OPERATING INSTRUCTIONS

WASTE AND MATERIALS OPERATOR

DEPARTMENTS 831 & 827

PCB-ARCH-EXT0372519

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TRAINING MANUAL

WASTE AND MATERIALS OPERATOR

DEPARTMENTS 831 and 827

REVISED NOVEMBER 1, 1971

by

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PCB-ARCH-EXT0372521

WASTE AND MATERIALS OPERATOR

TRAINING MANUAL

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JOB DESCRIPTION

Waste and Materials Operator

A. Duties

Operation of waste incinerator equipment, including oxidizer scrubbing systems, sumps, and all related equipment.

Loading and unloading tank trucks, dumping drums, and unloading tank cars of waste material for incineration.

Operation of unloading, loading and storage tank equipment involved in in-plant bulk material storage in Distribution Department equipment. This includes auxiliary equipment, such as air compressors, steam regulators, fork lift, and other equipment incidental to loading, unloading, or storage of these materials.

B. Responsibilities

1. Maintain maximum on-stream operation of the incinerator.
2. Maintain accurate legible records of operations.
3. Flammability testing of waste materials.
4. Take samples for laboratory analysis.
5. Keep precise unloading and loading records.
6. Inspect all cars and tank trucks before unloading or loading. Report all defects to supervision before handling.
7. Keep analytical data records.
8. Perform duties in a safe manner and use proper safety equipment.
9. Report to and work under the direction of a Distribution Foreman.
10. Maintain housekeeping in the area at acceptable levels.

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I. SUMMARY OF PROCESS - WASTE INCINERATOR

Waste liquids containing polychlorinated biphenyls are decomposed by heat in the incinerator into the following combustion products:

HCl, Cl_2, CO_2, H_2O, particulate matter (when burning Montar residue containing lime.)

Approximately 0.001 lb./hour of undestroyed PCBs are expected through the incinerator at the design PCB feed rate of 1250 lb./hour. This will go to the sewer in the scrubber effluent stream. This stream will be an HCl solution of less than 2% strength.

The hot combustion products leaving the incinerator are cooled from incinerator temperatures (2800°F. maximum) to approximately 210°F. by water sprays in the contactor tube before discharging into the quench pot. Somewhat less than 50% of the HCl is also removed here. Leaving the quench pot, the cooled gases pass through a high energy venturi section where approximately 98% of the particulate matter is removed by a pumped stream of HCl solution from the quench pot and packed scrubber sumps. Additional HCl is also removed in the venturi.

The gases then enter the bottom of a packed scrubber (polypropylene packing) where the remaining HCl is scrubbed out with well water. Scrubber efficiency is calculated to be approximately 99.4%.

On leaving the packed section the gases pass through a ~~monel~~ polypropylene demister pad and into the atmosphere.

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Design specifications for the contents of this stream at design waste feed rate are:

HCl -	5 lb./hour maximum
Cl_2 -	<50 ppm
Particulates -	<0.05 grains/SCF 20 micron size
Nitrogen Oxides -	<200 ppm

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II. SAFETY

A. EMERGENCY PROCEDURES

1. In case of a fire, go to the telephone, and dial Station 2000 and report a fire at the incinerator, Zone 3-4.

2. In case of an emergency and you need immediate help in the department, dial Station 2015 on the telephone; give the guard your name, department number and as much detail as possible concerning the emergency. The guard will then summon aid through the pagemaster system and help will come directly to the department.

3. In case you need emergency aid for yourself or others at the dispensary, then dial Station 400 and report the name of person, the department number and location of injured person to whoever answers.

4. Emergency Plan

The assembly points for all plant personnel in case of a plant emergency are:

PRIMARY: MAIN PARKING LOT

SECONDARY: WEST GATE

Department Shutdown

Shutdown will take place in either of two ways. First, persons will shut down their departments and evacuate if instructed to do so by the night superintendent, or by anyone else in charge of directing emergency activities.

Second, shut down and evacuation will take place if the emergency whistle is sounded. This whistle is five short blasts repeated five times. The emergency whistle will be sounded only if an entire plant shutdown is desired.

The emergency plan has been revised so that it can be implemented by the plant fire zones. This is so since our experience here at the plant and other large plants indicates that an emergency is likely to be confined to a particular zone of the plant.

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II. SAFETY (contd.)

A. EMERGENCY PROCEDURES (contd.)

The Incineration area fire call is 3-4 (3 long blasts followed by 4 short blasts of the fire whistle).

B. GENERAL

Most of the wastes contain primarily Aroclor (chlorinated biphenyl material). However, other unknown chemicals may be present, and so additional precautions must be taken.

Contact with the skin should be avoided. In case of spills on the body, wash the affected areas with soap and water.

Inhalation of fumes and vapors should be avoided. If it is necessary to work in areas where fumes are concentrated, a gas mask suitable for organic vapors should be worn.

Aroclors have very low vapor pressures and do not constitute a fire or explosion hazard and are not considered flammable. However, some material will be contaminated with flammable solvents.

C. DESIGN

The following safety factors were incorporated into the incinerator design:

1. The shelter at the drum dumping sump has open wall areas to disperse any fumes quickly.

2. The immediate dumping area has a Class 1, Group D, Division 1 electrical classification.

3. The storage tanks are blanked with nitrogen.

Storage tank filling lines are provided with dip pipes to prevent static charges.

A weak seam on the north end of the oxidizer has been incorporated to provide explosion relief for a major explosion.

FIA type safety-approved combustion safeguards and process interlocks have been incorporated.

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II. SAFETY (contd.)

C. DESIGN (contd.)

Main back-up city water cooling systems are on separate power feeders. In addition, a tie-in has been provided to the WGK plant firewater system if a plant-wide power failure shuts down the city water pumps.

D. LOCATION OF SAFETY EQUIPMENT

1. Safety Showers and Eye Baths

a. Ground level west of the drum melter.

b. Ground level, east of the air combustion blower (150)

2. First Aid Boxes

a. In safety shelter, ground floor, south side of office.

3. Gas Masks

a. In safety shelter, ground floor, south side of office.

b. On catwalk above storage tanks.

4. Fire Extinguishers

a. In safety shelter, ground floor, south side of office. - CO_2 and dry chemical

b. First floor platform on handrail, south side of incinerator.- dry chemical

c. Motor control center. - CO_2

d. Ground floor at scrubber column. This is 150# dry chemical extinguisher on a two-wheeled cart.

e. Column next to stairway leading to the storage tanks 116, 117 and 118. - dry chemical

5. Emergency Clothing

a. Ground floor in safety shelter, south side of office.

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II. SAFETY (contd.)

E. INSPECTIONS

1. Inspection of safety equipment is the operator's responsibility. Report any malfunctions.

2. Equipment inspection forms will be provided to be filled out daily.

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SAFETY EQUIPMENT CHECK LIST

Date

Before checking safety showers please notify Int. PNA Operator at Station 544. Also notify him when you have completed test of all safety showers.

SAFETY SHOWERS	Check and Sign Each Shift		
	Days	Middles	Lates
1. West of drum heater			
2. East of Control Panel			
3. Phenol truck loading dock			
4. North Phenol heating and Aroclor unloading dock			
5. South Phenol unloading dock First aid boxes Phenol area (face shield and alcohol)			
1. Inside drumming Bldg. W. Door			
2. Truck loading dock			
3. North unloading dock			
4. South unloading dock			
SHELTER EAST OF OFFICE			
1. Gas Mask (1)			
2. Fire extinguisher (2)			
3. Clothing Box (2)			
4. First Aid Box			
STORAGE TANK WALKWAY			
1. Gas Mask			
INCINERATOR WALKWAY			
1. Fire Extinguisher			

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II. SAFETY (contd.)

F. PERSONNEL PROTECTIVE EQUIPMENT

1. Lockers in the department will be assigned to each operator to keep equipment and tools necessary for operations.

2. Wearing of the following safety equipment is required:

   a. Safety glasses when in the operating area.

   b. Goggle-face shield unit when sampling or dumping drums and changing guns at the incinerator.

   c. Safety shoes, rubber or leather.

   d. Rubber gloves when sampling or dumping drums.

3. Wearing of the following safety equipment is strongly recommended:

   a. Hard hat

   b. Plastic apron when dumping drums.

4. Although this is not a toxic clothing department, protective clothing is issued and should be worn any time in the plant.

5. Asbestos gloves or heavy leather gloves will be available for work around the incinerator (removing waste gun, etc.)

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III. HOUSEKEEPING

The importance of a good, clean department cannot be overstressed. A clean department is both a safer and a more enjoyable place to work.

However, since the incinerator will be handling PCB, good housekeeping is doubly important. All possible precautions must be taken to prevent escape of PCBs to the environment. Design has provided:

1. Curbed and sumped incinerator area.
2. Settling and separating basins.
3. Multiple scrubbing of incinerator combustion gases.

A man walking through a spill could track enough PCB outside the curb to exceed the allowable department daily loss.

Supervision will make every reasonable effort to aid housekeeping. However, success or failure rests with each individual operator.

Housekeeping Assignments

A. All Shifts

1. Wash up all spills immediately.
2. Coil up hoses and hang on racks when not in use.
3. Keep gauges, instrument panel, and rotometers clean for operations.
4. Special clean-up assignments as directed by supervision.

B. Day Shift

Pick up trash around storage tanks 116, 117, and 118, tank truck unloading area and fuel oil storage area.

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III. HOUSEKEEPING (contd.)

C. Middle Shift

Pick up trash around and on all levels of the incinerator, the quench pot and settling basin area.

D. Late Shift

Pick up trash around office, scrubber column, and drum storage and handling areas.

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IV. NORMAL OPERATIONS

1. Unloading Facilities

a. Tank Car

Returned tank cars will be unloaded at the north existing phenol unloading spot on Track No. 7 at the southwest corner of the building BB-T. An unloading pump (Item 110) has been provided, and an unloading arm for top unloading of the cars. The material is pumped from the car to one of the three 20,000 gallon storage tanks (Items 116, 117, and 118) through a common 3" transfer line which also serves the unloading dock sump pump (Item 125), the Aroclor sump pump (Item 121) and the drum unloading sump pump (Item 119). Care should be exercised when pumping to see that all valves from these other sources are closed.

b. Tank Truck

Return tank trucks of waste liquids will be unloaded in the area just west of the storage tanks. The truck will be backed into position from the road south of the incinerator area. A flexible hose will connect the bottom trailer outlet to unloading pump, (Item 111) which will pump the contents into one of the three storage tanks.

c. Drums

Most of the returned material will be in 55 gallon drums. These will be stored in a designated area for unloading. They will be sampled for solvent content and viscosity and then picked up one at a time by fork lift with attachment (Item 134) and deposited on the south end of the drum conveyor (Item 107). The conveyor consists of a south section for receiving cold drums (three maximum). The center section is a live steam drum heater (capacity 3 drums) and the north section is a storage section for hot drums. The drum heater section is an insulated chamber using live steam for heating. It has vertical sliding counter-weighted doors. Each conveyor section has a stop with a foot-operated escapement which allows separation of the end drum so the drum crane (Item 128) can be attached.

The drum crane is a hand-operated hydraulic crane with an adjustable boom length and a lifter-dumper attachment.

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IV. NORMAL OPERATIONS (contd.)

1. Unloading Facilities (contd.)

c. Drums (contd.)

The crane boom is swung over the drum on the conveyor and the lifter-dumper clamped around it. The drum is then raised several inches to clear the conveyor and then the boom is swung manually to a position north of the drum unloading sump. The wheel-operated dumper is then used to tilt the drum to discharge into the sump.

A pump (Item 160) and flexible line has been provided for pumping drums out into the sump.

2. Sump Systems

a. Incinerator Area Sump

The entire incinerator area, including the truck unloading and drum unloading areas is curbed and drains to a sump at the west side of the area. A sump pump (Item 120) actuated by level switch LS-120-1 pumps Aroclor spills and/or water to the 10,000 gallon settling basin (Item 124) at the west side of the old phenol pressure evaporation area.

b. Settling Basin

The Aroclor settles by gravity and the water flows off the top to the sewer, under a weir to prevent discharge of any floating material contaminated with Aroclor. When the Aroclor layer on the bottom reaches a predetermined level (approximately 3 ft.), as measured by level indicator LI-121-1, the water layer is pumped to the sewer manually using Water Sump Pump (Item 122).

Steam is then introduced to the sump heating coil to raise the Aroclor layer to a pumpable temperature. The hot Aroclor is then pumped manually to one of the three storage tanks using the common line described under Tank Car Unloading Facilities. Be sure all valves are properly positioned to pump to the storage tank.

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IV. NORMAL OPERATIONS (contd.)

2. Sump Systems (contd.)

c. Unloading Dock Sump

The unloading dock sump pump (Item 125) is located in an existing sump at the phenol unloading docks between tracks No. 7 and 7D. This sump collects any spills associated with tank car unloading or unloading pump or piping leakage. The pump is piped to both the common transfer line to the storage tanks or to a phenol waste tank, since phenol is also unloaded in this area. Operation of this pump is manual and will be used to pump Aroclor only in the event of a spill or leak in the unloading area.

d. Drum Dumping Sump

The drum dumping sump receives the returned Waste Liquid Aroclors which may contain contaminants such as mineral oil, solvents, etc. As these drums are dumped into the sump, pump (Item 119) actuated by level switch LS-119-1, pumps the waste liquids into one of the storage tanks.

3. Montar Collection System

Still residue, called "MONTAR" is collected in Department 246 and transported to the incinerator area by tank truck. The procedure is as follows:

The truck is filled with approximately 2000 gallons of waste liquid Aroclor from one of the storage tanks in the incinerator area, using tank truck unloading pump (Item 111). The trailer is then transported to Dept. 246 and loaded in a designated area north of the still. The hot "Montar" at approximately 200°C. is pumped from the still into the trailer, mixing with the Aroclor. When all the Montar has been collected, the trailer is transported back to the incinerator area and unloaded into storage, again using the tank truck unloading pump (Item 111).

The trailer should be moved to the incinerator area and unloaded as quickly as possible to prevent the lime solids from settling out.

4. Aroclor Storage Facilities

Aroclor materials to be incinerated will be stored in three 20,000 gallon tanks, Items 116, 117, and 118. The north tank, Item 118, will be used for Montar. Each tank is provided with a heating coil to keep the contents pumpable (maximum 100°C). The steam to the coils is manually controlled.

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IV. NORMAL OPERATIONS (contd.)

4. Aroclor Storage Facilities (contd.)

Local temperature indicators TI-116-1, TI-117-1, and TI-118-1 have been provided. Each tank is also provided with an agitator to provide a homogeneous mixture and to keep solids suspended. Each tank is also provided with a local level indicator (LI-116-2, LI-117-2, and LI-118-2).

Since the returned waste liquid Aroclors may contain other materials some of which will be flammable solvents, a nitrogen blanket has been provided for the storage tanks. Conservation vents (XE-116-3, XE-117-3 and XE-118-3) will relieve at 6 oz./in^2 positive pressure or 1 oz/in^2 negative pressure. Bottled nitrogen is provided by portable trailers which feed a regulator station at the south side of the area.

Piping has been provided to allow transferring the contents of any storage tank to any other storage tank. The storage tanks are tied together by 3" overflow lines at the tops.

A valve has been provided on a spare nozzle on the top of each tank so tank level can be checked by tape and plumb-bob.

5. Waste Feed System

Waste liquids are fed to the incinerator by a MOYNO positive displacement pump (Item 104). Normal pump discharge pressure at full feed rate (1250 lbs./hour) will be approximately 70-80 psig. Item 1-104 can pump from either the middle (Item 117) or the north (Item 118) storage tank. The pumping rate is governed by a variable speed drive. Maximum rate is approximately 4 GPM. The feed rate to the incinerator is regulated by controlling the pressure at the waste gun, normally 55-65 psig. A pressure controller (PC 104-7) at the incinerator opens or closes a control valve (PCV-104-7) in the return line to the storage tanks. A three-way valve (FCV 104-4) is set to return the excess waste to the selected feed tank (117 or 118). A back pressure control valve (PSV-104-1) set at 80 psig relieves excessive pressure/volume back to either storage tank. A DP cell flow indicator, FI-104-5, has been provided to measure the feed rate to the incinerator. 100% corresponds to an approximate 5 GPM feed rate.

6. Incinerator-Scrubber System

The incinerator system consists of the combustion air blower (Item 150), quench column (Item 151), incinerator (Item 102), quench pot (Item 152), venturi scrubber (Item 153), venturi circulating pump (Item 106), packed scrubber column (Item 154) and mist eliminator (Item 155).

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IV. NORMAL OPERATIONS (contd.)

6. Incinerator-Scrubber System (contd.)

The incinerator is a refractory lined furnace where the destruction of the waste liquids take place, resulting in various gaseous products (HCl, Cl_2, CO_2, H_2O). Also, when burning material containing Montar, some particulate matter results.

The waste liquid Aroclors require supporting fuel to maintain combustion at the proper temperatures. This is provided by interruptable natural gas normally, with a back-up fuel oil system.

The hot gases and particulates leaving the incinerator pass through the Hastelloy "C" quench column into the polyester lined quench pot where they are cooled and some HCl removed by two sets of water sprays. A water level is maintained in the quench pot and the gases impinge on the surface, and the loose brick lining on the walls. Liquid level is maintained in the quench pot by control valve LCV-81. HCl solution from the quench pot flows to the sewer. The scrubber circulating pump pulls solution from the packed scrubber and feeds the Hastelloy "C" venturi scrubber where most of the particulate matter and some additional HCl gas are removed. The gases then pass vertically up through the polyester lined packed scrubber, where the balance of the HCl is removed, through a ~~monel~~ polypropylene demister pad and to the atmosphere. Well water flows down the packed scrubber countercurrent to the gas. The HCl solution from the scrubber sump (120 GPM) flows to the sewer through a loop which maintains a level in the sump. The loop has a siphon break. The manual by-pass valve is partially opened to control the scrubber sump level.

7. Incinerator System Water Supply

The primary water supply for the contactor tube sprays and the packed scrubber is well water. A booster pump (Item 112) supplies the required pressure (120 psig). In addition, city water from the break tank (Item 126) is pumped (by Items 127 or 132) to a weir at the top of the contactor tube (25-35 GPM) which cools the tube walls. In addition, this city water supply is also an emergency backup for the well water to the contactor tube. If well water pressure falls below a preset point, the incinerator furnace is shut down and additional city water flows to the contactor tube weir to protect the polyester lining in the quench and scrubber systems.

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IV. NORMAL OPERATIONS (contd.)

7. Incinerator System Water Supply (contd.)

As an additional protection, a failure of city water automatically brings in fire water from the plant loop system. This is the ultimate protection to cover such things as plant power failure. The tie-in is underground just south of the oxidizer.

Well water is also supplied to two sets quench nozzles in the incinerator. These are used to control burner outlet temperatures when burning Montar. An 80 psig steam supply, reduced to 20 psig by PRV-102-4 is connected to the ~~nozzles~~ jackets for use in continually cooling the nozzles. Normally, the quench guns will be removed and purge air will provide cooling.

8. Auxiliary Fuel Supplies

Natural gas is supplied from an existing 8" header above the storage tank walkway. It is reduced from a header pressure of approximately 50 psig to approximately 35 psig by pressure reducing valve PRV-102-3. It is fed to the incinerator through a FIA approved series of safety shut-off and double block and bleed valving. Natural gas also feeds the pilot flame. The pilot gas supply will be non-interruptable. This arrangement of valves and special hardware is located at ground level below the east side of the incinerator. Gas flow is controlled by temperature controller TRC-15 to maintain the desired incinerator temperature. At high waste firing rates it is necessary to manually close the gas firing valve to achieve the desired pressure at the main gas burner.

Back-up fuel oil, for use when natural gas is interrupted, is contained in storage tank (Item 114) located northeast of the incinerator area, just north of the Interim PNA department. Pumps (Items 115 or 123) deliver fuel oil to the incinerator, again through FIA approved arrangement of safety valves and other hardware. Fuel oil flow is also controlled by temperature controller TRC-15.

9. Atomizing Steam

125 psig steam is available to the waste fuel burner and the fuel oil burner for use as a fuel atomizer. Normally an atomizing pressure of 70-85 psig is maintained through the guns.

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IV. NORMAL OPERATIONS (contd.)

10. Other Required Utilities

Instrument air is supplied from an existing header located on the pipe bridge from Santosite.

Plant air is supplied from an existing header located on the pipe bridge from Interim PNA.

Steam for pipeline tracing is from the existing 80 psig header. Tie-in point is on the pipe bridge running across the north end of the incinerator area.

Primary electric power feeder is from Substation No. 13 with an automatic switchover to Substation No. 4 in the event of a No. 13 failure. EMERGENCY POWER FEEDS THE CITY WATER PUMPS AND THE LIGHTING AND INSTRUMENT TRANSFORMER ONLY.

11. Condensate Collection

All steam condensate discharges to a header which runs to tank (Item 133), located on the east side of the control building at ground level.

Liquid condensate is discharged to the sewer. Flashed steam exits to the atmosphere through a Swartwout exhaust head.

12. Purge Air System

Plant air has been provided to the following with separate shut-off valves on each feed:

a. Incinerator Sight Ports (On east side and north end of oxidizer) - Purge air should flow continuous whenever incinerator is in operation. (Valve ~1/2 open)

b. Incinerator Quench Nozzles (On either side at south end of oxidizer) - Purge air should be turned on when changing nozzles in a hot oxidizer. (Full open)

c. Flame Scanner Assembly (On west side of Burner Plenum) - Purge air should flow continuously whenever oxidizer is in operation. (1/2 open)

d. Waste Liquid Burner - Purge air should be turned on when replacing gun in hot oxidizer. (Full open)

e. Fuel Oil Burner - Purge air should be turned on when replacing gun in hot oxidizer. (Full open)

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IV. NORMAL OPERATIONS (contd.)

12. Purge Air System (contd.)

f. Thermocouple for TRC (in north end of the oxidizer) - Purge air should be turned on only when removing or installing the thermocouple in a hot oxidizer.

g. The Rayotube requires continuous cooling. This, however uses instrument air, and city water cooling.

h. Pilot Assembly - Purge air should flow continuously while the incinerator is operating (valve 1/2 open).

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V. Pre-Startup Checkout

The following pre-startup items should be checked before proceeding with initiating the startup procedure:

1. Well water and city water pumps are operable, well water pump suction valve is open and the valve between the city H_2O break tank and the selected city water pump (127 or 132) is open.

2. Electrical power is on to the control panel.

3. Instrument air is on and regulated at 20 psig.

4. Pilot gas manual valves are open, except last valve at the burner.

5. Main gas manual valve at the burner is closed.

6. Open the main gas valve above 118 storage, open the inlet and outlet valves at the gas meter east of quench pot (152), close the by-pass valve around the gas meter.

7. Fuel oil manual valve at the burner is closed. Also atomizing steam manual valve at burner is closed. All other fuel oil and atomizing steam manual valves are open. Fuel oil gun is removed.

8. If startup is to be on fuel oil, align fuel oil valves at storage tank and pumps for pumping to the oxidizer. Manual shut off valve at the burner should be closed.

9. Waste liquid manual valve at the burner is closed. Also, atomizing steam manual valve at burner is closed. Manual valves at the incinerator feed pump (104) suction and discharge should be open. Atomizing steam supply valving should be open. Waste oil gun is removed.

10. Manual reset safety valves, SV-65 on the main gas; SV-67 on the fuel oil are closed.

11. Fuel gas and atomizing steam supplies are available at the required pressures:

    Fuel gas - 35 psig
    Atomizing steam - 100 psig (minimum)

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V. Pre-Startup Checkout (contd.)

12. Set incinerator feed pump speed for desired waste feed rate (1250 lb./hr. Design, 400 lb./hr. minimum).

13. Shutdown pressure, flow and temperature switches are set at the following values:

(TRC-15) Oxidizer Hi Temp. 2950°F. on Hi Ray

Oxidizer Low Temp. - 1600°F. on Lo Ray

(TS-4 & TS-5) Quench Pot Hi Temp. - 225°F.

(PSL-7) Low Fuel Gas Pressure - 7 psig

(PSH-6) Hi Fuel Gas Pressure - 50 psig

(PS-8) Low Fuel Oil Pressure - 70 psig

(PSL-9) Low Atomizing Steam pressure - 90 psig

(FS-10) Low Combustion Air Flow - 2.5 in H_2O

(PS-38) Low Well Water Pressure to Contactor Tube - 40 psig

(FS-37) Low Recycle Flow to Venturi - 8 GPM

(FS-127-2) Low City Water Flow to Contactor Wier - 12%

(PAL-104-6) Lo Waste Flow - 2.5 psig

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VI. Normal Startup

A. Well Water to Scrubber

1. Open inlet and outlet valves to either upper or lower well water strainer (use only one strainer on stream at a time).

2. Open outlet valve to the flow indicator (FI 88) to the packed scrubber column (154), be sure the by-pass valve at flow indicator is closed.

3. Open pump discharge valve and start well water booster pump (112).

4. Slowly open and adjust inlet valve to flow indicator (FI-88) to set flow at 70 gpm.

5. With by-pass valve open in scrubber column overflow line, check for discharge flow.

6. Close by-pass valve to establish level in scrubber column. Check for proper overflow.

B. Control Panel Power

1. Turn on master power switch on the control panel to activate the system. The RED "Low Oil Pressure" light, the RED "Flame Failure" Light, the WHITE "Power On" Light, and the RED "Quench Pot Low Water Level" lights will be lit. The remote flame failure alarm and panel alarm horn will be energized.

2. Depress "Alarm Silence" button to cut off alarm.

C. Well Water to Quench Column

1. Open valves to lower 5 spray nozzles at quench column (151).

1a. Close valves to top 5 sprays.

2. Open outlet valve and close by-pass valve at flow indicator (FI-87) to quench column (151).

3. Open inlet valve gradually and set flow at 30 gpm with 80-100 psig.

3a. Bypass valve cw-w.w. closed. For emergency only

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VI. Normal Startup (contd.)

C. Well Water to Quench Column (contd.)

4. Low pressure by-pass valve on quench pot overflow should be open.

D. City Water to Weir

1. City water break tank (126) is full (low level alarm is out).

2. Automatic fill system (LCV 126-2) is operating.

3. Open valve from flow indicator (FI 127-8) located west of combustion air blower motor, (150) and close by-pass.

4. Open discharge valves above selected pump (127 or 132) and start pump. Water is then circulating back to the break tank.

5. Slowly open valve to flow indicator (FI 127-8). This will establish approximately 20-30 gpm*of city water to weir ring on the quench column. (151) check
*25-40% on gauge)

E. Combustion Air

1. Open blower damper ~1/3 open.

2. Start combustion air blower.

3. Close low pressure by-pass valve on quench pot overflow, when water level rises sufficiently to begin flowing out.

4. Run the blower under these conditions for a minimum of one hour.

F. Venturi Circulating System

1. Open the inlet valves to the scrubber circulating pump (106) and the block valves at the bottoms of the quench pot (152) and packed scrubber column (154).

2. Open the discharge valves on the circulating pump discharge.

3. Start circulating pump (106).

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VI. Normal Startup (contd.)

F. Venturi Circulating System (contd.)

4. Throttle the regulating valve below the mag flow meter (FI 102-2) to set the desired recirculating rate to the Venturi (50 gpm at 55 psig pressure).

5. Recheck well water flows to quench column and scrubber column.

6. Check quench pot level control. (LC 92). LCV 81 should be controlling. High and low quench pot level alarms should be out. No water should be draining from low pressure by-pass.

G. Purge

1. Establish purge air to all nozzles protruding into the incinerator (102), and open valve to purple peeper.

2. Depress RED reset button on the "High Quench Pot Temperature" switch.

3. Turn the TRC switch on the control panel to "ON", push RED button on TRC until position meter reads 0%.

4. Thermal couple should be in place. Position the TC-Loray-Hiray switch to T.C.

5. Depress "Purge Start" button, lighting the BLUE "Purging Light" and energizing the Purge Timer (3 minutes). After timing out, the AMBER "Purge Complete" light and WHITE "Relay Hot" lights come on and the BLUE light goes out. Power is now available to the burner system.

6. Allow a minimum of 10 seconds for the "Flame Scanner" to warm up, then Open the Manual Pilot Gas Valve at the Burner. (South end of incinerator.)

H. Firing on Natural Gas

1. Turn gas combination oil selector switch to GAS. Be sure manual valve on the Main Gas Line is closed at the burner.

2. Depress the "Ignition" pushbutton and hold in until pilot is lit.

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H. Firing on Natural Gas (contd.)

3. If the pilot flame is established within 20 seconds, the GREEN "Pilot Proved" light is lit and the RED "Flame Failure" light goes out. Release the "Ignition" button 1-2 seconds after the GREEN light comes on. If depressed more than 20 seconds, the purge cycle will have to be repeated.

4. When the Flame Scanner picks up the pilot flame the GREEN "Gas Burner Ready" light comes on.

5. Allow the temperature to line-out while firing pilot only.

6. Manually latch OPEN the first Main Gas Manual Reset Valve SV-65.

7. Gradually open the manual gas firing valve until main burner ignition. Monitor flame from sight ports. Allow burner to stabilize and note light off temperature. Hold light off temp. as low as possible maintaining a stable flame. This will require 5-10 psig gas pressure. Increase oxidizer temp. following the refractory cure sequence by opening the manual firing valve until the valve is full open.

8. The automatic gas valve has a minimum stop which allows 10-12# gas pressure at the burner with the manual firing valve full open.

9. With the TRC output gauge zero'd, place the set point slightly below the operating temp.

10. Open solenoid valve SV-60. SV-60 will manually latch open 180 seconds after the manual reset solenoid is opened.

11. Switch the TRC to "Automatic". This puts the system in a high fire condition.

12. When the quench pot temperature has increased to 170°F. slowly open the upper spray ring (5 valves) in the quench column. (Crack w.w. valve to rotometer to prevent low pressure shutdown)

13. During warm up it will be necessary to open the fan damper to maintain the 25% excess air content to the burner. (4% O_2 on the analyzer or Fyrite).

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I. Firing ~~on Fuel Oil~~

Incinerator Heatup Procedure

TIME-HOURS	OXIDIZER TEMPERATURE (Maximums)
0 - 1	Raise to 500°F.
1 - 4	Hold at 500°F.
4 - 5	Raise to 600°F.
5 - 6	Raise to 800°F.
6 - 7	Raise to 1000°F.
7 - 8	Raise to 1200°F.
8 - 9	Raise to 1400°F.
9 - 10 Switch to Lo Ray	Raise to 1600°F.
10 - 11	Raise to 1800°F.
11 - 12 Switch to Hi Ray	Raise to 2000°F.
12 - 13	Raise to 2200°F.
13 - 14	Raise to 2400°F.
14 - 15	Raise to 2600°F.

A slower heat-up is desirable to prolong incinerator brick life.

HOT STARTUP AFTER TEMPORARY SHUTDOWN

Over a period of 30 minutes, gradually increase the temperature to 1000°F. Hold this temperature for one hour. Gradually increase to 1200°F. over a one hour period. Gradually increase to 1400°F. over a one hour period. Gradually increase to 1600°F. over a one hour period. Switch to Lo Ray. Gradually increase to 2000°F. over a one hour period. Switch to Rayotube before proceeding. Gradually increase to 2200°F. over a one hour period. Gradually increase 2400°F. over a one hour period. Gradually increase to 2600°F. over a one hour period.

Notes

a. For operating temperatures up to and including 1600°F. the temperature sensor is thermocouple (Item 18). For operating temperatures above 1600°F. up to and including 2700°F. the sensor is the Leeds and Northrup Rayotube.

b. There is a 3-position selector switch on the control panel marked TC- LO RAY HI RAY. This switch should be set on TC when operating up to 1600°F., LO RAY from 1600°F. to 2000°F. and HI RAY from 2000°F. to 2800°F.

c. A Honeywell system is provided with a flame scanner operating on the pilot flame. Loss of pilot flame shuts down all fuel to the incinerator.

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J. Waste Feed

1. Select storage (117 or 118) to be incinerated. Open proper outlet valve. Position 3-way valve (w/air 117 or w/o air 118).

2. The incinerator must be at least 1600°F. before wastes can be fed (on LO RAY scale).

3. Wastes containing Montar are to be burned at 1900-2000°F. Other wastes are to be burned at 2000-2700°F.

4. Insert waste gun,

5. Be sure the manual valve on the waste feed line at the furnace is closed. Then open the manual atomizing steam valve at the burner. Pressure on the gage should be 60-70 psig.

6. Depress the "waste start" pushbutton on the panel. This opens flow control valve FCV-80 in the waste line and makes waste liquid available at the manual valve.

7. Start waste pump. (104)

8. Increase air damper setting to give 8-12% O_2.

9. Lower TRC set point below operating temperature (gas valve goes to minimum stop).

10. Set PC-104-3 setpoint to minimum.

11. Slowly open the manual valve admitting waste to the burner.

12. Trim up waste and steam flow to desired rate over 1/2 hr. period. Holding steam pressure to a minimum of 15# over the waste feed pressure.

13. As more waste is brought on the main gas pressure must be reduced to maintain 4-6% O_2

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Normal Startup (contd.)

K. Switch from Natural Gas to Fuel Oil

1. Stop waste flow to burner by depressing WASTE STOP button.
2. Insert fuel oil gun.
3. Open the manual valve at the burner admitting atomizing steam. Set pressure at 60-70 psig.
4. Be sure fuel oil pump is running and valving is set to deliver fuel oil to the burner. The manual valve at the burner should be "closed". Must have steam to PSL-9 also.
5. Turn GAS-OIL-COMBINATION selector switch to COMBINATION position. Amber"Fuel Oil Ready" light will come on.
6. Lower TRC 15 set point to close the gas control valve (FCV 79) to minimum stop.
7. Manually latch OPEN the Manual Reset Fuel Oil Valve (SV-67) and slowly open the manual fuel oil valve at the burner to give 45-55 oil pressure at gun.
8. Both gas and oil are now being fed to the incinerator at the minimum stop rates.
9. Turn 3-WAY selector switch to "OIL". Natural gas flow will shut off. The oxidizer is now operating on OIL only.
10. Slowly operate manual oil firing valve fully. This activates the low-fire timer.
11. After the timer times out SV-61 may be latched open.
12. Return the system to automatic control.
13. Reset TRC to desired temperature.
14. Re-establish waste flow by depressing the WASTE START button and starting pump. (104) Use procedure similar to gas firing.
15. Close manual valve in natural gas line at the burner.

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NORMAL OPERATIONS (contd.)

L. Switch from Fuel Oil to Natural Gas

1. Stop Waste flow to burner by depressing WASTE STOP button.
2. Turn GAS-OIL-COMBINATION selector switch to the COMBINATION position.
   Check that the manual main gas valve at the burner is closed.
3. Lower TRC 15 set point to minimum stop on the oil control valve. (FCV 78)
4. Manually latch OPEN the main gas Manual Reset Valve SV-65. Also slowly open the manual valve in the main gas line at the burner.
5. Both gas and oil are being fed to the incinerator.
6. Turn 3-WAY selector switch to GAS. The fuel oil will shut off. The oxidizer is now operating on GAS ONLY.
7. Return unit to automatic control.
8. Reset TRC to desired temperature.
9. Close manual fuel oil valve at the burner.
10. Close manual atomizing steam valve at the burner.
11. Steam and remove fuel oil gun.
12. Shut off fuel oil pump.
13. Restart waste feed to incinerator.

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CHECK LIST FOR INCINERATOR STARTUP

DATE: _____

Step	Time	OPERATOR
1. Pre-startup		
A. Utilities Available	_____	_____
1) Electrical power		
2) Steam		
3) Well Water		
4) City Water		
5) Instrument Air		
6) Plant Air		
7) Natural Gas		
B. Manual Valves at Incinerator Closed	_____	_____
1) Pilot Gas		
2) Main Gas		
3) Waste Feed		
4) Atomizing Steam		
5) Fuel Oil		
6) Quench Water		
C. Power to Control Panel	_____	_____
D. Well Water Systems	_____	_____
1) Align Valves		
2) Start Pump		
3) Set Flows		
E. Venturi Circulating System	_____	_____
1) Align Valves		
2) Start Pump		
3) Set Flow		
4) Check levels		

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Step	Time	Operator
F. City Water System	_____	_____
1) Align Valves		
2) Start Pump		
3) Set Flows		
G. Combustion Air	_____	_____
1) Set Butterfly		
2) Start Blower		
H. Temperature Controller	_____	_____
1) TRC On		
2) Thermocouple		
3) Selector Switch		
4) Control Valve Closed		
I. Purge	_____	_____
J. Pilot	_____	_____
1) Manual Valves Open		
2) Ignition		
3) Pilot Proved		
K. Fire Main Fuel	_____	_____
1) Open Manual Valves		
2) Reset Solenoids		
3) Raise temperature slowly		
L. Fire Waste	_____	_____
1) Align Valves		
2) Waste Start		
3) Start Pump		

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VII. SHUTDOWN PROCEDURES

A. For Extended Downtime

A normal shutdown will be one which is unforeseen due to lack of waste material for incineration, mechanical turn-arounds, pre-scheduled mechanical work or any situation which will allow time for a safe and orderly shutdown of all equipment. It is important that outlined procedures be followed to assure operator safety and to minimize the risk of damage to operating equipment.

1. Shut off flow of waste liquid to the incinerator (Item 102) by depressing "WASTE STOP" push button on the control panel. This will close the flow control valve (FCV-80) in the waste feed line just to the south of the control panel.

2. Reduce air by closing damper to ~1/2 open.

3. Close manual waste shut off valve at south end of incinerator (Item 102).

4. The (Moyno) waste feed pump (Item 104) located at ground level between storage tanks #116 and #117 will stop automatically when the flow control valve (FCV-80) closes.

5. Open crossover steam to the waste gun to steam out trapped waste to avoid charring and gun plugging.

6. Stop atomizing steam flow to the incinerator by manually closing the valve located on the incinerator platform.

7. Pull the waste gun.

8. Decrease incinerator temperature gradually to 1000°F. This is done by periodically lowering the temperature recorder controller set point (TRC-15). Do not exceed 200/hr. rate of reduction. The TRC is located in the control panel.

9. Once minimum stop is reached on the control valve, the manual gas firing valve must be partially closed to reduce gas pressure (~ 1#/hr.)

10. When the incinerator temperature (TRC-15) reaches 2000°F. set the selector switch to Loray.

11. When the incinerator reaches 1600°F., set the selector switch to TC.

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VII. SHUTDOWN PROCEDURES (continued)

A. For Extended Downtime (continued)

12. When incinerator temperature has been reduced to 1000°F. hold for at least sixty (60) minutes. Monitor periodically to see if temperature is remaining constant.

13. Close the main gas or fuel oil manual shut off valve at the incinerator. These are located at south end of incinerator on second level platform.

14. If burning fuel oil at the time of shutdown, close the manual atomizing steam valve at the incinerator after temperature has been reduced to 1000°F. and held for sixty (60) minutes. Use cross over steam to blow gun.

15. If burning fuel oil shut down the fuel oil pump (Item 115 the south pump or Item 123 the north pump). These pumps have manual on/off switches which are adjacent to the pump. The pumps are located west of fuel oil storage tank (Item 114) next to Area 9 shop.

16. Continue to burn pilot until temp. levels off.

17. Close the manual pilot gas valve at the south end of the incinerator, when pilot is cut off.

18. Turn off top five sprays to quench column when temp. $<500^{\circ}F$.

19. Cut back on combustion air flow to incinerator by throttling butterfly valve. Maintain minimum combustion air flow. Variables such as outside temperature will be a factor in the cooling rate of the incinerator.

20. The combustion air blower will always be left on until the incinerator temperature drops to 300°F. When 300°F. has been reached shut down blower by depressing blower "OFF" button.

21. Open the low pressure by-pass valve at the quench pot if level permits.

22. Close the manual gas valves at the meter and south of the control panel.

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VII. SHUTDOWN PROCEDURES (continued)

A. For Extended Downtime (continued)

23. With incinerator temperature 150°F. or lower, stop the well water pump. Close manual valves at pump, to scrubber column, and to quench column.

24. After fire water timer has timed out, stop city water to weir. Close manual valves at pump and to weir.

25. Stop circulating pump (106) and close valves to Venturi.

26. Drain quench pot and scrubber to sewer.

27. Close manual valves at quench pot and scrubber column.

28. Turn "Master Power Switch" on panel to OFF.

29. In winter drain water in all trapped piping legs. Also close city water to break tank (126) and drain.

B. For Short Term Downtime

This procedure will be followed for shutdowns of several days or less. It is assumed mechanical work or other short term outages will allow the resumption of operations without going through extended shut down procedures. It is important that these procedures be followed to assure operator safety and to minimize the risk of damage to operating equipment.

1. Shut off flow of waste liquid (Aroclor) to the oxidizer (incinerator Item 102) by depressing "Waste Stop" push button on the control panel. This closes the flow control valve (FCV-80) in the waste feed line just to the south of the control panel.

2. Close manual waste shut off valve at incinerator (Item 102). This is at south end of incinerator on second level platform just above the floor plate.

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VII. SHUTDOWN PROCEDURES (continued)

B. For Short Term Downtime (continued)

3. The (Moyno) waste feed pump (Item 104) located at ground level between storage tanks #116 and #117 will stop automatically when the flow control valve (FCV-80) closes.

4. Blow waste gun and pull.

5. Decrease incinerator temperature gradually to 1600°F. The same procedures should be followed as for an extended shut down.

6. If shutdown is expected to last less than twenty-four (24) hours allow the unit to operate at 2000°F. This will require less heat up time when operations resume.

7. If shutdown is expected to last over twenty-four hours and/or up to 7 days, reduce the incinerator temperature to 1600°F. and allow the unit to continue operating.

8. Supervision will direct further shutdown procedures.

C. Temporary Hot Shutdown Procedure

1. This thermal oxidizer system has been equipped with a corrosion liner of polyester material. This liner may be damaged if extreme care is not taken during temporary shutdown periods.

2. Shut off all waste flow and purge out and pull the waste guns.

3. Reduce oxidizer temperature to the lowest point time will allow.

4. Increase weir water flow to maximum.

5. Shut off fuel to the main burner and pilot.

6. Close damper to 1/3 open on the blower.

7. Close off the upper 5 quench spray block valves.

8. Shut off blower and close blower damper.

This type of shutdown is intended to be used when short term repairs or adjustments are to be made. When the down time is to exceed one hour a normal shutdown should be used.

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VII. SHUTDOWN PROCEDURES (continued)

D. Emergency Shutdown Procedure

This procedure is used to shut down and render the unit safe in any emergency situation, where personal injury is threatened. Emergency conditions may be such things as a minor explosion. This shut down should not be used unless absolutely necessary.

1. Cut electrical power to the unit by turning off the "Master Power Switch" on the control panel which is located under the incinerator (Item 120) at ground level.

2. By turning the "Master Power Switch" to the off position there will be a loss of power on all controls and they will go to a fail safe condition. The following will then occur:

   a. Main Gas - Closes and vents
   b. Fuel oil - If in use will close
   c. Pilot gas - Closes and vents
   d. Waste liquid (Aroclor) - Closes and pump stops
   e. Combustion air blower - Stops
   f. City water to weir continues
   g. Well water to quench column and scrubber column continue. Damage to the incinerator brick will occur unless the top 5 sprays are closed.
   h. Circulating water to Venturi continues.
   i. Fire water to weir starts

3. If prevented from reaching the control panel, the same emergency shut down results may be obtained by throwing the main control panel disconnect at the motor control center which is located on the second level above the control room.

4. If time and conditions permit (1) close the 5 quench column sprays, (2) close damper, and (3) close the manual valves on natural gas or fuel oil lines. Also close the manual valve in the waste liquid (Aroclor) line.

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VII. (Cont'd)

CHECK LIST FOR NORMAL SHUTDOWN

Step	Time	Operator
A. Stop Waste	_____	_____
1) "Waste Stop" Button		
2) Pump Stops		
3) Close Valves		
4) Blow Gun		
5) Remove Gun		
B. Gradually Lower Incinerator Temperature	_____	_____
1) 200°F./Hr. Rate of Decrease		
2) Selector Switch		
3) Thermocouple		
C. Main Fuel	_____	_____
1) Gas or Oil		
2) Hold at 1000°F.		
3) Close manual valves		
D. Combustion Air	_____	_____
1) Adjust Butterfly		
2) Stop at 200°F.		
3) Open By-Pass		
E. Well Water	_____	_____
1) Stop pump at 150°F.		
2) Close Valves		
F. Circulation Pump	_____	_____
1) Stop Pump		
2) Drain Equipment		
3) Close Valves		

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VII. (Cont'd)

CHECK LIST FOR NORMAL SHUTDOWN (continued)

Step	Time	Operator
G. City Water	_____	_____
1) Timer		
2) Stop Pump		
3) Close Valves		
H. Cut Control Panel Power	_____	_____

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VIII. MATERIALS HANDLING

A. Instruction for Material in Drums and Disposing of Empty Drums

Aroclor in drums will be delivered by the Warehouse Department to Dept. 831 via Stradolift. All full drums will be handled by fork lift or drum hoist, to be dumped or pumped into the drum unloading sump. Careful handling of material is very necessary to minimize any spills. The following instructions will be followed:

1. All drums delivered to area must be gas tested before unloading from pallet.

2. Any drum that is more than 0.1 on the gas tester is considered a flammable drum. Each flammable drum is to be dumped with at least six (6) drums that are not flammable.

3. A live steam drum heater is provided for any drum that will not pour freely. This is determined by sticking each drum with a rod that is provided. Do not heat any flammable drum.

4. Position drums on conveyor, using drum snatcher, that fits over the forks of the lift truck.

5. After conveyor is full, dump each drum one at a time using drum hoist.

6. A pump (160) is provided at the drum unloading sump to permit pumping of drums containing lighter materials.

7. The valves should be lined up to the selected tank and the sump pump (119) switched to automatic.

8. Replace all bungs in drums.

9. Empty drums will be stacked neatly in area designated by supervision. Remove drums by placing on pallet moving four (4) at a time.

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VIII. MATERIALS HANDLING

B. Loading and Unloading of Trailer

Some waste material will be received in tank trailer. In addition it will be necessary to load some tank trucks for picking up montars at Department 246.

Loading

These instructions begin after tank trailer has been spotted in department.

1. Attach ground cable to trailer.
2. Have driver cut motor on truck, set brakes and chock wheels. If trailer is dropped, place stand under front end of trailer.
3. Attached flexible hose from loading dock to quick coupling that is provided on top of trailer.
4. Measure tank and align all valves in line for pumping waste Aroclor to tank truck.
5. Start pump (111).
6. Pump approximately 2000 gallons of waste material from desired storage tank to trailer.
7. Stop pump, close all valves in line. Allow flexible hose to drain (5) five minutes to trailer. Secure hose.
8. Remove grounding cable. If tractor is attached to trailer remove chocks. Notify driver that trailer is ready for delivery.

Unloading

The following instruction begins when after a truck has been spotted for unloading.

1. Attached ground cable.
2. Have driver shut off motor, apply brakes, and set cocks.

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VIII. MATERIALS HANDLING (continued)

B. Loading and Unloading of Trailer (contd.)
Unloading (continued)

3. Connect hose from unloading pump to bottom of trailer.

4. Align valves in line for unloading of trailer to storage tank #118.

5. Be sure trailer is vented by opening fume nozzle on top of truck.

6. Start pump (111) and begin unloading.

7. When truck is empty, pressure will decrease on pump as indicated on pressure gauge (PI-111-1).

8. Stop pump and measure tank.

9. Close all valves in line.

10. Secure truck and trailer, notify driver that empty truck is ready to be removed.

C. Instructions for Unloading of Tank Cars

Some waste material will be received in tank cars. These cars will be spotted on Track 7 at Phenol unloading dock for unloading. Precautions must be taken to avoid any spills. If spills occur, there is a trench sewer and sump equipped with pump for pumping waste material to storage tank. To assure a safe operation, the following instructions are to be followed:

1. Hang blue track flag on semaphore.

2. Hook up ground connections and place wheel chocks in place.

3. Open dome vent. Remove dome cover.

4. Connect flexi hose to standpipe.

5. Gas test car.

6. Open hand valve at suction side of pump

7. Close drain in bottom of line at pump.

8. Be sure line from sump is locked out.

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VIII. MATERIALS HANDLING (continued)

C. Instructions for Unloading of Tank Cars (contd.)

9. Open valves in discharge line to desired storage tank. Check to be sure all other valves are closed.

10. Measure storage tank to be sure enough room is available to hold car.

11. Hold switch in "ON" position until enough line pressure will let pump run until low pressure again shuts down pump.

12. Disconnect car, close valves, secure track and measure storage tank.

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EQUIPMENT LIST

Item No.	Description	Material of Constructions
101	Montar Tank Trailer	Carbon Steel
102	Incinerator	Refractory-Lined Carbon Steel
151	Quench Column	Hastelloy "C"
152	Quench Pot	Polyester-Lined Carbon Steel
153	Venturi Scrubber	Hastelloy "C" Polyester Ductwork
154	Packed Scrubber Column	Polyester-Lined Carbon Steel
155	Demister Pad	~~Monel~~ Poly Propylene
150	Combustion Air Blower	Carbon Steel
104	Incinerator Feed Pump Moyno Positive Displ.	Stator - Vitron A Rotor - Chrome Plated Tool Steel Housing - Cast Iron
160	Drum Pump	Carbon Steel
106	Scrubber Circulating Pump	Chlorimet 3 (Hastelloy "C")
107	Drum Heater	Structural Steel Frame; Insulating Board Enclosure
110	Tank Car Unloading Pump	Worthington Self-Priming (Worthite)
111	Tank Truck Unloading Pump	Durco A20 (Ductile Iron)
112	Well Water Booster Pump	Durco A-70 (Alloy 20)
114	Fuel Oil Storage Tank (20,000 Gallons)	Carbon Steel
115, 123	Fuel Oil Pumps	Roper Gear Cast Iron
116, 117, 118	Waste Storage Tanks (20,000 Gallons)	Carbon Steel
119	Drum Unloading Sump Pump	Taber Vertical Ductile Iron
120	Incinerator Area Sump Pump	Taber Vertical (304 SS)
121	Aroclor Sump Pump	Goulds Vertical Ductile Iron
122	Water Sump Pump	Taber Vertical (304 SS)
124	Settling Basin	Concrete
126	City Water Break Tank	Carbon Steel
127, 132	City Water Pumps	Patterson (Semi-Steel and Bronze)
128	Drum Crane Capacity 2000 lbs.	Air Technical Industries
133	Condensate Tank	Carbon Steel
131	Fork Lift	

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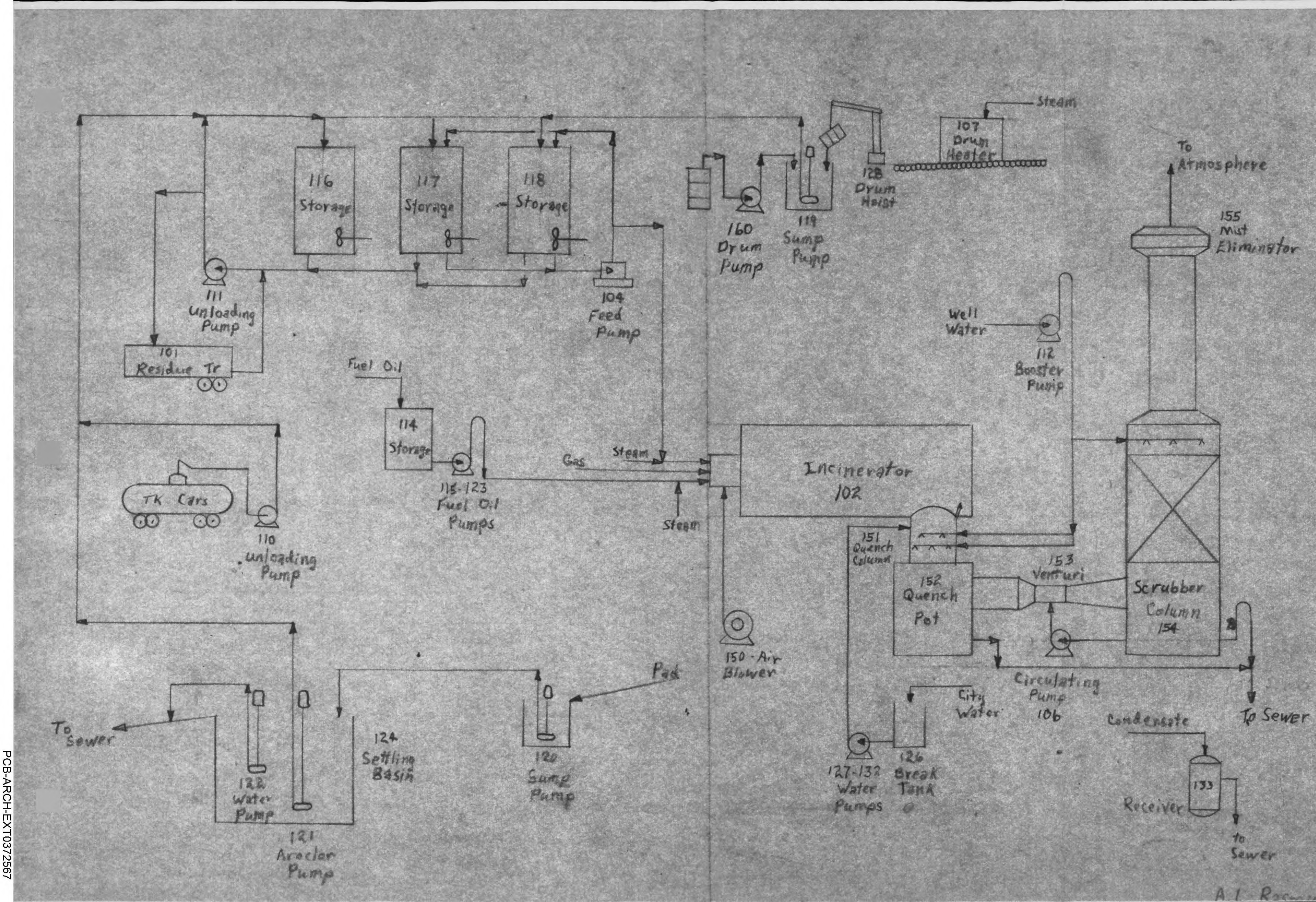

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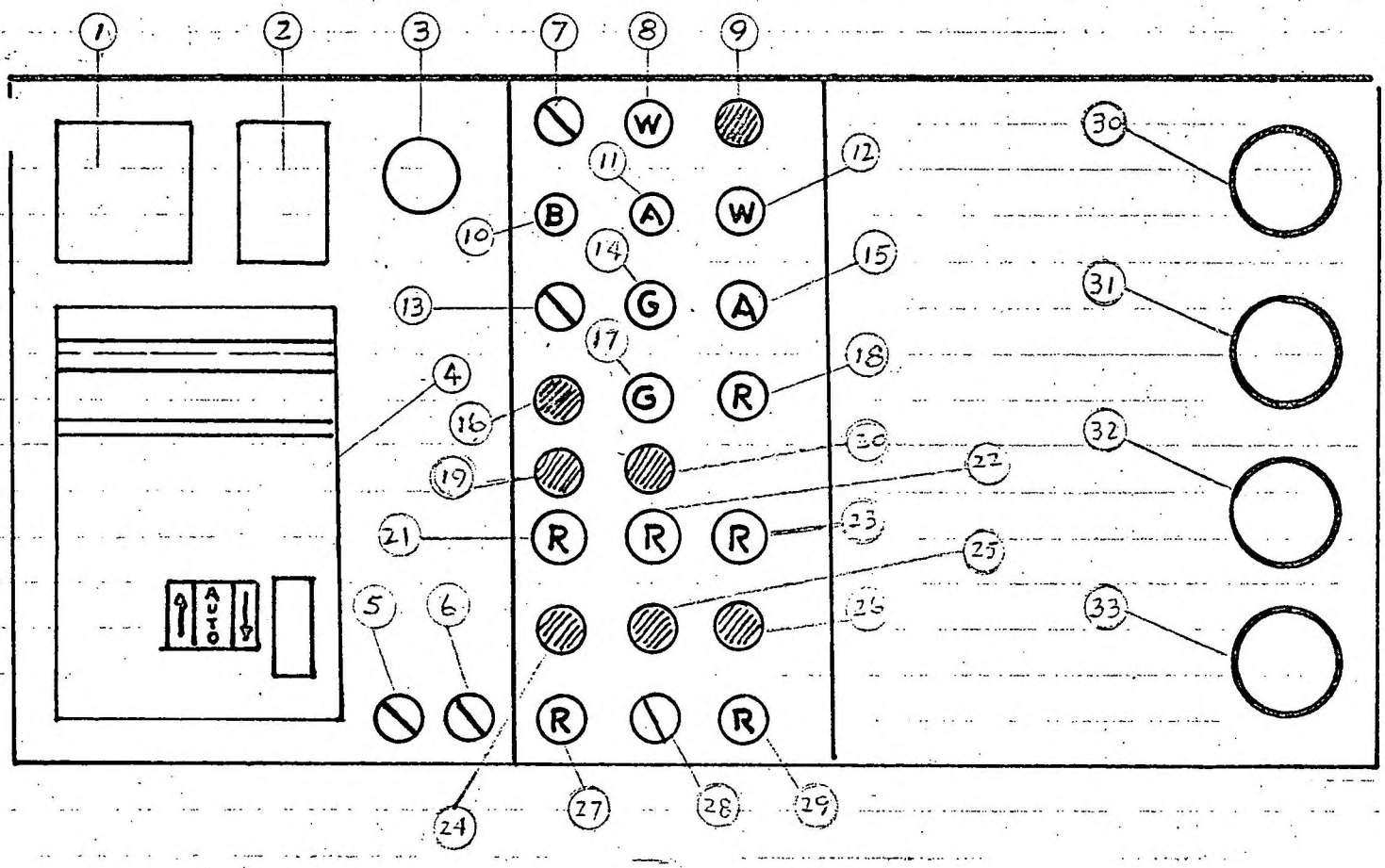
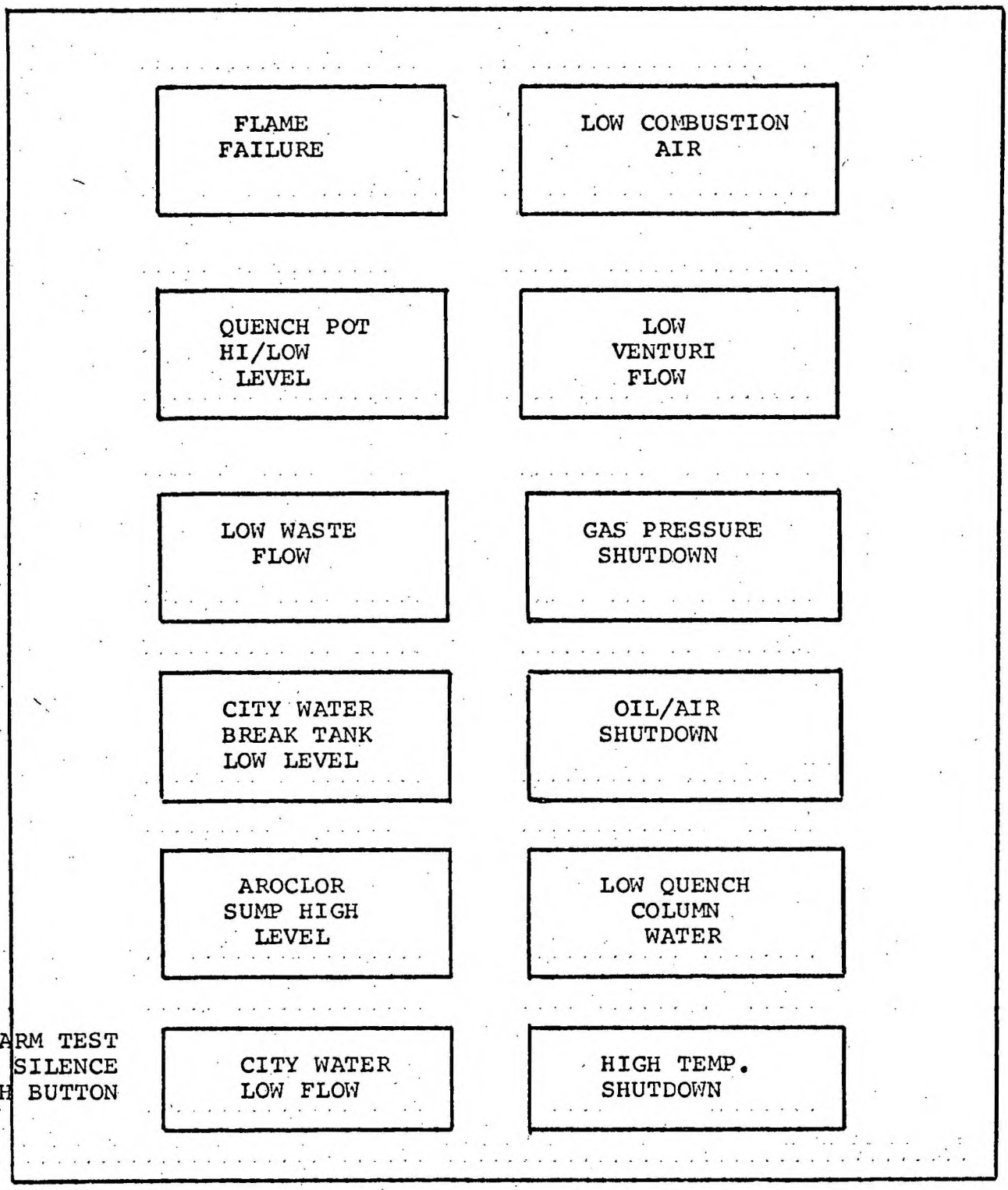


1. Quench pot high temperature indicator
2. Venturi circulating liquor flow indicator
3. Combustion air pressure gauge
4. Temperature recorder controller
5. Temperature recorder controller off/on switch
6. Thermo-couple-Lo Ray-High Ray selector switch
7. Master power off/on switch.
8. White light indicating power on
9. Blue push button to start purge
10. Blue light indicates purging
11. Amber light indicates purge complete.
12. White light indicating relay hot
13. Selector switch for gas-Combination-Oil
14. Green light indicates gas burner ready.
15. Amber light fuel oil ready
16. Black push button for ignition
17. Green light indicates pilot proved.
18. Red light indicates flame failure
19. Red push button to stop waste
20. Green push button to start waste
21. Red light indicates quench pot low level
22. Red light indicates quench pot high level
23. Red light indicates low oil pressure
24. Orange push button to silence alarm
25. Green push button to start blower
26. Red push button to stop blower
27. Red light indicates city water break tank low level
28. Hi-Low Combustion air flow switch
29. Red light indicates city water low flow
30. Timer for purge
31. Timer for ignition
32. Timer for low fire time delay
33. Timer for fire water time delay

PCB-ARCH-EXT0372568

ALARM PANEL



PCB-ARCH-EXT0372569

Process Area or Step	Variable Or Parameter	Description of Parameter As It Affects Safety, Quality, Yield Rate Or Other	Range For Best Known Process Performance	Frequency Of Monitoring	Measurement of Variable			Interaction With Other Variables	How Control Variables	Comments
					Frequency	Method	Accuracy			
	1. Water flow rate (FI 127-8) to weir.	Indicates city water flow rate to quench column weir.	35 ± 5%	Hourly by operator.	Continuous	Magnetic rotameter	±1%	FS_L 127-2 Opens SV 127-7 2) Closes SV 127-5 3) Cuts incinerator power 4) Cuts blower power 5) Alarms	Adjust manual valve.	Needed for cooling Hast.C quench column; 1% = .75 gpm
	2. Water flow rate (FI 87) to quench column.	Indicates well water flow rate to quench column sprays.	85 ± 5	Hourly by operator	Continuous	Armoured rotameter	± 1.2 gpm	FS_L 38 1) Opens SV 64 2) Cuts incinerator 3) Cuts blower power 4) Closes SV 127-5	Adjust manual valve.	Needed to quench the hot gases and protect the polyester lining.
	3. Water flow rate (FI 88) to scrubber	Indicates well water flow rate to scrubber column distribution header.	70 ± 10 gpm	Hourly by operator.	Continuous	Armoured rotameter	± 1.5 gpm		Adjust manual valve.	Needed as final scrubber to remove HCl.
	4. Liquor flow rate (FI 106-2) to venturi	Indicates circulating liquor flow rate to venturi scrubber	55 ± 5	Hourly by operator.	Continuous	Magnetic flowmeter	± .8 gpm	FS_L 1) Cuts waste feed.	Adjust manual valve.	Needed to scrub particulate matter.
	5. Pressure (PI 82) in quench pot	Indicates pressure of the quench pot.	80 ± 5 in H_2O	Hourly by operator.	Continuous	Pressure gauge	± 1 in H_2O	High pressure indicates pluggage in the scrubbing system.	Adjust air-fuel rates to incinerator.	
	6. Temperature (TIS^H) in quench pot	Indicates temperature of the quench pot.	205 ± 5°F	Hourly by operator.	Continuous	Iron constantan thermocouple	±5°F	High temperature: 1) Cuts incinerator power 2) Opens SV 64	1. Control incinerator temp. 2. Manual adjust water flows	High temp. can damage the polyester lining.
	7. Level (LC 92) of quench pot	Indicates liquid level in quench pot.	(9 ± 2 PSIG)	Hourly by operator	Continuous	Liquid level displacer	± 1 PSIG	1. High level alarm 2. Low level alarm	Automatic control loop to LCV 81	1. High: excessive back pressure; effect on quench pot [redacted] Temp.
	8. Pressure (PI 56) of combustion air	Indicates discharge pressure from combustion air blower.	80 ± 5 in H_2O	Hourly by operator.	Continuous	Magnehelic pressure gauge	± 1.5 in H_2O	1. FS_L 10 cuts incinerator power 2. Indirect measure of incinerator pressure	Adjust manual butterfly valve	Orsat analysis to get 25% excess air at maximum firing rate; equivalent of 4% O_2
	9. Temperature (TRC 15) of the incinerator.	Indicates temperature of the gases in the discharge end of the incinerator.	2000° ±25°F w/ Montars; w/ Aroclors (2200-2600)	Hourly by operator	Continuous	<1600°F Platinum-Rhodium thermocouple	±8°F	1. TS 18-76 cuts power to incinerator b 2. TS 18-76L stops waste liquid feed	Adjust setpoint on TRC 15; modulates the auxiliary fuel rates	High temp. or sudden changes can damage the refractory.
						>1600°F Rayotube	±8°F			

PCB-ARCH-EXT0372570

Process Area Or Step	Variable Or Parameter	Description of Parameter As It Affects Safety, Quality, Yield Rate Or Other	Range For Best Known Process Performance	Frequency Of Monitoring	Measurement of Variable			Interaction With Other Variables	How Control Variables	Comments
					Frequency	Method	Accuracy			
	10. Pressure (PI 53) of waste liquid feed	Indicates pressure of the waste liquid feed at the burner nozzle.	60±5 PSIG	Hourly by operator.	Continuous	Pressure gauge	± 2 PSIG	1. High-low flow due to nozzle pluggage. 2. Low-low flow due to lack of pressure	Manually adjust variable speed on 104 pump	Periodically check flow rate w/bucket-stopwatch.
	11. PCB to the sewer from Dept. 831	Indicates pounds of PCB per day lost from department.	0.25#/day	Daily by lab analysis and foreman calculation	Continuous 24 hr. sewer sampler composite	Lab analysis for ppb PCB estimated daily sewer flow	±.10#/day	Plant goal of <2# PCB per day	1. Control spills 2. Reduce water flows 3. Efficiency incinerator operation	Poor method, but best available.
	12. Oxygen in quench pot gases	Indicates fuel to air ratio in the incinerator.	4-6%	Hourly by operator.	Continuous	Ampero-metric	± 1.5%	1. High - poor fuel efficiency 2. Low - incomplete oxidation	1. Manually adjust blower damper 2. Manually adjust fuel rates	Beckman O_2 analyzer.

KIMBERLY-BONNER & ASSOCIATES

PCB-ARCH-EXT0372571

XII. KEY VARIABLES

VARIABLE LISTING

CITY WATER

Item	Name	Function
PS_L 126-1 PA 126-1	Pressure switch/alarm on air to city water make-up LCV.	Sounds alarm on low city water level in break tank (126); and lights red light on control panel (CP) and alarm in control room (CR).
LE-126-2 LC-126-2 LCV-126-2	Level control loop on city water break tank.	Measures level of water in break tank (126); adds city water as needed; valve is ATC.
PI 127-1	Pressure indicator on city water pumps discharge.	Measures pump condition and pressure available to weir (also emergency water).
SV 127-5	Solenoid valve in city water recirculation to break tank.	Closes on low city water flow (FS 127-2).
FS_L 127-2 FA 127-2	Flow switch/alarm on city water to weir.	Low flow: 1) opens fire water solenoid (SV 127-7); 2) sounds alarm, lights red low flow city water and alarm in CR; 3) cuts power to flame safeguard system, 4) cuts power to air blower.
FI 127-8*	Rotameter in city water line to quench column.	Measures city water flow to quench column weir.
FO ~~127-4~~	~~Flow orifice on~~ city water to weir. removed	Restricts normal city water flow ~~to quench column weir.~~
SV 64	Solenoid valve in emergency city water to weir.	Opens on low well water flow (FS_L 38) to quench column; also on 1) high incinerator temperature (TS 18-76H) or, 2) high quench pot temperature (TS 4^H or TS 5^H).
PRV-127-9	Pressure regulator on city water to weir.	Reduces city water pressure from pumps to prevent back-up into fire water system.

WELL WATER

PI 112-1	Pressure indicator on discharge of well water booster pump.	Measures pump condition; with PI 112-2 measures pressure drop across strainers.

*Denotes key variable.

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XII. KEY VARIABLES (Cont'd)

WELL WATER (Cont'd)

Item	Name	Function
PI 112-2	Pressure indicator downstream of well water strainers.	With PI 112-1, measures pressure drop across strainers.
FO 112-3	Flow orifice in well water to quench column sprays. removed	Restricts well water flow to quench column sprays.
FI 87*	Rotameter in well water to quench column sprays.	Measures well water flow to quench column sprays.
PS_L 38 ✓	Pressure switch in well water to quench column sprays.	Low pressure: 1) opens emergency city water solenoid (SV 64); 2) cuts power to flame safeguard; 3) cuts power to air blower (150); 4) closes recirculating solenoid (SV-127-5); 5) activates alarm panel in CR.
PI 53-4	Pressure indicator on well water to quench column sprays.	Measures pressure of well water available to quench column sprays.
FO 112-4	Flow orifice in well water to scrubber column.	Restricts well water flow to packed column scrubber distribution header.
FI 88*	Rotameter in well water to scrubber column.	Measures well water flow to packed column scrubber distribution header.
SV 63	Solenoid valve in well water to quench guns.	Closes on loss of pilot flame (BE 2); opens on proof of pilot.
FO 127-3	Flow orifice in well water line to quench guns.	Restricts flow of well water to quench guns.
PI 53 (two)	Pressure indicator on well water to quench guns.	Measures well water or steam pressure at incinerator quench guns.
FI 86	Rotameter in well water line to quench guns.	Measures well water flow to quench guns.

*Key variable.

PCB-ARCH-EXT0372573

XII. KEY VARIABLES (Cont'd)

FIRE WATER

Item	Name	Function
** SV 127-6	Solenoid valve in back-up fire water line.	Opens on proof of pilot (BE 2); loss of pilot actuates timer to close; FLP.
** SV 127-7	Solenoid valve in back-up fire water line.	Opens on low city water flow (FS_L 127-2); FO.

CIRCULATING SYSTEM

PI 85	Pressure indicator on circulating liquor to venturi scrubber.	Measurement of pump performance; measures pressure of circulating liquid to venturi scrubber.
FI 106-2*	Flow indicator in circulating liquor to venturi scrubber.	Measures flow of circulating liquid to venturi scrubber.
FS_L 37	Flow switch in circulating liquid to venturi scrubber.	Low flow: 1) closes waste valve (FCV 80); 2) stops Moyno pump (104); and 3) activates alarm panel in CR.

QUENCH POT

PI 82	Pressure indicator in vapor space of quench pot.	Measures pressure in quench pot; indirect measurement of pressure drop across venturi and scrubbing column.
TIS^H 4*	Iron-constantan thermocouple/switch in vapor space of quench pot.	High temperature: 1) cuts power to flame safeguard system, 2) opens emergency city water solenoid (SV 64), and activates alarm panel in CR.
TS^H 5	Chromel-alumel thermocouple/switch in vapor space of quench pot.	Same as above.
LC 92*	Level controller for quench pot liquid level.	High level opens LCV 81; low level closes LCV 81; air signal directly indicates quench pot level.

*Key Variable.

**When open, a fire alarm (3-4) is automatically turned into the powerhouse.

PCB-ARCH-EXT0372574

XII. KEY VARIABLES (Cont'd)

QUENCH POT (Cont'd)

Item	Name	Function
LCV 81	Level control valve in quench pot drain to sewer.	Maintains level in quench pot; valve activated by LC 92; ATO valve.
PS ^{H} 12 PA 12	Pressure switch on level controller.	High pressure activates high quencher level red light at CP and sounds alarm on alarm panel in CR.
PS_L 11	Pressure switch on level controller.	Low pressure activates low quencher level red light at CP and sounds alarm on alarm panel in CR.
XE-102*	Oxygen analyzer.	Measures percent oxygen in the cooled and scrubbed gases from the quench pot.

ATOMIZING STEAM

PRV-102-2	Pressure reducing valve in atomizing steam to incinerator	Steps 200 PSIG steam header pressure down to atomizing pressure of 125 PSIG.
PS_L 9-1	Pressure switch in atomizing steam to waste liquid nozzle.	Low pressure; 1) closes waste liquid solenoid (SV 59) and vents air to FCV 80 (closes), 2) stops incinerator feed pump 104.
PI 53-1	Pressure indicator on atomizing steam to waste liquid nozzle.	Measures pressure of steam available for atomizing waste liquid.
PS_L 9-2	Pressure switch in atomizing steam to fuel oil nozzle.	Low pressure; 1) closes fuel oil solenoid (SV 61) and vents air to FCV to 78 (closes). On oil: 1) cuts power to flame safeguard system, and 2) activates alarm panel in CR.
PI 53-2	Pressure indicator on atomizing steam to fuel oil nozzle.	Measures pressure of steam available for atomizing fuel oil.

*Key variable.

PCB-ARCH-EXT0372575

XII. KEY VARIABLES (Cont'd)

NATURAL GAS

Item	Name	Function
FQ 102-1	Accounting meter for natural gas usage.	Measures natural gas usage for optimization and accounting.
PRV 102-3	Pressure reducing valve for natural gas to the incinerator.	Steps down the natural gas header pressure to the required pressure (35 PSIG) for feeding the incinerator.
PS_L 7	Pressure switch on the natural gas to the incinerator	Low pressure (on either oil or gas) cuts power to flame safeguard system and activates alarm panel in CR.
FCV 79	Flow control valve in natural gas to main burner.	Modulated by incinerator temperature controller (TRC-15); low temp. opens; high temp. close; ATO valve; valve equipped with minimum stop positioner.
SV 60	Manual reset solenoid valve in air to FCV 79 (natural gas control valve).	1) On flame failure vents air to FCV 79 (valve closes); 2) prevents firing main gas until timer times out following proof of pilot and opening SV 65.
SV 66	Solenoid valve in natural gas to main burner.	Closes on flame failure; first valve of double block and bleed; cannot open until proof of pilot.
SV 62	Solenoid valve in vent of natural gas between block valves to main burner.	Opens to vent natural gas on flame failure; cannot close until proof of pilot.
SV 65	Manual reset solenoid valve in natural gas to main burner.	Closes on flame failure; second of DB&B; must be manually reset following proof of pilot when on gas.
PS_H 6	Pressure switch in natural gas to main burner.	High pressure cuts power to flame safeguard system when on gas, and activates alarm panel in CR.
PI 51	Pressure indicator on natural gas to main burner.	Measures pressure of natural gas available to main burner; may indicate gas rate.
PRV 83	Pressure reducing valve in natural gas to pilot.	Steps down natural gas pressure to ~10 PSIG for pilot gas.

PCB-ARCH-EXT0372576

XII. KEY VARIABLES (Cont'd)

NATURAL GAS (Cont'd)

Item	Name	Function
PI 54	Pressure indicator on natural gas to pilot.	Measures natural gas pressure available to pilot.
SV 57-1	Solenoid valve in natural gas to pilot.	Closes on flame failure; first valve of double block and bleed; opened during ignition.
SV 58	Solenoid valve in vent of natural gas between	Opens to vent natural gas on flame failure; closed during ignition.
SV 57-2	Solenoid valve in natural gas to pilot.	Closes on flame failure; second of DB&B; opened during ignition.
PI 102-5	Pressure indicator in natural gas at meter.	Measures pressure of gas passing through meter.
PI 102-6	Pressure indicator in natural gas.	Measures pressure of gas downstream of PRV 102-3.

FUEL OIL

L^I 114-1	Level indicator on fuel oil storage.	Measures level of #2 fuel oil in storage.
PI 115-1	Pressure indicator on discharge of fuel oil pumps.	Measures pump condition and operation of PCV 123-2.
PCV 123-2	Pressure control valve on discharge of fuel oil pumps.	Relieves excess pressure/volume from discharge of fuel oil pumps to storage.
PS_L 8	Pressure switch in fuel oil line to incinerator.	When burning oil low pressure cuts power to flame safeguard system and activates alarm panel in CR.
FCV 78	Flow control valve in fuel oil to incinerator.	Modulated by incinerator temperature controller (TRC-15); 1) temp. below set point - valve opens; 2) temp. above set point - valve closes; ATO valve.

PCB-ARCH-EXT0372577

XII. KEY VARIABLES (Cont'd)

FUEL OIL (Cont'd)

Item	Name	Function
SV 61	Manual reset solenoid valve in air to FCV 78 (fuel oil control valve).	1) On flame failure vents air to FCV 78 (valve closes); 2) prevents firing oil until timer times out following proof of pilot, opening SV 67 and LSO 68.
SV 67	Manual reset solenoid valve in fuel oil to incinerator.	Closes on flame failure; must be manually opened after proof of pilot when on oil.
PI 52	Pressure indicator on fuel oil to incinerator.	Measures pressure of fuel oil available to incinerator nozzle.
LSO 68	Limit switch on manual fuel oil firing valve.	When valve is fully opened, low fire timer is activated.
PRV 78-1	Low limit regulator in air signal to FCV 78.	Maintains a set minimum air pressure to FCV 78 so valve is always partially open.

INCINERATOR

BE 1	Flame safeguard system.	(See attachment).
BA	Alarm for flame safeguard.	Activation of flame safeguard sounds alarm, lights red flame failure at control panel, and activates alarm panel in CR.
BE 2	Purple peeper on pilot gas flame.	Ultraviolet scanner monitors the pilot gas flame; failure of the flame cuts power to the flame safeguard system.
PI 56*	Pressure indicator on air blower discharge.	Indirect measure of incinerator pressure; indirect measure of air flow; measures pressure of air delivered to incinerator.
FS_L 10	Flow switch in combustion air to incinerator.	Actually measures vacuum at blower suction; low combustion air flow cuts power to flame safeguard system and activates alarm panel in CR.

*Key variable.

PCB-ARCH-EXT0372578

XII. KEY VARIABLES (Cont'd)

INCINERATOR (Cont'd)

BE 1 - Flame Safeguard System - Function

Flame safeguard system will activate (cut power) on:

1. High fuel gas pressure (PS 6^H) (while on gas).
2. Low fuel gas pressure (PS 7_L).
3. Low combustion air flow (FS 10_L).
4. Low fuel oil pressure (PS 8_L) (while on oil).
5. Low fuel oil atomizing steam pressure (FS $9\text{-}2_L$) (while on oil).
6. Low city water flow (FS $127\text{-}2_L$).
7. Low well water pressure (PS 38_L).
8. High incinerator temperature (TS $18\text{-}76^H$).
9. High quench pot temperature (TIS 4^H or TS 5^H).
10. Flame failure (BE 2).

Flame safeguard system activation will:

1. Stop pilot gas (SV 57-1, SV 58, SV 57-2).
2. Stop main gas (SV 66, SV 62, SV 65, SV 60).
3. Stop fuel oil (SV 67, SV 61).
4. Start timer (20 CRT) to close fire water solenoid (SV 127-6).
5. Stop waste liquid (SV 59, 104).
6. Start alarm (BA).
7. Stop quench gun water (SV 63).
8. Activate alarm panel in CR.

PCB-ARCH-EXT0372579

XII. KEY VARIABLES (Cont'd)

INCINERATOR (Cont'd)

Item	Name	Function
PRV 102-4	Pressure reducing valve in cooling steam to incinerator quench guns.	Steps down 80 PSIG steam header pressure to 20 PSIG needed for cooling quench guns while running water through guns.
TS^{H}_{L} 18	Platinum-Rhodium thermocouple in incinerator.	Measures temperatures inside the incinerator up to 1600°F; high temperature cuts power to flame safeguard system and activates alarm panel in CR; low temperature cuts waste liquid feed (stops 104 pump and vents SV 59).
TS^{H}_{L} 76	Rayotube (temperature sensor) in the incinerator.	Measures temperatures inside the incinerator above 1600°F; low range 1600-2000°F; high range > 2000F, high temperature cuts power to flame safeguard and activates control panel in CR; low temperature cuts waste liquid feed (stops 104 pump and vents SV 59).
TRC 15*	Recorder-controller for temperature of the incinerator.	Continuously records the temperature of the incinerator; modulates the auxiliary fuel control valves (FCV 78 or FCV 79) to maintain the temperature at the set point.

WASTE LIQUID FEED

PRV 104-1	Pressure control valve on feed pump discharge.	Relieves excess volume/pressure from Moyno feed pump back to storage tanks 117 or 118.
PI 104-2	Pressure indicator feed pump discharge.	Measures pump condition/action of PRV 104-1.
PC 104-3	Pressure controller for waste feed.	Senses pressure of waste at gun and controls action of PCV 104-7.
FCV 104-4	3-way valve in relief line back to 118-117 storage tanks.	Used to return the excess waste from Moyno pump back to storage W/A to 117; WO/A to 118.
FI 104-5	DP cell in waste feed line.	Indicates waste feed flow to the incinerator.

*Key Variable.

PCB-ARCH-EXT0372580

XII. KEY VARIABLES (Cont'd)

WASTE LIQUID FEED (Cont'd)

Item	Name	Function
FA_L 104-6	Low flow alarm for waste feed.	Activates alarm panel in CR when the FI 104-5 signal is low.
PCV 104-7	Control valve in return line to storage tanks.	Used to set feed pressure PI 53-3 to incinerator by restricting waste flow back to storage tanks. ATC valve.
FCV 80	Flow control valve in waste liquid feed to incinerator.	On-off valve to stop flow of waste liquid to incinerator on flame failure or low atomizing steam pressure (PS_L 9-1); ATO valve.
102	Air line lubricate for FCV 80.	Lubricates FCV 80.
SV 59 ✓	Solenoid valve in air supply to FCV 80.	On flame failure or low atomizing steam pressure (FS_L 9-1) vents air to FCV 80 (valve closes).
PI 53-3*	Pressure indicator on waste liquid feed to incinerator.	Measures pressure of waste liquid available to burner; indirectly waste liquid rate.

SCRUBBER

Stack Sample	Analyze for HCl, PCB and particulate in vapor to atmosphere.	Measures efficiency of scrubbing system.
Effluent Sample	Analyze for PCB and HCl in stream to sewer.	Measures effectiveness of incinerator; check on proper water flow rates efficiency.
LI-154-1	DP - bubber system on scrubber sump.	Indicates level of HCl solution in scrubber sump.
PI-154-2	Manometer below packing section of scrubber column.	Indicates pressure of column. Measures pressure drop across column. Indicates when plugging is occurring.

*Key Variable.

PCB-ARCH-EXT0372581

XII. KEY VARIABLES (Cont'd)

WASTE STORAGE

Item	Name	Function
PRV 116-4	Pressure regulating valve for N_2 pad system.	Steps N_2 pressure down from header to several ounces for padding three storage tanks.
TI 101-1	Temperature indicator on residue trailer.	Measures temperature of Aroclor in Montar trailer.
PI 111-1	Pressure indicator on tank truck unloading pump discharge.	Measures pump condition.
TI-116-1 TI-117-1 TI-118-1	Temperature indicators on three storage tanks.	Measures temperature of Aroclor in
LI-116-2 LT-116-2	Level indicator on storage tank.	Measures level of Aroclor in storage tank.
LI-117-2 LT-117-2	"	"
LI-118-2 LT-118-2	"	"
XE-116-3 XE-117-3 XE-118-3	Conservation vent/flame arrestor for storage tanks.	Maintains slight N_2 pressure on storage tank; prevent flash back of flame from outside source.
PI 116-5	Pressure indicator in N_2 supply to storage.	Measures pressure of N_2 pad system.
PI-99	Pressure indicator at nitrogen trailer.	Indicates amount of N_2 remaining in trailer.

SUMPS

LE 120-1	Level control floor drain sump.	Keeps pad sump pumped out; starts and stops sump pump (120) on high and low levels, respectively.
PI 120-2	Pressure indicator sump pump discharge.	Measures pump condition.
PI 121-2	Pressure indicator Aroclor sump pump discharge.	Measure pump condition.

PCB-ARCH-EXT0372582

XII. KEY VARIABLES (Cont'd)

SUMPS (Cont'd)

Item	Name	Function
LI-121-1 LE-121-1 LA_H-121-1 LS^H_L 121-1	Interface indicator, alarm, and interlock for basin Aroclor level.	Measures Aroclor level in settling basin; sounds alarm, lights red high level Aroclor sump on CP, and activates alarm panel in CR; no 121 pump on low.
TI-121-3	Temperature indicator on settling basin.	Measure temperature of Aroclor in basin.
PI-122-1	Pressure indicator basin water pump discharge.	Measures pump condition.
PS_L-110-1 PI-110-1	Pressure indicator switch on car unloading pump discharge.	Measure pumping action, shuts down pump when low discharge pressure.
LS^H_L 119-1 LE 119-1	Level control/switch on drum unloading sump.	Starts pump on high level; stops on low level.
PI 119-1	Pressure indicator drum sump pump discharge.	Measures pump condition.
Settling Basin Effluent	Analyze for PCB in stream to sewer.	Measure of effectiveness of settling basin.
Sewer Sample*	Analyze for PCB in sewer stream.	Measurement of department effectiveness in controlling PCB losses.

*Key Variable.

PCB-ARCH-EXT0372583

XIII. INTERLOCKS AND ALARMS

MOTOR INTERLOCKS

150 - Incinerator Air Blower

The following conditions must be satisfied before starting Item 150.

a. Well water pressure to quench column (PS-38).

b. City water flow to weir (FS-127-2).

c. Main power on at incinerator panel.

Loss of any of the above will stop the blower.

104 - Incinerator Feed Pump

The following conditions must be satisfied before starting Item 104.

a. Incinerator temperature above 1600°F (TS-15).

b. Atomizing steam to waste nozzle (PS-9).

c. Pilot flame proved.

d. Waste valve (FCV-80) open. Depress "start waste" button on control panel.

e. Circulating water flow to Venturi (FS-51).

Loss of any of the above will stop 104.

The following motors have no interlocks and are controlled by a local start-stop pushbutton station.

106 - Packed column circulating pump.

111 - Tank truck unloading pump.

112 - Well water booster pump.

118 - Storage tank agitator.

116 - Storage tank agitator.

117 - Storage tank agitator.

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XIII. (Cont'd)

Motor Interlocks (Cont'd)

122 - Water sump pump.

127 and 132 - City water break tank pumps.

These pumps have timed seal-in relays to automatically restart after sbort power outages (less than 3 seconds). To stop pumps, hold stop button in for at least 5 seconds.

110 - Tank car unloading pump.

To start, hold start button depressed until discharge pressure closes PS-110-1. Pump will stop when discharge pressure drops or when stop pushbutton is depressed.

119 - Drum unloading sump pump.

Pump has 3 position control station located at motor.

Position 1 - Manual - pump runs continuously.

Position 2 - Off - pump stops.

Position 3 - Auto - pump starts upon high level in sump (LS-119-1 closes), pumping continues until low level is reached (LS-119-1 opens) stopping pump.

120 - Incinerator floor drain.

Same operation as 1-119. Substitute LS-120-1 for LS-119-1.

121 - Aroclor sump pump.

To start, depress start pushbutton. Motor will seal-in if sump is above low level (LS-121-1 closed). When sump reaches low level, pump will stop (LS-121-1 opens). To operate pump below low level, depress and hold start pushbutton.

160 - Drum pump.

PCB-ARCH-EXT0372585

XIII. (Cont'd)

Alarms

The following conditions will sound alarm on burner control panel.

a. Flame failure (Honeywell safeguard).

b. Low or high level quench pot. (PS-12 or PS-11).

c. Low waste flow. (FA_L 104-6).

d. Low level city water break tank. (PA-126-1).

e. High Aroclor level Aroclor sump. (LS-121-1).

f. Low flow city water. (FS-127-2).

g. Low combustion air flow. (FS-10).

h. Low Venturi flow. (FS-37).

i. Low or high gas pressure. (PS-7 or PS-6).

j. Low oil or air flow. (PS-8 or FS-10).

k. Low water flow to quench column. (FS-38 or FS-127-2).

l. High temperatures. (TS-4, TS-5 or TS 15-1).

PCB-ARCH-EXT0372586

INTERLOCKS INCINERATOR

Item Number	Name	Function
PS-6	High Gas Pressure	Complete shutdown. (when using gas only)
PS-7	Low Gas Pressure	Complete shutdown.
PS-9-1	Low Fuel Oil Atom. Steam Pressure	Complete shutdown. (when using oil only)
PS-8	Low Fuel Oil Pressure	Complete shutdown. (when using oil only)
FS-10	Low Combustion Air Flow	Complete shutdown.
~~PS~~-38	Low Water ~~Flow~~ Pressure to Sprays	Complete shutdown. Opens SV-64, stops blower.
FS-127-2	Low City Water Flow	Complete shutdown. Stops blower, starts fire water.
TS-15-1	High Incinerator Temperature	Complete shutdown. Opens SV-64
TS-4 & TS-5	High Quench Pot Temperature	Complete shutdown. Opens SV-64.
TS-15-2	Low Incinerator Temperature	Stop Waste Pump. Closes FCV-80.
PS-9-2	Low Waste Atom. Steam Pressure	Stops Waste Pump. Closes FCV-80.
BE-1	Flame Scanner	Complete shutdown.
LSO-65	Gas Valve	Start Low Fire.
LSO-67) LSO-68)	Oil Valve) Limit Switch)	Start Low Fire. Timer (oil).

PCB-ARCH-EXT0372587

XIV. TIMERS

A. 1TR - Purge Timer - Purpose is to "purge" (Blow all flammable gases out of) the incinerator. Timer is activated by depressing "Purge Start" button. Timer is set at 3 minutes. Completion of timer will allow the pilot ignition step of start-up.

B. 3TR - Ignition Timer - Purpose is to prevent forming an explosive mixture in the incinerator by flowing pilot gas without igniting. Timer is set at 20 seconds. Timer is activated as long as the "Ignition" push button is depressed. Failure to establish "Pilot Proved" within the allotted time or before releasing push button will require repurging the incinerator.

C. 2TR - Low Fire Timer - Purpose is to prevent shocking the incinerator refractory with high heat input during start-up. Timer is set at 180 seconds.

1) On Gas

Timer activated by manually resetting main gas solenoid (SV65). Completion of timer allows manual resetting of solenoid (SV60) in air to main gas control valve.

2) On Fuel Oil

Timer activated by manually resetting fuel oil solenoid (SV67) and opening the fuel oil manual valve at the incinerator. Completion of timer allows manual resetting of solenoid (SV61) in air to fuel oil control valve.

D. 20TR - Fire Water Time Delay - Purpose is to provide fire water backup supply to city water while incinerator is still hot during shutdown. Timer is activated when pilot flame is lost. Timer is set for 8 hours. Completion of the timer will shut the second fire water solenoid (SV127-6).

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XVI. UTILITY LOCATIONS

A. City Water

Underground valve for department supply is located about 12 feet north of packed column (154) discharge to sewer. Shut off above ground in the storage room east of department office.

B. Well Water

Underground valve for department supply is located under the truck ramp at the southeast of department. Shutoff above ground is about 2 feet north of the quench pot (152).

C. Fire Water

Underground valve is located about 3 feet southwest of the southwest column to the incinerator platform.

D. 200# Steam Supply

Comes into the department on the north piping bridge to the east side of the office building.

E. 80# Steam Supply

Comes into the department on the north piping bridge from Santosite and continues in to Interim PNA.

F. Instrument Air

Comes into the department on the north piping bridge from Santosite and continues on to Interim PNA.

G. Plant Air

Comes into the department on the east piping bridge from Interim PNA.

H. Natural Gas

Comes into the department on the east piping bridge from Interim PNA and continues on to Santosite.

I. Fuel Oil Storage (114)

Tank is located north of Area 9 maintenance office.

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XVII. TROUBLE SHOOTING

A. Flame Failure

In the event of a flame failure, the incinerator should automatically shutdown. The red "flame failure" light comes on, the audio alarm sounds, and the alarm panel in the control room is activated.

The following equipment will continue to operate:

1. City water pump (127 or 132)
2. Well water booster pump (112)
3. Venturi circulating pump (106)
4. Combustion air blower (150)

The objective during a flame failure is to reestablish fire to the incinerator as rapidly as possible. This is to minimize possible damage to the refractory.

Determine the cause of the flame failure -

Cause	Check
Low combustion air flow	Blower running, PI 56, alarm panel
High Incinerator Temp.	TRC15, alarm panel
High Quench Pot Temp.	TIS4, alarm panel, TIS5
Low or high gas pressure	PS-7, alarm panel, PS-8
Low fuel oil pressure (on oil)	Pump (115 or 123) running, PI 115-1, alarm panel
Low atomizing steam pressure (on oil)	PI 53-2, alarm panel
Low city water flow	FS-37, alarm panel, pump running
Low well water pressure	PS-38, alarm panel, pump running

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XVII. TROUBLE SHOOTING (Cont'd)

A. (Cont'd)

1. If blower down, immediately close valves to top 5 sprays on quench column.
2. Reduce combustion air to 1/3 damper or about 35 inches H_2O. Higher air rate may snuff out the pilot.
3. Check to be sure Moyno feed pump is off and Robot waste valve is closed.
4. Check panel for cause of failure and correct.
5. Start purge cycle.
6. Close manual gas valve, manual waste valve, trim back on atomizing steam to waste gun and blow the waste gun with steam.
7. When purge is complete - light pilot.
8. When pilot is lit, trip maxim valve.
9. Open manual gas valve slowly (1# at a time) until ignition - Stabilize the flame; then slowly open to full valve.
10. Adjust combustion air and check O_2.
11. Contact department supervision.
12. Return system to automatic.
13. Bring waste material on slowly when temperature is restored.

B. Lighting Problems

1. Failure of a pilot to ignite and burn steadily within the 20 second timed interval indicates a definite problem which must be located and corrected before any attempt is made to relight or otherwise proceed.
2. Visually observe the pilot through the sight port during the ignition period.

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XVII. TROUBLE SHOOTING (Cont'd)

B. (Cont'd)

3. If no sparks are seen at the ignition spark gap at pilot tip, check for improper spark gap or shorting in the high tension spark system. Simply rapping on the pilot assembly often is enough.
4. If sparks can be seen, but pilot will not light, check for air in gas supply line, insufficient gas pressure (10-15 psig at pilot), plugged pilot gas orifice, etc.
5. If pilot lights, but flame scanner does not activate the "Pilot Proved" light, dirty purple peeper lens is the most probable cause.
6. Verify purge air flow to the scanner.
7. Slight smugging can often be overcome by simply turning up the pilot gas to produce a larger flame body which the scanner can "see" without difficulty.
8. If preceding step fails, CAREFULLY remove flame scanner and clean lens with lens tissue. When properly aligned, the pilot flame body will completely cover the viewing area of the scanner tube.
9. If the flame cannot be seen, or is off center of the sight tube, realign the pilot by carefully bending or shimming.
10. If alignment is correct but scanner does not activate "Pilot Proved" light, check scanner by holding a match or other flame (flashlight will not work) in front of scanner eye.
11. If scanner does not respond to flame, see enclosed Honeywell trouble shooting guide.

C. Power Failure

1. Partial

Normally, power is supplied from substation #13. A failure

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XVII. TROUBLE SHOOTING (Cont'd)

C. 1. (Cont'd)

will shut down the entire incinerator area except:

an automatic switch changes power supply from #13 substation to #4 substation for emergency power. This supplies the lights, the instrument panel, and the city water pumps.

Try to reset the power to #13 substation by depressing reset button in motor control center. If power is established to #13 substation, the incinerator can be started again under normal startup instructions. If power cannot be established to #13 substation, call the night superintendent and the electricians.

Cool the quench column with city water until the incinerator can be restarted.

2. Total

During a total power failure (both substations) the following will occur:

a) Fire alarm 3-4 comes in

b) Fire water starts into weir system at high rate.

c) All pumps and blower stop

d) Waste liquid valve closes

e) Pilot gas, closes and vents.

f) Main gas, closes and vents

g) Fuel Oil, closes

h) Quench pot level valve closes, so will overflow through Venturi

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XVII. TROUBLE SHOOTING (Cont'd)

C. 2. (Cont'd)

i) Well water continues to flow at reduced rate

j) Automatic switch in motor control center will be energized to secondary substation supply:

1) #13 substation is primary power

2) #4 substation is secondary power

k) Control panel and alarms are dead

Actions

1. Close top 5 well water sprays to quench column.
2. Notify the night superintendent when the system goes down.
3. Close the manual valves at the south end of the incinerator on natural gas, pilot gas, fuel oil, waste, atomizing steam and quench guns.
4. Prepare system for a resumption of operations.
5. Reset power to substation #13 when power available.
6. Start up.
7. If the system is down for one (1) hour or more, notify department supervision.

D. City Water Failure

In the event city water fails, the following will occur:

1. Fire water comes in setting off alarm (3-4) for fire department - 127-7 opens.
2. The alarm sounds and the red low flow city water light comes on.
3. Power to flame safeguard system cut.
4. Cuts power to air blower.
5. Recirculating solenoid valve (SV127-5) closes.
6. By-pass solenoid (SV64) opens.

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XVII. TROUBLE SHOOTING (Cont'd)

D. (Cont'd)

Check List

1. Close top 5 well water sprays to quench column.
2. Check item #126 (city water break tank) level.
3. Check items #127 or 132 (city water break tank pumps).
   If stopped: a) Check start and stop button; try to reset
   b) Switch pumps
4. Explain alarm to fire department when they arrive in department
5. Check city water supply
6. Start-up incinerator when city water reestablished.

E. Well Water Failure

Well Water Users

1. Quench column sprays
2. Packed scrubber column
3. Incinerator quench guns

Loss of W/W will shut the operation down. The most critical of the three users is the loss of flow to the quench column sprays. Low pressure to the quench column sprays (40 psig) will open emergency city water solenoid (SV64), cut power to flame safeguard, and cut power to combustion air blower.

Upon indication of no flow or low flow, check the following:

1. Close top 5 well water sprays to quench column.
2. Well water booster pump Item 113. Pressure indicator (PI 112-1) will measure pump condition. Pump pressure should be 125 psig.
3. Check strainers in well water line. There should be no more than 25# drop between PI 112-1 and 112-2.
4. Check flow orifice for pluggage.

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XVII. TROUBLE SHOOTING (Cont'd)

E. (Cont'd)

5. Check well water sprays for pluggage
6. Start-up incinerator when well water reestablished
7. Notify supervision if department will be down longer than one (1) hour

F. Instrument Air Failure

In any event that instrument air failure occurs, the following list of valves will be affected.

1. LCV-126-2 - Level control valve on city water break tank opens and tank overflows.
2. FCV-80 - Flow control valve, waste liquid feed to incinerator closes. Stops waste liquid feed to incinerator. Waste pump (104) stops.
3. LCV-81 - Level control valve in quench pot drain closes. Causes quench pot to overflow to pack column through Venturi.
4. FCV-79 - Flow control valve in natural gas to main burner closes. Minimum natural gas to main burner.
5. FCV-78 - Flow control valve in fuel oil to incinerator closes. Shuts off fuel oil to incinerator.

The incinerator will continue to operate on pilot gas only.

Action

1. Stop fuel oil pump if running.
2. Determine cause of failure.
3. Reestablish auxiliary and waste fuel flows when corrected.

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WASTE INCINERATION DEPT. 831 Date _____

Incinerator Temperature Thermocouple to 1600 F LowRay 1800 to 2000 F HighRay 2000 to 2800 F (TC) (LR) HR)	Combustion Air PI-56 WW to Scrubber FI-88	QUENCH POT Temp. TIsH 4	QUENCH POT Pressure PI-82	QUENCH POT Level LC-81	CITY H_2O Flow Indicator 127-8	CITY H_2O Pressure 127-1	WELL H_2O Pressure at Strainer PI 112-2	VEN-TURI Column FI-87	VEN-TURI Pressure PT 53-4	VEN-TURI Flow FT 106-2	VEN-TURI Pressure PI 85	WASTE Feed Pres. PI 53-3	WASTE Atom Stm Pres PI 53-1	FUEL DP Cell FI 104-3	FUEL Burner Gas Pres. PI-51	FUEL % O_2	DRUMS MTY.
																	DAYS _____ MID. _____ LATE _____

DAY SHIFT

8	
9	
10	
11	
12	
1	
2	
3	

Operator _____

WASTE STORAGE			
Tk	116	117	118
Temp			
Level			

Gas Meter _____
Aroclor Sump Level _____
N_2 Pressure _____

MIDDLE SHIFT

1	
5	
6	
7	
8	
9	
10	
11	

Operator _____

WASTE STORAGE			
TK	116	117	118
Temp			
Level			

Gas Meter _____
Aroclor Sump Level _____
N_2 Pressure _____

LATE SHIFT

12	
1	
2	
3	
4	
5	
6	
7	

Operator _____

WASTE STORAGE			
Tk	116	117	118
Temp			
Level			

Gas Meter _____
Aroclor Sump Level _____
N_2 Pressure _____

OMMENTS: _____

PCB-ARCH-EXT0372597

NIGHT SHEET-DEPTS. 831 & 827

_____
Date

_____ Days _____ Middles _____ Lates

Operate Incinerator and Allied Equipment as follows:

Incinerator Temp. Between_____°F and _____°F, Combustion Air_____, Quench Pot Temp. Not to Exceed_____°, Pressure (PI-82) _____# and Level (LC-81) _____, City Water Flow to Wier_____% and the Pressure (127-1) at _____#. Well Water Pressure at (PI 112-2) _____#, Flow to Column (FI-87) _____, Pressure to Sprays (PI 53-4) _____#, Flow to Scrubber (FI-88) _____.

Venturi Flow (FI 106-2) _____, Circ. Liquor (PI 85) _____#, Pressure at Moyno Pump_____#, Waste Feed (PI 53-3) _____#, Atom. Steam at Waste Gun_____#, Gas Pressure at Burner_____#.

Maintain _____ to _____% O_2 Burn Waste From No. _____ Stg.

WASTE AROCLOR UNLOADING:

_____

_____

PHENOL: _____

_____

_____

SAFETY: _____

_____

_____

HOUSEKEEPING: _____

_____

GENERAL COMMENTS: _____

_____

If the unit is shut down for any reason take steps to bring it back on the line and notify the Night Supt. and Dept. Supervision.

_____

PCB-ARCH-EXT0372598

PHASE II - BULK DISTRIBUTION

I. SUMMARY OF OPERATIONS

PHENOL UNLOADING AND LOADING

Cumene Phenol is received in 26,000 gal. tank cars from Chocolate Bayou. The tank cars are unloaded into two 20,000 gal. storage tanks, the Southwest and Southeast storage tanks. From these tanks phenol will be loaded into tank trucks, tank cars or pumped to the East or West storage tanks to hold for inventory or loading.

II. SAFETY

A. Materials Handling

1. Phenol is a corrosive liquid which crystallizes at 40.9°C. If skin contact is made, severe burns will result, the severity being in proportion to the contact time. The nervous system is injured if first aid treatment is not used immediately. Phenol vapors are toxic and should be avoided at all times. Phenol is an extremely dangerous chemical and should be treated as such at all times. Flush contact areas with copious amounts of water and apply alcohol. Do not apply alcohol to eyes.

   a) Safe Handling Procedures

      1) Keep pump packing glands tight and mechanical seals repaired at all times.

      2) Wear protective equipment such as rubber gloves, eye protection and other equipment as required by the specific job.

      3) Stay out of areas contaminated by Phenol vapors.

      4) Use extreme caution when sampling, pumping or working with equipment where there is even a remote possibility of skin contact.

2. Oxalic and citric acid powder used as inhibitors (color stabilizers) for some Phenol customers

PCB-ARCH-EXT0372599

PHASE II - BULK DISTRIBUTION (Cont'd)

II. A. 2. (Cont'd)

present no problem as far as skin contact is concerned. However, oxalic acid is a poison and should be treated as such.

B. Safety Equipment

1. Inspection of Safety Equipment

Inspection of safety equipment is one of joint responsibility -- the operator and the foreman. It is the operator's responsibility to check safety equipment and report any malfunction. The foreman is responsible for keeping equipment repaired and ordering safety supplies and equipment.

2. Location of Safety Equipment

Safety Showers & Eye Baths

a) North tank car melt dock
b) Ground level center of unloading dock
c) South tank car unloading dock
d) Tank truck loading dock
e) Foot of stairs to office
f) 2nd level at office door
g) Outside east wall Bldg. BBT
h) West of "Lil Mo" on ground level

Safety Shower Alarms

Use of safety showers (a, b, c, d and h) sounds alarms in Dept. 251.

First Aid Cabinets

a) At S.E. and S.W. storage tank pumps
b) North tank car melt dock
c) Center tank car dock
d) South tank car unloading dock
e) Truck loading dock
f) At east and west storage tank pumps
g) In safety station on outside east wall of Bldg. BBT
h) At "Lil Mo" pump

PCB-ARCH-EXT0372600

PHASE II - BULK DISTRIBUTION (Cont'd)

II. B. 2. (Cont'd)

Telephone Extension

Inside southeast corner of Bldg. BBT at door.

Fire Extinguishers

a) Inside S.E. corner of Bldg. BBT - CO_2
b) Inside S.E. corner of Bldg. BBT - 2-wheel cart, dry powder

Fire Alarm Box is located on pipe bridge post outside northeast corner of Bldg. BBT. Dept. 827 is in fire zone 3-4.

Gas Mask - All purpose. Located inside Bldg. BBT at foot of stairs to office.

Emergency Clothes

a) Inside southeast wall of Bldg. BBT.
b) Outside east wall of Bldg. BBT in safety station.

C. Requirements on Use of Safety Equipment

1. Safety glasses must be worn at all times while in this area unless goggle-faceshield unit is required for greater protection.

2. Safety goggle-faceshield unit must be worn when sampling or when doing other high hazard work. Rubber gloves are also required at such times. Aprons and face shields as needed.

3. Always use special safety equipment such as track flags and tank car and tank truck grounding wires.

D. Emergency Assembly Area

The assembly points for all plant personnel in case of a plant emergency are:

PRIMARY: MAIN PARKING LOT
SECONDARY: WEST GATE

PCB-ARCH-EXT0372601

PHASE II - BULK DISTRIBUTION (Cont'd)

II. D. (Cont'd)

Department Shutdown

Shutdown will take place in either of two ways. First, persons will shut down their departments and evacuate if instructed to do so by the night superintendent or by anyone else in charge of directing emergency activities.

Second, shutdown and evacuation will take place if the emergency whistle is sounded. This whistle is five short blasts repeated five times. The emergency whistle will be sounded only if an entire plant shutdown is desired.

The emergency plan has been revised so that it can be implemented by the plant fire zones. This is so since our experience here at the plant and other large plants indicates that an emergency is likely to be confined to a particular zone of the plant.

The Phenol distribution area fire call is 3-4 (3 long blasts followed by 4 short blasts of the fire whistle).

III. HOUSEKEEPING RESPONSIBILITIES

A. The Distribution Operator is responsible for cleanup in the Phenol handling area.

B. At the end of each shift all hoses not being used are to be boiled up on hose racks where provided. All hoses should be blown clean with air after each use to prevent possible hazard to next user, freezing, or contamination of product.

C. Special cleanup instructions are given to the operator by the foreman so that a high level of housekeeping is maintained.

PCB-ARCH-EXT0372602

PHASE II - BULK DISTRIBUTION (Cont'd)

IV. DETAILS OF OPERATION

A. Unloading Phenol Tank Cars

26,000 gal. tank cars of Cumene Phenol when received from Chocolate Bayou may be frozen and will require melting before transfer to storage can be made.

The Phenol tank car unloading pump located at ground level at the end of the south tank car dock, pumps Phenol to both the SE and the SW storage tanks.

The valves on the line from the unloading pump into the southeast and southwest storage tanks are located at the top of the tanks. Also, the tanks are connected by a leveling line. If this line is frozen, it will be necessary for the distribution operator to direct flow as required, to prevent a spill, since a 26,000 gal. tank car is larger than a single storage tank (each storage tank holds 20,000 gallons).

26,000 gal. cars can be melted at both south (unloading) docks and the north dock. The north dock can be used for loading tank cars.

1. To prepare for top unloading of tank car:

   a) Put blue track flags on semaphore arms.

   b) Attach ground wire to tank car. Step on running board to drain off static electricity.

   c) Open dome cover to vent car. (You should vent car before steam coils are connected). Wear goggles and stand behind or to one side to avoid Phenol crystals blown by a sudden release of pressure from car.

   d) If Phenol is solid, put steam on the standpipe jacket or use stainless steel hairpin coil to melt a hole to the coils before turning on steam to the coils. Be sure steam condensate from the standpipe or the hairpin coil doesn't drain or blow into the dome. Insert probe into tank car to activate automatic steam control valve and insure temperature doesn't exceed 60°C. on the steam regulator gauge.

PCB-ARCH-EXT0372603

PHASE II - BULK DISTRIBUTION (Cont'd)

IV. A. 1. (Cont'd)

e) Turn steam on both standpipe and coils. Use low pressure steam (about 10 to 15 lbs.) for the first hour or two to avoid high impact at coil bends which can cause coil rupture or cracking of weld joints.

f) Increase steam pressure to coils to 60 to 80 lbs., (do not exceed 100 lbs.) after first hour or two and heat car to 60°C. (140°F.)

g) Sample Phenol after it is all molten. Lower sample bottle slowly to bottom of car to get a representative sample. (Sample bottle clamp rod, chain or sheath would be made of nickel, stainless steel, or wood).

h) Never heat Phenol above 60°C.

i) If lab analysis is ok, connect unloading line of self priming pump to the car standpipe. Wearing eye protection, remove probe, coil it and place on hanger on dock. Use extreme car in coiling probe so as not to flip Phenol and that insulated portion of probe doesn't touch steam lines.

j) Make sure there is room in storage tanks to hold contents of car.

k) Make sure steam is on the transfer line and SE and SW tanks leveling line tracers. Make sure loading hole lid is open and remains open during car unloading. Shut off all steam to car.

l) Turn on unloading pump and check to see if level is rising in both SE & SW storage tanks. (The level may rise in only one storage if level line is frozen).

m) When the tank car is empty, blow the unloading line free of Phenol with dry air.

n) Disconnect the steam hoses and blow out the steam coils with air. A good blow out is especially necessary in cold weather. Condensate left in coils may freeze and split them. Leave the caps off the coils.

PCB-ARCH-EXT0372604

PHASE II - BULK DISTRIBUTION (Cont'd)

IV. A. 1. (Cont'd)

o) Disconnect ground cable, remove all steam hose connection fittings and prepare cars for return trip to Chocolate Bayou.

p) Remove blue track flags from semaphore arms.

q) If the tank car needs repair, notify supervision.

2. Summary of Top Unloading Procedure

a) Connect ground cable to tank car. Place blue track flags on semaphore arms.

b) Open dome to vent car. Leave dome open during entire unloading operation.

c) If phenol in car is solid, put steam on jacket of standpipe or use stainless steel hairpin coil to melt vent hold to coils. Insert temperature control probe.

d) Connect steam fittings to tank car heating coils. (Steam traps are on steam supply and condensate lines).

e) Turn on steam slowly to prevent damage to coils (about 10 to 15 lbs. for the first hour or two).

f) After 1 to 2 hours, increase steam pressure to a maximum of 100 lbs; 60 to 80 lb. steam is adequate.

g) Heat contents of car to 60°C. on steam regulator gauge. Never heat over 60°C.

h) Sample the phenol.

i) Remove the temperature control probe. Connect suction line of unloading pump to the standpipe in the car dome and start pump.

j) Blow unloading line free of Phenol.

k) Disconnect unloading line and blow out the steam coils with air. Leave caps off coils.

PCB-ARCH-EXT0372605

PHASE II - BULK DISTRIBUTION (Cont'd)

IV. A. 2. (Cont'd)

l) Disconnect ground cable and raise ramp. Prepare car for return to supplier.

m) Remove blue flags from semaphores when car is ready to be switched out.

B. Tank Car Loading

1. Tank cars to be loaded with phenol will not be spotted at the north dock (track 7 - 11 spot). To prepare for loading a car:

a) Put blue track flags on semaphore arms.

b) Lower ramp and extend it to the car. Make sure ramp and sliding handrails are securely locked in position.

c) Open dome of the car and inspect it to be sure that the car is clean and free of foreign odor.

d) If car has a heel less than 12" that is crystallized and appears white in color, it is ok to load.

e) If car is not clean enough, call supervision.

f) Large heels (12" or more) must be sampled and ok'd by the lab before loading.

g) A coil test sheet is required for each car prior to loading. This is supplied by the Rip Track and should be found in box on outside wall at southwest overhead door of Bldg. BBT. Do not load car unless coils have been tested.

h) Place loading arm in the dome of car and secure by chain on arm. Pipe must be properly secured before starting to load.

i) Attach ground wire to car step or running board.

j) Be sure seat valve is closed and that there is a cock on the bottom outlet of car.

k) Start phenol to car.

l) Stop phenol transfer to car when there is about one foot of phenol in car.

PCB-ARCH-EXT0372606

PHASE II - BULK DISTRIBUTION (Cont'd)

IV. B. 1. (Cont'd)

m) Slowly open the cock on the bottom outlet. (Take care and wear protective equipment). Any phenol indicates that the seat valve is not closed.

n) If ok, close cock and continue to load.

o) If there is any evidence of phenol at bottom outlet, stop loading procedure (blow line, etc.) and notify supervision.

p) Load car to amount requested by customer.

q) Blow loading line with dry air. Do not use steam.

r) Sample car. Get 1-8 oz. for complete analysis.

s) Remove loading line and close dome.

t) Wash any phenol drip from car.

u) Remove ground wire.

v) Place seals on car openings of car's destination is outside of plant.

w) Call Repair Track (Station 2042) to head car.

x) Raise ramps after car is headed.

y) Pull track flags.

z) Inform supervision that you are loaded, headed, clear and ready for switch. Record in the loading log book the car number, lot number and amount of phenol loaded.

C. Tank Truck Loading

1. Tank trucks are inspected essentially the same as tank cars. That is, it is ok to load if the tank truck is:

a) Clean and free of foreign odor.

b) Or, if the last load was phenol and it has a heel of 12" or less, that appears white in color.

c) Large heels of phenol - 12" or more must be sampled and ok'd by lab before loading. Check with supervision.

PCB-ARCH-EXT0372607

PHASE II - BULK DISTRIBUTION (Cont'd)

IV. C. 2. Tank trucks will be loaded from southeast and southwest storage tanks by Monsanto truck drivers. Since only in specification phenol will be pumped to these tanks, sampling by truck drivers will not be needed.

3. The Distribution Operator will pump to or from any phenol storage as needed and take required samples.

4. Tank truck wheels must be blocked and the tractor, if under the trailer, must have the engine off and the brakes set. If trailer is dropped, place aluminum support under nose of trailer before loading.

5. Before removing loading lines from any type carrier, the line must be blown with dry air. Do not use steam, as this will contaminate phenol and lower the crystallizing point. Blow lines slowly to avoid splashing phenol out of truck dome.

6. Try to keep rain, snow, sleet, steam condensate or dripping water out of both full and empty tank trucks.

7. Summary of tank truck loading procedure:

a) Spot tank truck at dock.

b) Turn off engine and set brakes.

c) Block tank truck wheels and place support under nose of trailer if unit is dropped for load.

d) Connect grounding wire.

e) Open dome and inspect the tank truck.

f) Put loading line in dome and secure it. (Secured by sleeve on line).

g) Monsanto truck drivers line up valves for flow from SE and SW storage tanks to the tank truck to be loaded. Distribution Operator can load by storage tank outage from east and west storage tank or by trailer innage from the SE and SW storage tanks.

h) Check filling of tank truck and shut off transfer pump and block valves when tank truck is loaded.

PCB-ARCH-EXT0372608

PHASE II - BULK DISTRIBUTION (Cont'd)

IV. C. 7. (Cont'd)

i) Blow line to the tank truck from air taps on loading storages. Introduce air slowly to avoid splashing phenol.

j) Return all valves to original open or closed positions.

k) Remove loading line from tank trucks.

l) Take sample.

m) Close dome and wash any phenol from tank truck with hot water.

n) Disconnect ground wire and remove aluminum trailer support if trailer was dropped for loading.

Note: Tank trucks (and cars) can be loaded from the east and west storage tanks by tank outages, but when loading from the southeast and southwest storage tanks it will be necessary to watch the tank truck and go by tank truck innage.

Tank trucks for Queeny and WGK Departments 236, 248 and 254 will not be sampled. They will accept the analysis of the tank from which they will be loaded. All other tank trucks and cars will be sampled, and samples taken to lab.

WGK Form 201 (Rev. 12-66) scale ticket is used for tank truck loads.

D. Waste Phenol Handling

1. Drips, spills, rainwater and wash water collect in a sump wbich is located at the south tank car dock.

2. A high level electrode in the sump turns on the sump pump. This fraction water from sump is pumped to a waste tank and hauled to dump. If sump overflows check power to pump or electrodes.

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PHASE II - BULK DISTRIBUTION (Cont'd)

IV. E. Inhibited (color stabilized) Phenol.

There are two color stabilizers for phenol:

1. Oxalic acid.

   a) It is cheaper.

   b) It is poisonous - not fit for food grade or pharmaceutical grade phenol.

   c) To add oxalic to the phenol:

      1. Fill tank car or truck 1/3 full.

      2. Add amount of oxalic determined by supervision.

      3. Finish filling the tank car or truck.

2. Citric Acid.

   a) It is expensive.

   b) It is non-poisonous. It can be used for food grade or pharmaceutical grade phenol.

   c) Fill tank truck or tank car 1/4 to 1/2 full, then add a determined amount of citric into tank truck or car.

   d) Finish filling tank truck or car.

      Note: As a rule, oxalic inhibited phenol is never shipped by tank truck.

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PHASE II - BULK DISTRIBUTION (Cont'd)

V. SAMPLING AND SPECIFICATIONS

A. Tank Car Unloading

1. Take 1 - 8 oz. sample of each car. Take them to the lab for complete analysis.

2. Call supervision if car is out of specs. Unload car if it is in specification material and you have room in storage tanks.

B. Tank Car and Tank Truck Loading

1. Be sure storage from which phenol is being taken is in specificationmaterial.

2. Get 1 - 8 oz. sample from tank cars and 1 - 8 oz. from trucks for outside customers.

3. Tank trucks for Queeny and WGK Departments 236, 248 and 254 will not be sampled. They will accept tank analyses.

4. Off color and low Xpt. phenol can be used by Department 236.

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PHASE II - BULK DISTRIBUTION (Cont'd)

VI. EQUIPMENT LIST

PHENOL HANDLING EQUIPMENT

519	Sump Pump South end unloading dock.	Lawrence 2 x 3 HBDH Type 9 316 SS In 3.0 Out 2.0 Motor Vertical 15 HP 1200 RPM Frame 3240.
551	S.W. Phenol Storage Tank 21-3292	20,000 gal. Heresite lined steel tank.
552	Phenol Loading Pump	Durco 3X25110 Type 8 20 Alloy in 3.0 Out 2.0 Motor Horizontal 10 HP 1800 RPM Frame 256U.
557	E. Phenol Storage Tank	13'0" Dia. x 20'0" High Heresite Lined Steel Tank.
558	W. Phenol Stg. Tk.	Same as Item 557.
559	S.E. Phenol Stg. Tk.	Same as Item 557.
566	E. Phenol Pump (East Set)	Durco WHD2 Type 1 20 alloy In 2.0 Out 1.0 Motor Horizontal 5 HP 1800 RPM Frame 215
567	W. Phenol Pump (East Set)	Same as Item 566. Motor GE Horizontal 5 HP 1800 RPM Frame 215.
5571	Phenol Transfer Pump	Durco WHD2 Type 1 20 Alloy In 2.0 Out 1.0 Motor United Horizontal 10 HP 1800 RPM Frame 256U.
574	Air Compressor (Ref.Room)	Motor Wagner Horizontal 3 HP 1800 RPM Frame 213 Joy Size (2) 3 1/2 x 3 Tank Mounted Belt Drive.
575	Phenol Loading Pump	Durco A60 Type 1 20 Alloy In 3.0 Out 2.0 Motor Westinghouse Vertical 10 HP 1800 RPM Frame 256U.
580	Phenol Unloading Pump	Durco

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PHASE II - BULK DISTRIBUTION (Cont'd)

VII. TANK CALIBRATIONS

EAST, WEST, SOUTHEAST AND SOUTHWEST PHENOL STORAGE TANKS

Diameter = 13'
Capacity per 1" on side sheet = 82.75 gallons
" " 12" on side sheet = 993 gallons

Height = 20'

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
1	83	34	2814	67	5544	100	8275
2	166	35	2896	68	5627	101	8358
3	248	36	2979	69	5710	102	8441
4	331	37	3062	70	5793	103	8523
5	414	38	3145	71	5875	104	8606
6	497	39	3227	72	5958	105	8689
7	579	40	3310	73	6041	106	8772
8	662	41	3393	74	6124	107	8854
9	745	42	3476	75	6206	108	8937
10	828	43	3558	76	6289	109	9020
11	910	44	3641	77	6372	110	9103
12	993	45	3724	78	6455	111	9185
13	1076	46	3807	79	6537	112	9268
14	1159	47	3889	80	6620	113	9351
15	1241	48	3972	81	6703	114	9434
16	1324	49	4055	82	6786	115	9516
17	1407	50	4138	83	6868	116	9599
18	1490	51	4220	84	6951	117	9682
19	1572	52	4303	85	7034	118	9765
20	1655	53	4386	86	7117	119	9847
21	1738	54	4469	87	7199	120	9930
22	1821	55	4551	88	7282	121	10013
23	1903	56	4634	89	7365	122	10096
24	1986	57	4717	90	7448	123	10178
25	2069	58	4800	91	7530	124	10261
26	2152	59	4882	92	7613	125	10344
27	2234	60	4965	93	7696	126	10427
28	2317	61	5048	94	7779	127	10509
29	2400	62	5131	95	7861	128	10592
30	2483	63	5213	96	7944	129	10675
31	2565	64	5296	97	8027	130	10758
32	2648	65	5379	98	8110	131	10840
33	2731	66	5462	99	8192	132	10923

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PHASE II - BULK DISTRIBUTION (Cont'd)

VII. TANK CALIBRATIONS (Cont'd)

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
133	11006	166	13737	199	16467	232	19198
134	11089	167	13819	200	16550	233	19281
135	11171	168	13902	201	16633	234	19364
136	11254	169	13985	202	16716	235	19446
137	11337	170	14068	203	16798	236	19529
138	11420	171	14150	204	16881	237	19612
139	11502	172	14233	205	16964	238	19695
140	11585	173	14316	206	17047	239	19777
141	11668	174	14399	207	17129	240	19860
142	11751	175	14481	208	17272	241	19943
143	11833	176	14564	209	17295	242	20026
144	11916	177	14647	210	17378	243	20108
145	11999	178	14730	211	17460	244	20191
146	12082	179	14812	212	17543	245	20274
147	12164	180	14895	213	17626	246	20357
148	12247	181	14978	214	17709	247	20439
149	12330	182	15061	215	17791	248	20522
150	12413	183	15143	216	17874	249	20605
151	12495	184	15226	217	17957	250	20688
152	12578	185	15309	218	18040	251	20770
153	12661	186	15392	219	18122	252	20853
154	12744	187	15474	220	18205	253	20936
155	12826	188	15557	221	18288	254	21019
156	12909	189	15640	222	18371	255	21101
157	12992	190	15723	223	18453	256	21184
158	13075	191	15805	224	18536	257	21267
159	13157	192	15888	225	18619	258	21350
160	13240	193	15971	226	18702	259	21432
161	13323	194	16054	227	18784	260	21515
162	13406	195	16136	228	18867	261	21598
163	13488	196	16219	229	18950	262	21681
164	13571	197	16302	230	19033	263	21763
165	13654	198	16385	231	19115	264	21846

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VII. TANK CALIBRATIONS (Cont'd)

EAST, WEST, SOUTHEAST AND SOUTHWEST PHENOL STORAGE TANKS

715#/inch - 19,860 Gallons

INS.	POUNDS	INS.	POUNDS	INS.	POUNDS	INS.	POUNDS	INS.	POUNDS
1	715	49	35035	97	69355	145	103675	193	137995
2	1430	50	35750	98	70070	146	104390	194	138710
3	2145	51	36465	99	70785	147	105105	195	139425
4	2860	52	37180	100	71500	148	105820	196	140140
5	3575	53	37895	101	72215	149	106535	197	140855
6	4290	54	38610	102	72930	150	107250	198	141570
7	5005	55	39325	103	73645	151	107965	199	142285
8	5720	56	40040	104	74360	152	108680	200	143000
9	6435	57	40755	105	75075	153	109375	201	143715
10	7150	58	41570	106	75790	154	110110	202	144430
11	7865	59	42284	107	76505	155	110825	203	145145
12	8580	60	42900	108	77220	156	111540	204	145860
13	9295	61	43615	109	77935	157	112255	205	146575
14	10010	62	44330	110	78650	158	112970	206	147290
15	10725	63	45045	111	79365	159	113685	207	148005
16	11440	64	45760	112	80080	160	114400	208	148720
17	12155	65	46475	113	80795	161	115115	209	149435
18	12870	66	47190	114	81510	162	115830	210	150150
19	13585	67	47905	115	82225	163	116545	211	150865
20	14300	68	48620	116	82940	164	117260	212	151580
21	15015	69	43995	117	83655	165	117975	213	152995
22	15730	70	50050	118	84370	166	118690	214	153010
23	16445	71	50765	119	85085	167	119405	215	153725
24	17160	72	51480	120	85800	168	120120	216	154440
25	17825	73	52195	121	86515	169	120835	217	155155
26	18540	74	52910	122	87230	170	121550	218	155870
27	19255	75	53625	123	87945	171	122265	219	156585
28	20020	76	54340	124	88660	172	122980	220	157300
29	20735	77	55055	125	89375	173	123695	221	158015
30	21450	78	55770	126	90090	174	124410	222	158730
31	22165	79	56485	127	90805	175	125125	223	159445
32	22880	80	57200	128	91520	176	125840	224	160160
33	23595	81	57915	129	92235	177	126555	225	160875
34	24310	82	58630	130	92950	178	127270	226	161590
35	25025	83	59345	131	93665	179	127985	227	162305
36	25740	84	60060	132	94380	180	128700	228	163020
37	26455	85	60775	133	95095	181	129415	229	163735
38	27170	86	61490	134	95810	182	130130	230	164450
39	27885	87	62205	135	96525	183	130845	231	165165
40	28600	88	62920	136	97240	184	131560	232	165880
41	29315	89	63635	137	97955	185	132275	233	166595
42	30030	90	64350	138	98670	186	132990	234	167310
43	30745	91	65065	139	99385	187	133705	235	168025
44	31460	92	65780	140	100100	188	134420	236	168740
45	32175	93	66495	141	100815	189	135135	237	169455
46	32890	94	67210	142	101530	190	135850	238	170170
47	33605	95	67925	143	102245	191	136565	239	170885
48	34320	96	68640	144	102960	192	137280	240	171600

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DEPT. 827

PHENOL DISTRIBUTION

CUMENE PHENOL INVENTORY DATA

Date

Storage Location	Level In Inches	# Stock
East Stg. Tank		
West Stg. Tank		
S.E. Stg. Tank		
S.W. Stg. Tank		
Little Mo.		

Total Stock in Storage

Correction Factor

Total Pounds in Stg. Tanks

TANK CARS AVAILABLE

Number	Pounds
Total Pounds in Tank Cars	

Total Pounds in Stg. Tanks

Total Pounds in Tank Cars

GRAND TOTAL

Foreman/Operator
Sta. 412

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