap or strip steel is not acceptable. Temporary supports shall be removed after permanent supports have been installed. Temporary supports that have been welded to the pipe shall be removed by grinding smooth to the outside surface of the pipe.

e. Flanged Connections

Flanged piping connections to vessels or equipment shall be perfectly aligned and shall be properly fitted before bolting up. Piping may be heated to bring it into alignment only when approved by the Engineer who will determine if heating is permissible for the particular conditions. However, heating of vessels or nozzles on vessels or equipment will not be permitted. Extreme care shall be exercised to avoid damage, especially where connections are made to nonferrous vessels or equipment. Flanges shall be installed with the bolt holes straddling the pipe centerline unless otherwise indicated in the piping arrangements and equipment drawings.

f. Cold Springing for Fitup

No cold springing for fitup (as distinguished from intentional cold spring called for on drawings) shall not be done except in the presence of the Engineer who will approve all operations.

g. Protection of Flange Faces and Pipe Threads

Care shall be taken to protect flange faces and pipe threads during erection. Flange faces shall be clean and free from foreign matter before assembly. Damaged flange faces may be dressed with a medium cut file if the damage is not sufficient to require new facing. Damaged flange faces shall be refaced by machining or discarded if necessary.

h. Joining Pipe

(1) Screwed Joints

For making up screwed joints in metal pipe and fittings, cylinder oil and graphite or graphite pipe-joint compound, unless indicated otherwise on Piping Material Specifications, shall be used and shall be applied to the male threads only. Screwed joints in plastic shall be made up with the joint compound recommended by the pipe manufacturer. Piping shall be free from fins and burrs. Pipe ends shall be reamed or filed out to size of bore and all chips shall be removed. Screwed flanges shall not be screwed on the pipe beyond the flange face. No lead shall be allowed in threading compound used on domestic water lines.

(2) Welded

For making-up welded joints, the welding shall be performed by the manual shielded metallic arc process in accordance with the requirements specified herein. No stress relieving or radiographic inspection of welds will be required, unless required by code and directed by the Engineer.

(3) Bolted

For making-up flanged joints, flange bolts, bolt-studs and nuts with gaskets shall be used. The initial bolt stresses to be applied in the assembly of flanged joints shall afford a reasonable factor of safety with reference to the yield point of the bolting material and shall be sufficiently high to assure a tight joint.

i. Valves

Valves shall be installed, as indicated on the drawings, in positions accessible for operations and repair.

j. Piping Specialties

All piping specialties shall be installed at locations shown on the drawings and in accordance with the manufacturer's installation recommendations.

3.4 Test and Inspection After Installation

3.4.1 General

Piping shall be tested prior to installation of instruments and before insulation; however, if it is not practicable to perform testing prior to installation of instruments, it shall be the Contractor's responsibility to remove instruments and plug or seal instrument connection, so tests can be performed and to reinstall such instruments after testing.

The Contractor shall test all final closures where pipe lines connect to lines installed by Others. Testing of final closures shall be performed as directed by the Engineer, and coordinated with other Contractor's as required.

3.4.2 Preparation for Pipe Testing

All orifice plates shall be removed from the orifice flanges. All control valves shall be removed or screen protected during flushout of piping system prior to testing.

Pump suction start-up screens of a design approved by the Engineer shall be installed on suction side of pumps prior to flushout and testing. All instrument shut-off valves for pressure gages, pressure transmitters and the like shall be closed prior to flushout or pressure testing of piping system. Prior to testing, hermetically sealed type pressure gages and transmitter removed from the piping systems and the flanged connection point shall be sealed off by means of suitably gasketed blind flanges. Temperature sensing points shall be fitted with their designated thermowells or the couplings shall be suitably plugged prior to testing. After testing has been completed, all instruments which were removed for testing purposes shall be reinstalled and start-up screens removed.

3.4.3 Test Pressure and Test Medium

a. Pressures

The piping systems shall be pressure tested at the pressures indicated on the individual material specifications sheets. All pressures so indicated are referenced to the lowest point in the line or system under test.

b. Media

(1) Water, Steam and Slurry Piping

Piping shall be hydro-tested using clean water as the test medium. Temperature of water used for testing shall not exceed 100°F, the Contractor shall make adequate provisions to prevent freeze-ups. When tests are completed the lines shall be completely drained and remaining moisture blown out with air.

(2) Lube Oil Piping

Piping shall be tested at the specified pressure either with water or with an approved hydrocarbon oil, providing that the flash point is over 120°F and the freezing point is at least 25°F lower than minimum ambient temperature. If water is used, the above requirements for water piping shall apply except that the air used for blowing out oil lines shall be dry bottled air, and the drying out shall be continued until no moisture is detected in the expelled air.

(3) Hydrogen, Air Piping and Natural Gas

Piping shall be tested only with the test media indicated on the applicable piping materials specifications sheets. Contractor's attention is called to the fact that the test pressures indicated on the piping materials specifications sheets are applicable only to the type of medium specified.

3.4.4 Testing Procedures

a. Hydrostatic

During initial liquid filling of piping, care shall be taken to expell all air from the lines. Lines shall be filled slowly, with all high points properly vented, until steady liquid flow has been observed at all such vents.

When steady liquid flow has been observed at each vent, the vent shall be closed and the pressure slowly raised to full test pressure. When specified test pressure has been attained, such pressure shall be maintained for not less than two (2) hours plus the time required to visually inspect all piping for leaks. After visual inspection at full specified test pressure, the line pressure shall be slowly reduced to specified maximum operating pressure and shall be maintained at this pressure for a

minimum of 24 hours during which all inflow into the piping system shall be carefully metered. All such inflow shall be deemed "leakage". Such leakage shall not exceed 0.2 gal/psi/24 hours/mile/inch diameter of the pipe. All defects which develop during testing shall then be retested until no defect or unsatisfactory leakage can be detected.

b. Pneumatic

Pressure shall be slowly raised to preliminary test pressure not greater than 25 psig to locate any major leaks. After all leaks detectable at this preliminary test pressure have been corrected, the pressure shall be slowly raised in steps, not greater than 25 psig until specified test pressure is attained. Pressure shall be held at each step for a minimum of 10 minutes to allow the system to equalize strains and to allow for detection of major defects. After full specified pneumatic test pressure has been attained, each joint, valve packing, etc. shall be soap tested for air leaks, and all such leaks shall be properly corrected to the satisfaction of the Engineer.

3.4.5 Cleaning and Disinfection

a. Cleaning

All pressure piping shall be thoroughly cleaned prior to placing the piping in use or connecting the piping to equipment. Cleaning shall be accomplished by blowing out with compressed air or flushing with water and chemicals to remove all foreign or loose materials and leave piping in a clean condition. The exterior of all piping shall be free from materials deleterious to the application of pip coverings or painting.

b. Disinfection

After successful hydrostatic testing, all new domestic water piping shall be thoroughly disinfected with a chlorinated solution containing not less than 50 parts chlorine per million parts water, held for a minimum of eight hours under a head of not less than five feet above the highest point in the line. After completion of the retention time, all disinfected lines shall be thoroughly flushed with potable water until residual chlorine is approximately but not more than 0.2 parts per million. During flushing, solution and water shall be conducted to a suitable area away from excavations and structures, or to a suitable drain.

3.5 Penetration Through Wall, Ceilings, Floors and Roof

3.5.1 Pipe

Pipe sleeves shall be provided where pipes pass through masonry or concrete walls, floors, roofs and partitions. Pipe sleeves shall either be as shown on construction details or be painted steel pipe sleeves in outside walls below grade, in floor or in roof slabs unless otherwise indicated. Sleeves in partitions shall be painted sheet steel of 26 USS gage minimum. Space between pipe, tubing or insulation and the sleeve shall not be less than ¼ inch. Sleeves shall be of sufficient length to pass through entire thickness of walls, partitions or slabs. The Contractor shall be responsible for all closure of pipe penetrations at any walls, roofs or slabs.

3.5.2 Floor, Wall and Ceiling Plates

The pipe at sleeves in buildings shall be fitted with floor, wall and ceiling plates, be one-piece pattern, and be held to the pipes by set screws. Plates shall be painted cast or malleable iron.

3.5.3 Flashing for Buildings

Where pipes pass through building roofs and outside walls, proper flashing shall be provided and shall be made tight and waterproof.

ATTACHMENT I

CONSTRUCTION DRAWING LIST

Drawing No.	Revision	Title
23316-100-P	0	Piping Legend & General Notes
25222-100-P	B	General Plant Water System Diagram
23346-100-P	A	Water Treatment System P&ID Sheet 1
23347-100-P	A	Water Treatment System P&ID Sheet 2
25348-100-P	B	General Arrangement
25349-100-P	0	Washdown Transfer Sump Piping Plan & Sections
25350-100-P		Washdown & Clarified Water Piping Plan
25351-100-P		Washdown & Clarified Water Piping Section
25352-100-P		Washdown & Clarified Water Piping Details
25353-100-P	A	Bedding Sumps Miscellaneous Details
23317-302-P	B	Ore Unloading & Bedding Area P&ID
23321-302-P	0	Piping Plan, Lower Level
23322-302-P	0	Piping Plan, Upper Level
23323-302-P	0	Washdown Sump Pumps Piping Plan & Sections
23324-302-P	0	Piping Sections
23325-302-P	0	Miscellaneous Details
23326-302-P	0	Bedding Plant Piping Plan
23327-302-P	0	Bedding Plant Piping Section
23328-302-P	B	Bedding Plant Piping Section & Details
25223-302-P	0	Delivery Conveyor Washdown Piping
25224-302-P	A	Front End Loader Washdown
25225-302-P	A	Dust Collector Piping

ATTACHMENT I

CONSTRUCTION DRAWING LIST

Drawing No.	Revision	Title
25355-302-P	A	Reclaim Area Washdown Piping Plan & Section
23318-512-P	B	Sintering Plant P&ID
23330-512-P	B	General Piping Plan
23331-512-P	B	Sinter Machine Piping Plan Sheet 1
23332-512-P	B	Sinter Machine Piping Plan Sheet 2
23333-512-P	B	Sinter Machine Piping Sections
23334-512-P	0	Sinter Machine Piping Section & Details
23335-512-P	0	Direct Charge Dust Suppression Piping
23337-512-P	B	Corrugated & Smooth Roll Crusher, Ross Rolls & Sinter Bins Piping Plan
23338-512-P	B	Piping Sections
23341-512-P	B	Pellet Drum & Mixer Piping Plan
23342-512-P	B	Pellet Drum & Mixer Piping Section
23345-512-P	B	Spiked Roll Crusher & Washdown Water Return Piping Plan & Section
25221-512-P	B	Storage Tank Spray System Piping Plan & Section

ATTACHMENT II

EQUIPMENT DRAWINGS

Drawing No.	Title
McLanahan Corp. Equipt. No. 51216	
P-12-D7	General Arrangement
P-2-E2	Parts List & Assembly
Sale, Inc. Equipt. No. 51217	
D-7686	General Assembly, Spraying System
11816	Slope Jet Nozzles
D-7535	General Arrangement
C-7613	General Assembly System Installation
McDowell Wellman Equipt. No. 51230	
M-152744	Breaker Shaft Arrangement
M-152745	Breaker Shaft Details
M-152801	Water Cooled Heat Shield
M-152802	Ignition Furnace Schematic
M-152803	Ignition Furance Piping Arrangement
M-152804	Ignition Furnace Piping Details
McLanahan Corp. Equipt. No. 51236	
4-E-14	General Arrangement
P-1E-45	General Arrangement & Parts List