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HW-77803

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DESIGN BASES,

BAUXITE-SULFURIC ACID FEED FACILITIES
100-K AREA

by

E. I. Etheridge
Plant Design Unit
Design Engineering Subsection
FACILITIES ENGINEERING SECTION

June 10, 1963

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DESIGN BASES
HAUXITE-SULFURIC ACID FEED FACILITIES
100-K AREA

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100-K AREA

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JUN 16 1965

DESIGN BASES, REVISION 2
BAUXITE-SULFURIC ACID FEED FACILITIES
100-K AREA

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DESIGN BASES

BAUXITE-SULFURIC ACID FEED FACILITIES
100-K AREA

1.0 INTRODUCTION

The following criteria delineate the objective, bases, and functional requirements that shall govern the preparation of detail design of the bauxite-sulfuric acid feed facilities to be installed in the 183-KE and KW Buildings. These facilities will produce the chemical coagulant used in the treatment of Columbia River water in the water plants and thus replace the existing liquid alum feed systems used for this purpose.

2.0 OBJECTIVE

The objective of this document is to define the operational and technical requirements of the new process and to outline the functional requirements of the proposed facilities for the purpose of detail design. The criteria below define the requirements for a single K Area water plant. Unless otherwise stated they shall apply for both K Area water plants.

3.0 BASIC WATER TREATMENT REQUIREMENTS AND CONSIDERATIONS

3.1 General

Chemical treatment of Columbia River water is necessary prior to using it as reactor coolant to control (1) corrosion of reactor aluminum components; (2) film buildup on heat transfer surfaces in the reactor which might otherwise restrict coolant flow or heat transfer; and (3) radioisotope types and concentrations discharged to the river by the reactor coolant effluent. Any interruption or deviation of the prescribed chemical treatment of the water may adversely affect these conditions, and thus the efficient operation of the reactors.

3.2 Water Plant Flow

3.2.1 Normal

The maximum raw water flow at the 183 building headhouse during normal operation is 232,000 gpm. This flow is equally supplied between two 60-inch influent raw water headers entering the 183 building headhouse. Each influent header supplies one-half of the K water treatment plant.

3.2.2 Shutdown

The minimum raw water flow at the 183 building headhouse during reactor outages is 15,000 gpm. This flow is supplied through either influent header.

3.3 Chemical Coagulant

Hydrated aluminum sulfate is the standard water treatment coagulant of the K Reactors' water plants. It is continuously introduced, at varying feed rates of a few parts per million by weight of the raw water flow, into the two 60-inch influent raw water headers at the 183 Building headhouse. The hydrated aluminum sulfate is uniformly mixed with the raw water by the turbulent flow in the headers before the raw water is discharged into the influent distribution flumes of the sedimentation basins. The current feed rate is 18 ppm and is constant throughout the year. This feed rate (18 ppm) shall be called the design feed rate for the new facilities. However, feeding from 3 to 25 ppm shall be possible for all possible water plant flows. The chemical formula of the hydrated aluminum sulfate shall be $\text{Al}_2 (\text{SO}_4)_3 \cdot 15\text{H}_2\text{O}$.

3.4 pH Control

The pH of reactor process water may vary between the range of 6.6 and 7.0. The pH is currently controlled at 6.6 ± 0.1 referred to 10 degrees centigrade. Acidity is added to the basic raw water by the hydrated aluminum sulfate feed and is supplemented by feeding commercial grade, 93 w/o sulfuric acid. Supplemental acid feed is introduced at the flash mixers of the influent distribution flumes of the sedimentation basins.

4.0 BAUXITE-SULFURIC ACID FEED PROCESS REQUIREMENTS AND CONSIDERATIONS

4.1 General

The production of hydrated aluminum sulfate by the reaction of crude bauxite ore and sulfuric acid on a continuous flow basis for usage in water treatment differs from commercial hydrated aluminum sulfate production practices. While the reactants are continuously fed into the reaction vessel, the product, hydrated aluminum sulfate, unreacted solids, excess acid, and water, are continuously removed from the reaction vessel, diluted with cold water, and introduced into the raw water headers. Since sulfuric acid is utilized to regulate the pH of the treated water, an excess of acid is permissible in the bauxite reaction without incurring an economic loss. By providing excess acid in the reaction vessel and violently agitating the reaction, the reaction time and reaction vessel size (geometry) can be reduced considerably from that normally employed in commercial aluminum sulfate plants. In addition, by optimizing the reactant feed ratios and reaction temperatures, high conversion yields are realized.

4.2 Chemical Reaction

The chemical reaction of bauxite (aluminum oxide) and sulfuric acid is $3 \text{H}_2\text{SO}_4 + \text{Al}_2 \text{O}_3 \rightarrow \text{Al}_2 (\text{SO}_4)_3 + 3 \text{H}_2\text{O}$. For the reaction to be started, relatively high temperatures, 240-270 F, must be attained. Heat is provided for the reaction by feeding water to the chemicals and utilizing the heat of dilution from the mixing of water with sulfuric acid. The reaction, bauxite and sulfuric acid, is exothermic, giving off approximately 37,500 BTU's per pound mole of H_2SO_4 feed.

At steady state, the boiling point of the solution in the reaction vessel is reached and the temperature of the reaction becomes stabilized. Steam is evolved from the reaction, thus creating an off-gas problem. Variations in the chemical feed ratios, incomplete chemical mixing, reaction vessel hold-up time, and buildup of unreacted solids in the reaction vessel will cause the reaction temperature to change and affect the product yield of the reaction. Thus, monitoring the reaction temperature provides an effective means for controlling the reaction.

4.3 Process Parameters

The following parameters shall be used in equipment sizing and design of the new facilities.

4.3.1 Bauxite Feed

Bauxite shall be fed at the ratio of 8.9 pounds per gallon of 93 w/o sulfuric acid feed. The bauxite ore shall be slurried with water prior to introduction into the reaction vessel. Chemical and screen analyses of the bauxite ore supplied for IPD water treatment use are listed in the Appendix.

4.3.2 Sulfuric Acid Feed

Commercial grade, 93 w/o concentration sulfuric acid shall be utilized for the process. The sulfuric acid shall be fed directly into the reaction vessel. Consideration shall also be taken in the design for feeding 99 w/o concentration sulfuric acid during the summer months.

4.3.3 Water Feed

Water shall be supplied to the reaction at the ratio of one gallon per gallon of 93 w/o concentration sulfuric acid feed. This water feed shall be utilized in preparing the bauxite slurry and in providing steam agitation in the reaction vessel. Plant service water and steam currently available in the 183 building shall be utilized.

4.3.4 Reaction Hold-Up Time

The reaction hold-up time in the vessels for 18 ppm hydrated aluminum sulfate feed and 232,000 gpm shall be four minutes.

4.3.5 Product Yield

Conversion of the available aluminum oxide into aluminum sulfate shall be a minimum of 90 per cent.

4.3.6 Reaction Temperature

Calculated reaction temperature range for the above feed ratios and product yield is 250-275 F.

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5.0 FUNCTIONAL REQUIREMENTS

5.1 General

This section defines the functional requirements of new equipment for the bauxite-sulfuric acid feed process, and modifications to be made to the 183 Building and existing water treatment systems to install the facility.

5.2 Bauxite Storage

5.2.1 Storage Silos

Outdoor storage shall be provided at the 183 Building for storing bauxite ore. Two alternate storage silo arrangements together with pneumatic conveyor systems shall be evaluated for their operational safety and economic merits. Final selection shall be made after these merits have been determined.

5.2.1.1 Arrangement 1 - New Silos

Two carbon steel silos complete with concrete foundations shall be installed in the available space between the chlorine car building and headhouse, adjacent to the rail siding. The silos shall be approximately 16 feet in diameter and 32 feet high and have a minimum combined bauxite storage capacity of 480,000 pounds. Conveyor equipment for unloading covered hopper railcars to the silos, and from the silos to the feed bin inside of the 183 Building headhouse, shall be located on the north side of the rail siding.

5.2.1.2 Arrangement 2 - Relocated Excess C Area Silo

An excess dry storage silo located at the 183-C Building shall be dismantled, moved and installed on concrete foundations at the 183-K Building in the available space between the existing liquid alum storage tanks and sulfuric acid storage tanks south of the rail siding. The C Area silo is 24-feet in diameter and 40 feet high and has a bauxite storage capacity of 850,000 pounds. The new conveyor equipment for unloading covered hopper railcars to the silo, and from the silo to the feed bin inside the 183 Building, shall be located on the south side of the rail siding. Conveyor piping to the feed bin in the 183 Building may be run either over or under the railroad track.

5.2.1.3 Silo Accessories

Bag filter vents shall be provided for the storage silos to control bauxite dust when filling the silos.

The vent size and capacity shall be determined from the air flow of the conveyor system. The dust loading capacity of the filters shall be adequate to permit unloading one rail hopper car into the silo without reducing the capacity of the conveyor system before filter clean-out is required. The vents shall be provided with manual shakers for clean-out of the bag filters.

Vibrators shall be installed on the sides of the conical bottoms of the storage silos. The controls of the vibrators shall be intertied with the control of the conveyor system, so that when a silo is being loaded or unloaded, the vibrator of the silo is in operation. Manual override controls shall also be provided.

The silos shall be provided with visual bin level indicators.

5.2.2 Conveyor System

A pneumatic conveyor system shall be provided for unloading bauxite ore from covered hopper railcars on the rail siding to the storage silos and moving the bauxite ore from the storage silos to the feed bin inside the 183 Building; movement to the feed bin shall be intermittent. The conveyor system shall be rated for an unloading capacity of 10 tons per hour. The feed capacity to the feed bin is not as important, but it shall be of similar magnitude as the unloading capacity. Consideration shall be given to utilizing a combination air-stream conveyor system where suction pressure is used to unload the bauxite ore from the hopper car to the receiver (cyclone separator) and blower. At the receiver, the conveyor system changes over to a positive pressure system to move the bauxite to the storage silos. For supplying bauxite to the feed bin from the storage silos, a positive pressure is utilized, with the storage silo feed gates located in the conveyor pipe run from the blower to the feed bin. With this arrangement, the blower and receiver may be located on ground level. A closed system, whereby the air is recirculated for use, is not required. The intake hopper for attaching to the covered hopper cars, piping, feed gates, diversion gates, and shutoff gates of the system shall be included in the vendor package. The intake hopper shall be fabricated from light metal to facilitate handling. The diversion gates and shut-off gates in the system shall be automatically controlled. The storage silo feed gates shall be manually controlled. Filters shall be provided at the receiver to protect the blower. The blower shall be driven by electrical power. The electrical motor and wiring of the system shall be explosion proof. Controls for the system shall be mounted on a panel located at the blower and receiver. On-off

controls shall be provided at bauxite system control panel-board inside the 183 Building.

The blower and receiver shall be installed on a concrete pad with minimum metal housing provided for weather protection.

5.2.3 183 Building Bauxite Feed Bin

The bauxite feed bin for the system shall be provided by converting an existing carbon steel, open top, liquid solution storage tank, T-6, in the 183 Building. The tank shall be modified by installing an air-tight cover on the vessel, raising the tank approximately 6 feet from its present elevation, and replacing the flat bottom with a conical bottom having two hopper feed outlets. The bin shall be supported by structural steel legs to permit access beneath the bin. The feed bin shall provide approximately 100,000 pounds of bauxite storage.

An access manhole shall be provided in the side of the feed bin, with ladder rungs installed on the inside of the bin. A bag filter vent shall be installed on the top of the feed bin, with the exhaust air to be vented outside and above the roof of the building. Size of the vent shall be determined from the air flow of the pneumatic conveyor system. A manual shaker shall be provided for clean-out of the vent filters. Two continuous service vibrators shall be provided on the feed outlets of the feed bin. The vibrator shall be electric powered with the on-off switches located at the vibrators. A visual bin level indicator shall be provided. Manual operated shut-off gates shall be provided at the feed outlets.

5.3 183 Building Modifications

To provide space in the 183 Building to install the proposed bauxite feed system, the existing liquid solution storage tank, T-5, shall be dismantled and removed from the building. Liquid storage tank, T-6, shall be converted to a bauxite feed bin (Section 5.2.3). The existing concrete support piers and piping of these tanks shall be removed. The existing discharge piping and pumps of the remaining solution tanks shall be relocated as required for necessary additional space. The tank openings in the first floor of the building shall be covered with steel grating. The grating flooring shall support a live load limit of 100 pounds per square foot.

5.4 Bauxite Feed and Slurry Mix

Flow of bauxite feed material from the feed bin to the slurry mix tank shall be regulated by a screw-type dry feeder machine. Two feeders shall be provided, with one feeder serving as an operational spare. The feeders shall be located beneath the feed bin in such a manner that both machines can feed into the single slurry tank. The feeders shall have an adjustable feed rate from 0 to 750 pounds per

hour of bauxite material. Variation in the feed rates from 300 to 750 pounds per hour shall be less than ± 5 per cent, and below 300 pounds per hour ± 10 per cent. The feeders shall be fabricated from mild carbon steel material, with the feed stream totally enclosed for dust control. Controls of the feeders shall be located at the system control panel of the system.

The slurry mix tank for the system shall have a minimum hold-up capacity of two hours slurry feed. The tank shall be mild carbon steel and shall have a removable transparent plastic cover. A mechanical mixer shall be provided for mixing the bauxite and water slurry in the tank. Slurry feed to the reaction vessels from the slurry tank shall be through a metering pump or a centrifugal pump and rotameter. Because of the small flow rate, consideration shall be given to recirculating a portion of the pump discharge flow rate. Two pumps shall be provided, with one pump serving as an operational spare. Pump controls shall be located at the system control panel.

5.5 Reactor Vessels and Tie-Ins

The production of hydrated aluminum sulfate in this process shall be performed in two parallel reaction vessels. Location of the vessels shall be immediately adjacent to the slurry mix tank. Each reaction vessel shall supply hydrated aluminum sulfate for one-half of the water plant during normal operation. Provisions shall be made, however, to allow removal of either reaction vessel from service and to produce and supply hydrated aluminum sulfate for all of the water plant from the other reaction vessel in service. The feed and discharge piping of the reaction vessels and the control equipment shall be sized for these conditions.

The reaction vessels proposed for the system shall be glass-lined carbon steel vessels (SK-1-2355). The vessels shall be of the type in which the glass lining is fused directly to the surface of the carbon steel shell. The vessel size shall be from 20 to 30 gallon capacity, contingent upon the vessel manufacturers' standard size. The vessels shall be equipped with clamp-on glass-lined cover lids and shall be rated for a maximum internal working pressure of 25 psig.

A tentative number, size, and location of nozzles to be provided for the vessels are shown on SK-1-2355. Consideration shall be given to the possible reduction of number and sizes of nozzles for the vessels. A baffle arrangement shall be installed in the vessel in front of the product outlet nozzle to prevent direct channeling of the feed materials to the product nozzle. The baffle may be part of the vessel or may be removable. Temperature sensing elements shall be provided in the reaction vessels for monitoring the reaction temperature. The temperatures shall be indicated at the system control panel and recorded in the main control room of the 183 Building.

Tie-in of the feed and discharge lines to the vessels shall be made through short glass-lined pipe stubs. Corrosion resistant check valves shall be provided for the feed lines at the tie-ins to prevent corrosion in the feed lines from off-gases generated in the vessels

during inadvertent feed stoppages. The connection of the water eductors to the product outlet nozzles shall be made as close to the vessels as practicable. The eductor serves two purposes. It provides suction pressure for withdrawing the product solution from the vessel and provides dilution water for cooling the solution and preventing crystallization of the aluminum sulfate in the piping. It is imperative that the product solution be diluted as close to the reaction vessels as practicable before the concentrated solution begins to cool.

Special valves shall be provided at the drain nozzles of the vessels. These valves shall be a combination flush and diffuser glass-lined valve. The diffuser portion of the valve shall be utilized to admit steam to the vessel for agitating the reaction. Steam flow for agitation shall be approximately 50 cfm. Regulation of the steam flow shall be at the control panel. The flush function of the valves shall be utilized for draining the vessels to a common sump pit to be provided for the system. A sump pump shall be provided to transfer the drainage from the sump pit to the existing neutralizing pit in the 183 Building for final disposal. Controls of the pump shall be located at the sump pit.

Special spray rinse valves shall be installed in the central nozzles in the cover lids of the reactor vessels. These valves shall be utilized to periodically wash down with hot water and steam the crud and insoluble materials that have accumulated on the interior surfaces of the reaction vessels. To protect the vessel linings against thermal shock, the hot water and steam supply system shall be designed so that it will be impossible to admit cold water (less than 120 F) into the reaction vessel. The valves shall be sized for an approximate 3-8 gpm of water flow rate.

5.6 Sulfuric Acid Feed

Sulfuric acid for the system shall be supplied from the existing constant head feed tank of the concentrated sulfuric acid system in the 183 Building. Acid flow from the head tank to the reaction vessels shall be by gravity. The acid feed line shall be routed from the constant head tank to the control panel, where the acid feed shall be metered through rotameters and thence to the reaction vessels. A strainer shall be installed in the feed lines upstream of the rotameters to remove impurities normally found in commercial grade acid. Provision shall be made for periodic cleaning of the rotameters. The acid feed lines shall be Schedule 80, carbon steel piping with welded connections. Tie-in to the reaction vessels shall be through the cover of the vessels.

5.7 Filtered Water Supply and Feed Streams

Water supply for the bauxite system shall be taken from the existing 8-inch filtered (service) water header in the 183 Building.

Normal header pressure at the headhouse is 100 $\pm$ 5 psig; larger pressure fluctuations are experienced occasionally because of intermittent water usages from the filtered water system within the plant. To minimize flow fluctuations in the critical water feed streams of the system, which may result from pressure surges within the 8-inch header, a branch header shall be provided for the bauxite system in which a constant pressure of approximately 80 psig shall be maintained. The following water feed streams shall be supplied from the branch header: 1) slurry water feed, and 2) dilution water feed. The piping of these feed streams shall be routed to the main control panels where rotameters shall be provided for metering the flow rates.

Other water requirements for the system may be supplied directly from the 8-inch filtered water header or from the branch header.

5.8 Reaction Vessels Discharge System and Injection

Water eductors shall be utilized for withdrawing the product solution from the reaction vessels and diluting the solution. Maximum product solution temperature after dilution shall be 80 F. Minimum dilution water flow shall be 7.0 gallons per gallon of 93 w/o sulfuric acid feed. Control of the product stream shall be regulated by varying the dilution water flow rates. Calibration charts shall be individually determined for each eductor. The eductors shall be selected based on the corrosive conditions of 50-60 w/o boiling sulfuric acid and for a minimum operating life of one year. From the eductors, the dilute hydrated aluminum sulfate solution shall be passed through a centrifugal booster pump to provide sufficient pressure to inject the solution into the existing pressurized chlorine solution injection piping. Normal pressure in the chlorine solution piping is approximately 25-30 psig. At the tie-ins with the chlorine solution piping, shut-off valves and check valves shall be provided in the dilute hydrated aluminum sulfate solution piping. Shut-off valves and check valves shall also be installed in the existing hydrated aluminum sulfate feed system injection piping at this location. Acid resistant plastic piping and valves shall be considered for the discharge system. Allowances shall be made in the design of the discharge system for the undissolved solids present in the product.

An alternative to the above discharge system shall also be considered. The merits of both systems shall be investigated before final selection is made. This alternative discharge system shall provide higher dilution water pressure for operating the eductors by providing a booster pump in the water supply for the eductors. Sufficient pressure would then be available downstream of the eductors to inject the diluted solution into the pressurized chlorine solution lines. Consideration shall be given to possible overpressurizing and damaging the entire reaction system if a flow blockage should occur downstream of the eductors.

The discharge piping of the two reaction vessels shall be interconnected so that one of the reaction vessels can be removed from service and the other reaction vessel in service can supply hydrated aluminum sulfate feed for both sides of the water plant. The flow rate of dilute solution to each side of the water plant shall be monitored and indicated at the main control panels. Sample taps shall also be provided in the dilute solution piping.

5.9 Off-Gas System

An off-gas system shall be provided for removing and disposing of the steam and sulfuric acid fumes generated in the reactor vessels. The system shall consist of a water scrubber for removing sulfuric acid fumes and an exhaust fan for maintaining a slightly negative pressure (-0.05 to -0.1 inch water gage) above the reaction vessels. Rigid fiberglass pipe shall be utilized for the ductwork from the reaction vessels to the scrubber and from the scrubber to the exhaust fan. The off-gas duct shall be connected to the reaction vessels through a nozzle provided in the cover lids of the reaction vessels. Manual shut-off dampers shall be provided for each reaction vessel; the dampers shall also be utilized for regulating the pressure in the vessels.

The scrubber shall be of fiberglass construction and shall be located inside the 183 Building to eliminate possible freeze-up during cold weather. The drain water from the scrubber shall be discharged to the existing neutralizing pit in the 183 Building. The exhaust fan may be located either inside or outside of the building. Fan controls shall be located at the main control panel for the system.

5.10 Instrumentation

A control panel shall be provided for the operation of the system. This panel shall be located adjacent to the reaction vessels on the basement floor of the 183 Building. Control and regulating equipment that shall be located at the panel board are:

1. Rotameters and valves for regulating the water and acid feed streams.
2. Constant weight feed indicator and regulator for bauxite feed.
3. Temperature indicators for the reaction temperatures.
4. Steam flow controls for vessel agitation.
5. Flow and pressure indicators for the dilute hydrated aluminum sulfate solution supply lines.
6. Scrubber water valve.
7. Pressure gage for monitoring pressure in the constant pressure water supply header, chlorine solution injection headers.

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8. Electrical controls for slurry pumps, dilute solution pumps and exhaust fan.

In addition to indicating the reaction temperatures at the feed system control panel, the reaction temperatures shall be recorded in the 183 Building main control room. Alarms for indicating feed bin high and low level, bauxite feed stoppage, bauxite reaction high and low temperature, exhaust fan stoppage, and dilute hydrated aluminum sulfate solution stoppage shall also be provided in the 183 Building control room.

Slurry feed regulation shall be provided at the reaction vessels.

5.11 Functional Testing

Upon completion of the installation of the feed facilities, the system shall be tested to demonstrate the operability for maximum, minimum, and design operating conditions. Acceptance test procedures shall be prepared for conducting these tests.

6.0 CODES AND STANDARDS

Unless otherwise stated, the design, the material used, and the work to be performed shall adhere to the requirements set forth in the latest edition of Hanford Works Standards and applicable codes approved by these standards.

7.0 BIBLIOGRAPHY

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2. HW-76001, "Bauxite-Sulfuric Acid Coagulant Feed Systems, 100-K," Preliminary Engineering Report, E.L. Etheridge, January 14, 1963.
3. HW-76926, "Project Proposal, Modification for Use of Bauxite, KE and KW Water Plants," Project CGI- 105, J.V. Loftus and T.H. Lyons, June

8.0 REFERENCE DRAWINGS

1. SK-1-23553, "Bauxite-Sulfuric Acid Feed System, Flow Diagram, 183-K Building."
2. SK-1-23554, "Bauxite-Sulfuric Acid Feed System, Equipment Layout, 183-K Building."
3. SK-1-2355, "Reaction Vessel, Bauxite-Sulfuric Acid Feed System, 183-K Building."

EL Etheridge:dl

APPENDIX

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1.0 Crude Bauxite Ore

1.1 Supplier: Stauffer Chemical Company

1.2 Purchase Specifications

Chemical Analysis: 61 to 68 per cent aluminum oxide

Sieve Analysis: 75 $\pm$ 5 per cent through 100 mesh screen.

1.3 Latest Complete Sieve Analysis:

<u>Screen Mesh</u>	<u>Per Cent Retained</u>
80	0.9
100	2.3
200	10.6
325	15.3
thru 325	70.9

1.4 Density

60-66 pounds per cubic foot.

1.5 Gross Chemical Analysis in 60 w/o Boiling H₂SO₄

<u>Components</u>	<u>Soluble</u>	<u>Insoluble</u>	<u>Total</u>
Al ₂ O ₃ (includes Fe ₂ O ₃)	55.3*	6.9	62.2
SiO ₂	-	5.8	6.0
H ₂ O	27.2*	3.1**	30.3**
Total	82.5	15.8	98.5

* By difference. Analyses are those reported by the analytical laboratory. They are not corrected to add to 100 percent.

** Weight loss on calcination at 800 C.

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2.0 Alternate Bauxite Ores (Revision I)

To provide facilities capable of utilizing alternate bauxite ores, the bauxite feed equipment shall be sized to permit feeding ores which may vary from 50 to 80 per cent in aluminum oxide content. Anticipated sieve analyses of these ores will be 75 ± 5 per cent through 100 mesh screen.

14-B

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JUN 16 1965

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Revision 2

5.6 Sulfuric Acid Feed Addendum

The sulfuric acid system for the process shall be capable of the concurrent feeding of acid for pH adjustment to the bauxite-sulfuric acid reaction vessels and feeding of acid for pH adjustment directly to the diluted product downstream of the reaction vessels.

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NOTE:
1 FEED RATES ARE FOR 18 PPM ALUM FEED.
2 --- EXISTING

SK-1-23553

PRELIMINARY ENGINEERING DRAWING

DESIGN POINT	DESIGN POINT	APPROVED FOR CONSTRUCTION	U. S. ATOMIC ENERGY COMMISSION MANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC
DATE	DATE	APPROVED FOR PURCHASE	IPD DRAFTING
SCALE	NONE	APPROVED FOR DESIGN	BAUXITE-SULFURIC ACID FEED SYSTEM FLOW DIAGRAM
REVISION	1	DATE	103K 8503
REVISION	2	DATE	SK-1-23553
REVISION	3	DATE	
REVISION	4	DATE	
REVISION	5	DATE	
REVISION	6	DATE	
REVISION	7	DATE	
REVISION	8	DATE	
REVISION	9	DATE	
REVISION	10	DATE	
REVISION	11	DATE	
REVISION	12	DATE	
REVISION	13	DATE	
REVISION	14	DATE	
REVISION	15	DATE	
REVISION	16	DATE	
REVISION	17	DATE	
REVISION	18	DATE	
REVISION	19	DATE	
REVISION	20	DATE

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1ST FL EL 491.6

FIBERGLASS DUCT

CONTROL PANEL SEE ENLARGED VIEW

ACID 93% H₂SO₄ DILUTION WATER EDUCTOR PUMP

SEE BASEMENT PLAN FOR CONT. EL 477.0

PRELIMINARY ENGINEERING DRAWING

CHECK PRINT		COMMENT PRINT		APPROVED FOR CONST.		U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC	
DATE	BY	DATE	BY	DATE	BY	DATE	BY
APPROVED FOR PURCHASE				I. P. D. DRAFTING			
SCALE: NONE				APPROVED FOR DESIGN			
DATE: 10/1/63				DATE: 10/1/63			
DRAWN BY: J. L. BOP				DATE: 10/1/63			
NEXT USED ON SK-1-23553				DATE: 10/1/63			
DRAWING TITLE				BAUXITE-SULFURIC ACID FEED SYSTEM EQUIPMENT LAYOUT			
REFERENCE DRAWINGS				183 K 8503			
NONE				SK-1-23554

GLASS-LINED CARBON STL
VESSEL - 20 GAL. CAPACITY.

NO.	DESCRIPTION	REV. BY DATE	APP'D BY	FOR	DATE	REF. NO.
	REVISIONS					

QTY.	PT. NO.	DESCRIPTION
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SK-I-23555

PRELIMINARY ENGINEERING DRAWING

SK-I-23553 FLOW DIAGRAM 8503
 DWG. NO. DRAWING TITLE
 REFERENCE DRAWINGS
 USED ON SK-I-23554

CHECK PRINT		COMMENT PRINT		APPROVED FOR CONST.		U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC	
BY	DATE	BY	DATE	BY	DATE	I. P. D. DRAFTING	
APPROVED FOR PURCHASE		APPROVED FOR DESIGN		REACTION VESSEL			
BY	DATE	BY	DATE	BAUXITE - SULFURIC ACID FEED SYSTEM			
SCALE NONE		CLASSIFIED BY		CLASSIFICATION		NONE	
PROJECT		DATE		DATE		DATE	
10480F		5/28/63		183 K		8503	
DWG. NO.		INDEX NO.		DWG. NO.		INDEX NO.	
SK-I-23555		SK-I-23555		SK-I-23555		SK-I-23555	

DATE

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6 / 24 / 94

END