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PROCESS ENGINEERING REPORT OPERATING MANUAL FOR K-65 STORAGE AREA FEED MATERIALS PRODUCTION CENTER - FERNALD, OHIO (USED AS A REFERENCE IN THE OU4 RI REPORT)

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CCC, INC/USAEC
REPORT

OU4

PROCESS ENGINEERING REPORT

OPERATING MANUAL

for

K-65 STORAGE AREA

PART IX

SECTION NO. 24-3

JOB NO. 3034

of the

FEED MATERIALS PRODUCTION CENTER - FERNALD, OHIO

AEC CONTRACT AT(30-1)-1060

for

UNITED STATES ATOMIC ENERGY COMMISSION

NEW YORK OPERATIONS OFFICE

THE ENGINEERING DEPARTMENT

of

Catalytic Construction Company, Philadelphia 2, Pa.

NOTE

Certain drawings, referred to in the text, have been removed from this report so that the document may be classified as "restricted".

CATALYTIC CONSTRUCTION COMPANY
PHILADELPHIA 7, PA.

[redacted]

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FEED MATERIALS PRODUCTION CENTER - FERNALD, OHIO

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Report by:
Walter J. Dougherty

Arthur S. Jennings

Supervised by:
Francis W. Winn

Dominic J. Oriolo

Approved by:
Whitney Weinrich

Date:
Philadelphia, Pa.

[redacted]

[redacted]

K-65 OPERATING MANUAL

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K-65 OPERATING MANUAL

I. Introduction

The primary function of the K-65 area is to process and store radioactive solids which have been recovered from the nitric acid digestion of pitchblende. This solid material, which is known as K-65, consists primarily of siliceous matter but may also contain metallic compounds such as molybdenum, vanadium, lead, and the like. The radioactivity of K-65 is caused by the presence of radium. The K-65 area is equipped to handle raw materials from either the ore refinery at FMPC or from outside sources. Since the K-65 is the property of the vendor, it is important that a strict accounting of materials be followed.

This manual presents the necessary information required to satisfactorily operate the K-65 handling and storage area. This information is intended to serve as a guide to operating personnel and to provide general data concerning the process. Included in this presentation are descriptions of the process and processing equipment, specific operating procedures, and technical data pertinent to the operation.

II. Process Description

The K-65 handling and storage area is an operating unit of the FMPC and is located about 1500 feet west of the ore refining plant. K-65 material is received in this area either as wet solids or as a slurry. The wet solids comprise material which has been produced at another activity and has been temporarily stored in 55 gallon drums. The slurry is produced in the FMPC ore refinery and is regularly transferred to the K-65 area. As a result of the work performed in the area, the K-65 is permanently stored as wet

[redacted]

solids in two concrete storage tanks. All material to be stored is pumped into the tanks as a slurry. The K-65 settles out and forms a bed of wet solids while the slurrying liquor is periodically decanted from the tanks. This liquor is physically processed and is retained in storage for further use as a slurrying agent.

The storage and handling processes are discussed in three sections in this part of the manual. The first describes the methods by which the incoming wet solids are removed from the drums, slurried, and transferred to the storage tanks. The second section deals with the processing involved in handling the slurry received from the ore refinery. The third section describes the recovery and processing of the slurrying liquor.

A schematic process flow diagram of the area is presented on Drawing P-3034-37-F, in the Appendix. As shown on this diagram, the area consists essentially of two concrete storage tanks, general solids and slurry handling equipment which are housed in a processing building, and a piping system for the transfer of slurry to the storage tanks from the processing building and from the ore refinery. The storage tanks have a total capacity of 250,000 cubic feet and will allow for storage of the anticipated K-65 receipts for a two year period. A more detailed description of the processing equipment will follow in the next part of the manual.

A. Wet Solids Processing

The wet solids are delivered to the area in 55 gallon drums, each containing approximately 500 pounds of material. When produced, the material has a bulk density of about 90 pounds per cubic foot and contains about 40 wt. % moisture. Chemically the material should be alkaline or neutral.

Because of the length of temporary storage, however, the properties of these solids may be altered somewhat.

One drum of the material is handled at a time. Each drum is placed on a slat conveyor by a shielded drum handling truck. The conveyor moves it inside the building where it is placed on a skip hoist and raised to a point above the slurry tank. Here it is inverted and the contents of the drum is dumped into the tank by vibration and also by a high velocity water jet. The water jet also serves to wash the drum which is eventually returned to the conveyor and removed from the building. About 75 gallons of slurrying liquor, which will be fresh water during initial operations, is consumed in removing the solids from one drum. The resulting slurry, which has a consistency of about 4 pounds of wet solids per gallon of slurry, is continuously agitated in the slurry tank.

When about 15 or 16 drums have been dumped and about 2000 gallons of slurry has been produced, the contents of the slurry tank is pumped to storage (tank F34-6). This slurry pumping is followed by a 1650 gallon clear liquor wash which is passed through the slurry tank, slurry pump, transfer line and into the storage tank. About 400 gallons of the liquor is allowed to remain in the slurry tank to aid in preparing the next batch of slurry.

This processing cycle is repeated about every three hours. The time cycle should be carried out as follows:

Slurry preparation	= 120 min.
Slurry pumping	= 20 min.
Clear liquor wash	= 15 min.
Miscellaneous operations	= 35 min.

[redacted]

B. FMPC Slurry Handling

In the ore refinery operation the radioactive raffinate from the extraction process is further processed and prepared for storage in the hot raffinate area. Here the K-65 solids are separated from the aqueous nitric acid digest liquor on a rotary filter. The wet cake from this filter is washed and reslurried with a neutralizing liquor. This liquor is the aqueous solution which has been recovered from the storage tanks in the K-65 handling area. This recovered liquor is treated with an alkaline salt in the hot raffinate area and is reused as a neutralizing and slurrying fluid. The neutralized slurry thus produced constitutes feed which is pumped from the hot raffinate area to the K-65 area where it is stored (tank F34-7).

The slurry has a consistency of about 4 pounds of wet solids per gallon of slurry; it is alkaline and may contain a slight amount of free caustic. The slurry liquor, mentioned above, consists of an aqueous solution of metallic nitrate.

The frequency and quantity of slurry to be transferred to the K-65 area varies with the quantity of pitchblende fed to the ore refinery. The average daily load is about 4000 gallons of slurry but this figure may become as high as 10,000 gallons. The pumping rate has been specified as 110 gpm, which allows for a 5.5 ft./sec. linear velocity in a 3 inch schedule 80 transfer line. This velocity is considered as a safe minimum for maintaining turbulent flow and preventing the settling of solids in the transfer line. Slurry pumping is carried out once daily and consumes from 40 minutes to 1-1/2 hours of operating time. Slurry pumping is followed by a clear liquor wash amounting to from 1200 to 1500 gallons of the recovered nitrate solution.

[redacted]

The processing of this slurry and wash solution as received in the K-65 area is relatively simple. The material is received in the storage tank together with a certain amount of wash liquor. The wash liquor remaining in the pipe line is drained to the decant sump (F34-4).

C. Slurry Liquor Recovery

The slurries which are pumped into the storage tanks eventually settle into two layers. Experimental evidence indicates that complete settling is attained after about 20 minutes. The slurry liquor, either water or a metal nitrate solution, forms the top layer over a bed of wet K-65 solids. Periodically this layer of clear liquid is decanted from the tanks and allowed to flow by gravity to the decant sump tank which has a capacity of 9200 gallons.

This liquid is periodically removed from the sump tank, passed through a pressure filter, and temporarily stored in the filtrate storage tank. From here the material is either used for slurry preparation in the K-65 area or is returned to the hot raffinate area of the ore refinery where it is used as a neutralizing liquid. The purpose of the filtration step is to remove any sediment which could have been carried from the storage tanks during decantation. All solid material delivered to the K-65 area must be retained in this area for accountability purposes.

The decantation operation proceeds automatically as the liquid level builds up in the storage tanks. These tanks possess a series of drawoff ports by which means the decantation takes place. These ports are arranged in two vertical lines which are located on diametrically opposite sides of the tanks. There are 25 ports on each line making a total of 50 per tank. The bottom part on each tank is one foot from the tank bottom. Initial

[redacted]

decantation will proceed when the liquid level reaches this 1 foot elevation. The remaining 49 ports are located at 6 inch intervals. The following table illustrates the schedule by which decantation may be expected to proceed:

	Initial Decantation	Subsequent Decantation
Vol. Slurry fed to start drawoff	38,000 gal.	19,000 gal.
Vol. Slurry to complete drawoff	112,000 gal.	57,000 gal.
Wt. wet solids to complete drawoff	225 tons	112 tons
Time required to start drawoff @ [redacted] slurry/oper. day, feed	[redacted] days	[redacted] days
Time of drawoff @ [redacted] slurry/ oper. day, feed [redacted]	[redacted] days	[redacted] days
Vol. decanted liquor recovered to complete drawoff	68,000 gal.	34,000 gal.
Vol. decanted liquor per day	3,800 gal.	3,800 gal.

The above data represent operation of only one tank.

The figures under the heading of initial decantation pertain to the drawoff occurring from the bottom port only. The data under subsequent decantation are representative of what may be expected from the time the first and second ports are closed. This will also be true for operations between the upper located ports. The volume of slurry to complete the drawoff is the total volume required to form the bed of wet solids between ports. This figure is also shown as a weight of wet solids. The remaining data are self explanatory.

The figure of [redacted] of slurry per operating day is considered as an average transfer from the ore refinery. On this basis one storage tank has enough capacity to handle a [redacted] production of solids. The second tank will accommodate the solids obtained from outside sources.

[redacted]

III. Equipment Description

Presented herein is a general description of the operating facilities in the K-65 handling and storage area. This description is supplemented by an engineering flow diagram (3034-H-03-R), an equipment list (Table 1), and equipment schedules which can be found in the Appendix of this report. The equipment list includes item numbers, purchase order numbers, vendor's name, and the equipment service. The item and purchase order numbers provide a means of cross reference to Section 24-2 of Catalytic's Specifications, wherein is included detailed information pertaining to the design, operation, and performance of all items of equipment.

The description of equipment is presented in three sections. The first section involves the equipment housed in the processing building. The second section includes the concrete storage tanks and those items in the vicinity of the tanks. A third section involves miscellaneous items such as pumps, motors, instruments and piping systems.

A. Processing Building

The processing building in the K-65 area houses the equipment utililized in preparing slurries from solids received in drums and in processing the liquor decanted from the concrete storage tanks. This equipment consists primarily of a drum emptying unit, a slurry tank, a pressure filter, and miscellaneous pumps and motors.

The function of the drum emptying unit (designated as item G34-9) is to transfer solid K-65 material from the 55 gallon drums to the slurry tank. This unit consists of three integral parts, comprising the slat conveyor, the skip hoist and drum dumper and the pneumatic pusher. The slat conveyor

[redacted]

is a motor-powered unit and performs the function of moving the full drums from the entrance of the building to a point directly in front of the skip hoist. In this operation, the conveyor is manually started and is stopped automatically by a limit switch. The pneumatic pusher then engages the drum and moves it to the gig clamp on the skip hoist. The pusher is operated by compressed air from a compressor located in the building.

The skip hoist is a conventional unit which raises one drum at a time to a point above the slurry tank and inverts it. Included in the dumping equipment are a manually operated vibrator and facilities for producing a high velocity water jet. The jet is manually started but is controlled and stopped automatically. The skip hoist also is capable of returning the empty drum to the ground floor. By means of a magnet on the pusher, the drum is replaced on the conveyor which transfers it to a storage space.

The slurry tank (item F34-1) is an agitated carbon steel vessel having a capacity of 3200 gallons. A diagram of the tank is included in the Appendix. Because some of the wet solids may be slightly acid, the tank has been designed with a larger corrosion allowance than ordinarily. The vessel is equipped with the necessary instrumentation to indicate high and low slurry levels and to control operation of a clear liquor washout system. This system is arranged so that the vessel will always contain a minimum level of clear liquor when shut down.

A pressure filter (item D34-1) is provided to remove sediment from the liquid decanted from the storage tanks. This unit is an Adams pressure filter with poro-carbon tubes and is also equipped with the necessary pressure gauges and relief valves.

[redacted]

In addition to the above equipment, the building will house a slurry pump (G34-1), two water pumps (G34-2 and G34-12), two filtrate pumps (G34-3 and G34-4), and a sump system. The pumps will be discussed in more detail in a later section of the report. The sump system consists of a building sump and a trench sump. Both are rectangular concrete structures built below the ground floor level. The building sump is set up to accommodate spillage and wash down water. The purpose of the trench sump is to receive any leakage from the slurry transfer lines between the ore refinery and the storage area. Both sumps are serviced by pump G34-10.

B. Storage Tank Area

The equipment in this area consists of two prestressed concrete tanks, a sump tank for decanted liquor, and two sump pumps.

The concrete storage tanks (items F34-6 and F34-7) each have a capacity of 125,000 cubic feet. A diagram showing the tank design is included in the Appendix. Tank F34-7 receives slurry directly from the ore refinery while tank F34-6 receives the slurry prepared in the K-65 processing building. As explained in the Process Description, facilities are available for recovering the slurrying liquor by decantation. The tanks possess and 8-inch wall thickness which provides considerable protection against gamma radiation. In order to prevent the slurry liquor from drawing into the soil, a combination concrete and asphalt bottom has been constructed under the tanks. Below this is a layer of crushed stone in which several drain pipes are embedded. These pipes drain into the decanted liquor sump tank. The slurry is fed to each storage tank through four nozzles located at the four quadrants on the roof. Additional ports are also available on the roof through which level

[redacted]

soundings can be made to establish the level and contour of solids in the tank. If it is desired to feed more slurry to one quadrant of the tank than to another, this can be accomplished.

The decant liquor sump tank (F34-2) is a 9,000 gallon carbon steel tank which provides a resevoir for the slurry liquor drawn from the storage tanks. The vessel is located between the storage tanks and is buried in the ground. Access to the various nozzles is available through a rectangular box constructed on the top of the tank. This tank receives all drainage from the various piping systems servicing the area and also will receive any drainage from the storage tanks. The sump tank is serviced by two self-priming centrifugal pumps (F34-5 and F34-6).

C. Miscellaneous Equipment

The processing building, storage tank area, and ore refinery are interconnected by means of a piping system. Two 3-inch schedule 80 carbon steel pipes are available for transportation of slurry and clear liquor between these points. This system is also supplemented with some additional piping in the K-65 storage and handling area. The entire piping arrangement is shown schematically in the Engineering Flow Diagram (Dwg. 3034-H-03-R) which can be found in the Appendix. All of the transfer lines are submerged in a concrete trench which is covered with removable concrete slabs.

Multiport plug valves have been provided at various line junctions. This provides a valving system which is simple in design and is easily operated and maintained. Long sweep elbows have been used where possible on all slurry lines. Also, provisions are available at numerous points for washing

[redacted]

out and reaming slurry lines if they should become plugged. Since all flow conditions are at atmospheric temperature, none of the lines are insulated. However, all lines are sloped so that the contents may be drained into the decant liquor sump tank.

The units in the K-65 handling area are equipped with the necessary instrumentation to adequately control the processing. This instrumentation is necessary because of the remote manner of material handling and because of the irregular schedule of operator attendance. The instrumentation consists mostly of liquid and slurry level controllers and alarms. The controllers are connected to switches on pumps and valves while the alarms are mounted on the panel board in the processing building. This panel board contains the annunciator system together with pump starters and other electrical equipment. Each instrument will be discussed in connection with the equipment item to which it is connected. A schematic representation of the area instrumentation is given on the Engineering Flow Diagram, drawing 3034-H-03-R. A detailed description of each instrument can be found in Section 24-2 of Catalytic's Specifications.

Slurry tank F34-1 possesses a water purge type level controller. This instrument rings an alarm on a high level and activates equipment which starts a water wash and ultimately shuts off the slurry pump on a low level. As a result of the activities of this instrument, the contents of the tank can be transferred to storage and the equipment can be washed out without running the risk of tank overflow or line plugging.

Decanted liquor sump tank F34-4 is equipped with a diaphragm type level controller which starts either of the transfer pumps on high level and

[redacted]

shuts it off on low level. The pumps can be operated manually if desired.

The trench sump is also set up with a diaphragm type level controller which starts and stops pump G34-10 on high and low level. Filtrate liquor storage tank, F34-2, possesses a diaphragm type level instrument which sounds an alarm on both high and low level. Operation of pumping equipment for this tank is manual.

Additional instrumentation in the area includes pressure switches on the water pumps, G34-2 and G34-12. These are connected to the pump discharge lines and start the pumps when water pressure is required.

Slurry pump G34-1 is also equipped with a pressure switch which rings an alarm in the event of a lowering of the pump discharge pressure.

A pump schedule can be found in the Appendix of this report. This tabulation shows all pertinent information concerning the pumps and motors. More detailed data may be found in Section 24-2 of Catalytic's Specifications.

IV. Safety

The major hazard involved in the K-65 area is the radioactivity of the K-65 solids which may contain as much as 500 mg of radium per ton. The following tabulation indicates the exposure in millireps per hour which can be expected at various distances from an 8-inch concrete wall shielding the K-65 material:

Distance in Feed	Radiation, MR/hr.
3	28
6	23
10	19
15	15
20	11.5
30	9
48	7.5
75	3.75

As a safeguard to the operator, shielding has been provided at all areas where solids or slurries are handled. The shielding includes (1) 8-inch thick concrete cells which house the slurry handling equipment and the concrete storage tanks and (2) various barrier walls around the area.

Another hazard to guard against is the evolution of radon gas from the K-65 solids while being dumped from the drum. An exhauster has been provided to remove hazardous gases resulting from this operation.

Despite the safeguards which have been incorporated in the plant design, it must be emphasized that the radiation hazard has not been completely eliminated, as noted from the exposure data tabulated above. Operating personnel should practice good judgment, wear proper protective clothing, and follow the practices prescribed by this manual and particularly by the Health and Safety group. Unnecessary exposure or contact with the solids or slurries in any form should be avoided. The use of the film badge by the operator will be a check against the possibility of overexposure to radiation.

Only authorized personnel should be allowed in the K-65 handling and storage area. Under no circumstances should personnel enter the area housing the drums filled with K-65. These drums should be handled only by the truck which has been provided with adequate shielding. It is important that the exhauster be started before full drums are placed in the building and kept running until all slurry is removed from the slurry tank. The time spent by the operator in and around the cells or by the concrete storage tanks should be kept to a minimum for each operation involved.

V. Operating Instructions

This section of the report presents the procedure for starting up,

[redacted]

operating, and shutting down the equipment when performing the basic functions involving wet solids processing, FMPC slurry handling, slurry liquor recovery and wash down and sump pumping.

The procedures are specified on the premise that all equipment has been installed according to design, that all instruments have been set properly, and that the entire area has been tested and inspected.

A. Startup from an Empty System

This procedure is applicable when starting the plant with processing materials for the first time and is employed only in connection with wet solids processing. The main consideration is to initiate the processing of wet solids in the processing building by charging fresh water to the slurry tank, as outlined below:

(1) Start the blower (G34-16)

(2) Fill the slurry tank (F34-1) with enough water to completely cover the rotor on the agitator. This can best be done by means of a hose connected to line TW-23 inside the cell.

(3) Start the water purge system on the level instrumen' on tank F34-1 by opening the valve on line 1P 34-1.

(4) Start the agitator (G34-13).

(5) Check the settings on the timers (FC34-2 and FC34-3).

(6) Check the panel board to see that all annunciator lights are on dim.

(7) Start Compressor.

The system is now ready for "Normal Operation" as discussed under Section V - C, below.

[redacted]

B. Startup from Full System

The procedure is identical to empty system startup except that it is not necessary to put water into the slurry tank (F34-1). A minimum level of clear liquor will always be in the tank once empty system startup has been carried out.

C. Normal Operation

1. Wet Solids Processing:

(a) Start the drum emptying operations, which will involve handling and dumping one drum at a time. For a detailed procedure on handling the drum emptying equipment, refer to Section 24-2 of Catalytic's Specifications. Be sure that each empty drum is properly inspected and is free of solids before being removed from the cell.

(b) When a high level in the tank (F34-1) is reached, the alarm on the annunciator will ring and the lights on the panel board will be on bright. Stop the alarm and reset. Open flush bottom valve at the bottom of the tank. Start the pump (G34-1). When the slurry level is low, the solenoid valve (LSV 34-12) will open and admit water to the tank through line Z0-28. This water will flow for 15 minutes. Pump G34-1 will be stopped automatically. Close the flush bottom valve and repeat the cycle.

2. FMPC Slurry Handling

(a) Contact the hot raffinate area and find out which line the slurry will be pumped in, XJ-1 or XJ-2.

(b) Set the valves at the junction of XJ-1, XJ-2, and Z0-20, so that flow of material will be on to XJ-1 and not into Z0-20. These valves are three way, three port plug cocks.

[redacted]

(c) Set the valve at the junction of XJ-7 and XJ-3 so that flow will be in XJ-3 and not into XJ-7. This will allow slurry to go to tank F34-7.

(d) Contact the hot raffinate area and report that preparations for pumping are complete. Keep in touch with the hot raffinate area during the progress of the operation.

(e) When informed that clear liquor pumping is complete, set the valve at the junction of lines XJ-1, XJ-3, and ZO-1 so that both XJ-1 and XJ-3 will drain into sump tank F34-4 via lines XJ-7 and ZO-1. After draining the area is ready for shutdown.

3. Slurry Liquor Recovery

In this process, the decanted liquor flows through lines ZO-1, ZO-2, ZO-3 and ZO-4 into decanted liquor sump tank F34-4. The fluid collected in this tank will be removed periodically and filtered before it is sent to temporary storage. In order to perform these operations, the following procedures should be employed:

(a) Check tank F34-4 periodically to determine when it is ready for pumping. This can be done by level soundings.

(b) When it is desired to pump this tank, check the valve on line ZO-11 at the inlet to the pressure filter and make sure it is open.

(c) Check the valve on line ZO-16 at the outlet of the pressure filter and make sure it is open. Be sure all other valves on the filter are closed.

(d) When ready to pump, open the valve on line TW-17 and build up the level in tank F34-4. A high level will start pump G34-5 or G34-6. When

the pump starts, close the valve on TW-17.

(e) When the level in tank F34-4 reaches a low point, the pump will be shut off. Close the valves on lines ZO-11 and ZO-16.

(f) Open the valve on line XJ-9 and then open the valve on line ZO-27. This will blow down the contents of the filter into tank F34-1. Be sure the agitator in this tank is rotating before opening the valve on line ZO-27.

(g) Check the pressure gauge on pump G34-2 or G34-12, which ever is running. When this pressure falls to a steady value, the filter will be blown back. Close the valve on line ZO-27. Allow the filter to drain for a few minutes. Close the valve on line XJ-9.

(h) Dispose of the slurry in tank F34-1 in accordance with the instructions given in the section on wet solids handling.

(i) Check the level in tank F34-2 after each filtration by a level sounding. Keep a record of this level.

(j) When it is desired to deliver clear liquor to the refinery, contact the hot raffinate area and determine how much liquor this area can receive.

(k) Set the 3 way, 3 port plug valves at the junction of lines XJ-1 and XJ-2 so that flow will be in the desired line.

(l) Open the valve on line ZO-18 and start filtrate pump G34-3 or G34-4. Keep in contact with the hot raffinate area and pump until this area cannot receive any more liquor or until the low level alarm on tank F34-2 sounds. Turn off the filtrate pump.

(m) Close the valve on line ZO-18. Adjust the valve at the junction

[redacted]

of lines XJ-1 and XJ-2 so that the line carrying clear liquor will drain to tank F34-4. Reset these valves so that lines XJ-1 and XJ-2 are open to the sump but line ZO-20 is not.

4. Washdown and Sump Pumping

An auxiliary operation, not covered in the Process Description, is the washdown of the processing building and the handling of washdown liquors. This operation will be carried out periodically in both the shielded and unshielded areas. Hose connections are available on lines TW-22, outside the cell, and on line TW-23 inside the cell. In the event of an overflow of tank F34-1, a washdown of the cell area together with a pumping of the sump should be carried out immediately. Floor washings will flow to the floor sump from where they will be pumped to storage tank F34-6. The following procedure for pumping the building or trench sump should be followed:

(a) Set the valve at the junction of lines XJ-8 and XJ-4 so that flow will be into line XJ-4.

(b) Set the valve at the junction of lines ZO-14 and ZO-13, so that suction will be taken from the correct sump.

(c) Start pump G34-10 and maintain a visual watch on the sump while it is being pumped.

(d) If the sump contains any solid material, admit clear liquor by means of a washdown hose. The last material to be pumped from the sump should be sediment free.

(e) Shut off the pump and adjust the valve at the junction of lines XJ-4 and XJ-8 so that the contents of the pump discharge can drain into tank F34-4.

[redacted]

[redacted]

(f) After draining, adjust this valve so that pump G34-10 discharge is open to tank F34-6.

(g) Adjust the valve at the junction of lines ZO-13 and ZO-14 so that pump G34-10 will be able to take suction from the trench sump. Set the pump on level control so that it will automatically pump the trench sump if any liquid should drain into it at times when it is not attended.

D. Normal Shutdown

Normal shutdown will occur whenever the plant is shut down for a scheduled event such as for overnight, weekends, or a holiday.

The following procedure is applicable to normal shutdown of the wet solids handling facilities in the processing building.

(1) Pump all slurry from the tank (F34-1) and be sure that this is properly followed by a clear liquor wash.

(2) Drain line XJ-4 through line XJ-7 and ZO-1 into the decant sump tank (F34-4).

(3) Turn off the agitator in the slurry tank (F34-1).

(4) Turn off the blower (G34-16).

(5) Turn off the power to all operating units in the area except to pumps G34-10, G34-5 or G34-6. These pumps must be ready to handle material in the trench sump or in tank F34-4 at all times. Do not turn off power on the line going to the metals oxide storage area.

(6) Turn off the water purge system on tank F34-1.

The procedure involved in normal shutdown of FMPC slurry handling facilities entails setting the plug valves to that any unscheduled flows will go the the correct place.

[redacted]

(1) Set the valve at the junction of lines XJ-1, XJ-3, and XJ-7 so that flow from XJ-1 will be to tank F34-4.

(2) Set the valves at the junction of XJ-1 and XJ-2 so that these lines are both open and flow from either can proceed to tank F34-4.

E. Emergency Shutdown

Emergency shutdown will occur at times involving catastrophies such as fire, explosion, bombing raids and the like. On an emergency shutdown, cut off the main power switch in the processing building. Notify the nearest area of the situation as soon as possible.

The most likely condition which would require an emergency shutdown during FMPC slurry handling would be leakage of piping or valves. If leakage is noted, the following procedure should be carried out:

(1) Notify the hot raffinate area immediately to stop pumping slurry and to throw on the emergency clear liquor pumps. This will wash the slurry out of the line and prevent possible plugging.

(2) When the normal clear liquor wash has been accomplished, drain the line in the manner prescribed in the "Normal Operation" section of the instructions.

(3) Hose down the trench at the point of leakage. Be sure that all solids have been washed to the trench sump. Pumping of this sump will be described in a later part of the instructions.

[redacted]

VI. APPENDIX

Schematic Process Flow Diagram (Drawing P-3034-3[illegible])

Engineering Flow Diagram (Drawing 3034-H-03-R)

Equipment List (Table I)

Pressure Filter (Item No. D-34-1

Slurry Tank (Item No. F-34-1)

Filtrate Tank (Item No. F-34-2)

Decant Tank (Item No. F-34-4)

Concrete Storage Tank (Item No. F-34-6 and F-34-7)

Drum Lid Washing Tank (Item F-34-8)

Pump Schedule

[redacted]

[redacted]

[redacted]

TABLE I

EQUIPMENT LIST

ITEM NO. OR TAG NO.	P.O. NO.	VENDOR	SERVICE
D34-1	3000-1457	R.P. Adams Co.	Adams Poro-Carbon Type Pressure Filter
F34-1	3000-1792	Pilyard Co.	Slurry Tank-3200 gal. C.S. Tank
F34-2	3000-2222	Sun Ship Co.	Filtrate Tank-12490 gal. C.S. Tank
F34-4	3000-2222	Sun Ship Co.	Decant Tank-9000 gal. C.S. Tank
F34-6	Fuller	Preload Corp.	K-65 Storage Tank-125,000 ft.^{3} Prestressed Concrete
F34-7	Fuller	Preload Corp.	K-65 Storage Tank-125,000 ft.^{3}, Prestressed Concrete
F34-8	3000-2222	Sun Ship Co.	Drum Lid Washing Tank-83 gal., C. S. Tank
G34-1	3000-1683	Duriron	Slurry Pump - 110 gpm
G34-1	3000-1592	U.S. Electric	Motor for Slurry Pump
G34-2	3000-1918	LaBour	Water Pump - 60 gpm.
G34-2	3000-1951	U.S. Electric	Motor for Water Pump
G34-3	3000-1918	La Bour	Filtrate Pump - 30 gpm.
G34-3	3000-1951	U.S. Electric	Motor for Filtrate Pump
G34-4	3000-1918	La Bour	Spare Filtrate Pump
G34-4	3000-1951	U.S. Electric	Motor for Spare Filtrate Pump
G34-5	3000-1846	La Bour	Decant Pump - 30 gpm.
G34-5	3000-1951	U.S. Electric	Motor for Decant Pump
G34-6	3000-1846	La Bour	Spare Decant Pump
G34-6	3000-1951	U. S. Electric	Motor for Spare Decant Pump

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EQUIPMENT LIST (Cont'd.)

ITEM NO. OR TAG NO.	P. O. NO.	VENDOR	SERVICE
G34-9	3000-1195	Gifford Wood Co.	Drum Emptying Unit including Slat Conveyor, Air Pusher, Skip Hoist and Magnetic Drum Grab
G34-10	3000-1846	LaBour	Building & Trench Sump Pump 10 gpm.
G34-10	3000-1951	U. S. Elect.	Motor for Sump Pump
G34-12	3000-1918	LaBour	Spare Water Pump
G34-12	3000-1951	U. S. Elect.	Motor for Spare Water Pump
G34-13	3000-1688	Mixing Equip. Co.	Vert. Agitator for Slurry Tank
G34-13	3000-1592	U. S. Elect.	Motor for Vertical Agitator
G34-16	3000-1563	Sturtevant	Exhaust Blower to Remove Radon Gas from G34-9
G34-16	3000-1592	U. S. Elect.	Motor for Exhaust Blower
G34-17	3000-2827	Garden-Denver	Air Compressor to Supply Air to G34-9
G34-17	From Stock	Continental	Motor for Air Compressor.
PRESSURE GAGES			
PG34-1	3000-1594	Helicoid	Discharge Line of Water Pump (G34-12)
PG34-2	3000-1594	"	Discharge Line of Water Pump (G34-2)
PG34-3	3000-1594	"	Discharge Line of Filtrate Pump (G34-3)
PG34-4	3000-1594	"	Discharge Line of Filtrate Pump (G34-4)
PG34-5	3000-1594	"	Discharge Line of Build. Drain. Pump (G34-10).
PG34-6	3000-1594	"	Discharge Line of Sump Pump (G34-6)

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EQUIPMENT LIST (Cont'd.)

ITEM NO. OR TAG NO.	P.O. NO.	VENDOR	SERVICE
PG34-7	3000-1594	Helicoid	Discharge Line of Sump Pump (G34-5)
PG34-8	3000-1594	"	Inlet Line of Press. Filter (D34-1)
PG34-9	3000-1594	"	Output of Press. Filter (D34-1)
PG34-10	3000-1594	"	Intake of Press. Filter (D34-1)
PG34-11	3000-1594	"	Discharge Line of Slurry Pump (G34-1)
SOLENOID VALVES			
FCV34-2	3000-2198	ASCO	On Line Z0-30-3"-Al to Slurry Tank
LSV34-12	3000-2198	"	On Line Z0-28-3"-Al to Slurry Tank
RELIEF VALVES AND ALARM			
RV34-1	3000-1643	Lonergan	On Intake Line of Pressure Filter (D34-1)
RV34-2	3000-1643	"	On Discharge Line of Pressure Filter (D34-1)
AN34-1	3000-1968	Panalarm	Panelboard Annunciator at Operator's Platform
LEVEL INSTRUMENTS			
LS34-1	3000-2290	Mercoid	High L.S. on Slurry Tank F34-1
LS34-2	3000-1972	"	Level Switch on Filtrate Tank, F34-2
LS34-3	3000-1972	"	Level Switch in Building Sump
LS34-4	3000-1972	"	Level Switch on Decant Tank (F34-5)

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EQUIPMENT LIST (Cont'd.)

ITEM NO. OR TAG NO.	P. O. NO.	VENDOR	SERVICE
LC34-5	3000-2364	Brown-Instru.	Diaphram Box on Filtrate Tank (F34-2)
LC34-6	3000-2364	"	Diaphram Box in Bldg. Sump
LC34-7	3000-2364	"	Diaphram Box on Decant Tank (F34-5)
LS34-12	3000-2290	Mercoid	Low Level Switch on Slurry Tank (F34-1)
PRESSURE SWITCHES			
PS34-1	3000-2312	Mercoid	Discharge Line of Slurry Pump (G34-1)
PS34-2	3000-1972	"	Combined Discharge of Water Pumps (G34-2 & 12)
FLOW INSTRUMENTS			
FC34-1	3000-2375	Brooks	Purge Unit for LS34-1 and LS34-12
FC34-2	3000-2361	Eagle Sig.	Controlling FCV 34-2 on Liquid Line to Slurry Tank
FC34-3	3000-2361	" "	Controlling LSV34-12 on Liquid Line to Slurry Tank

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