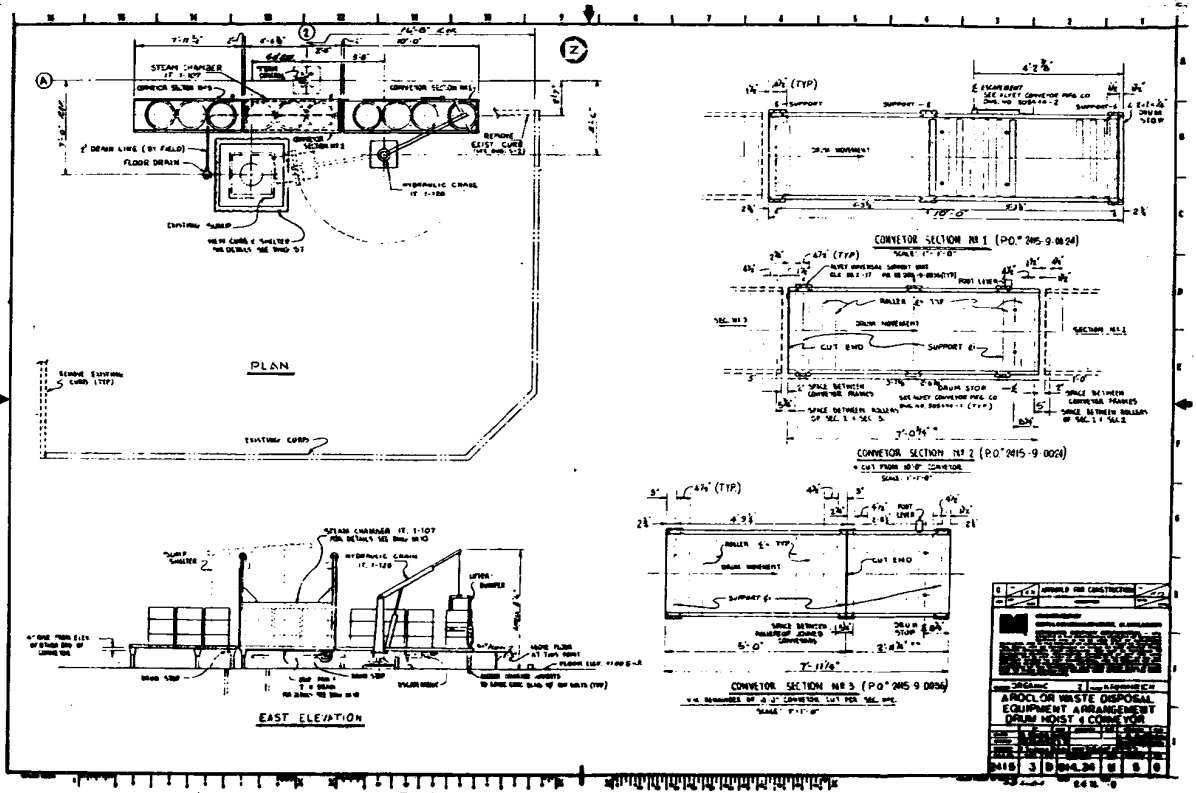
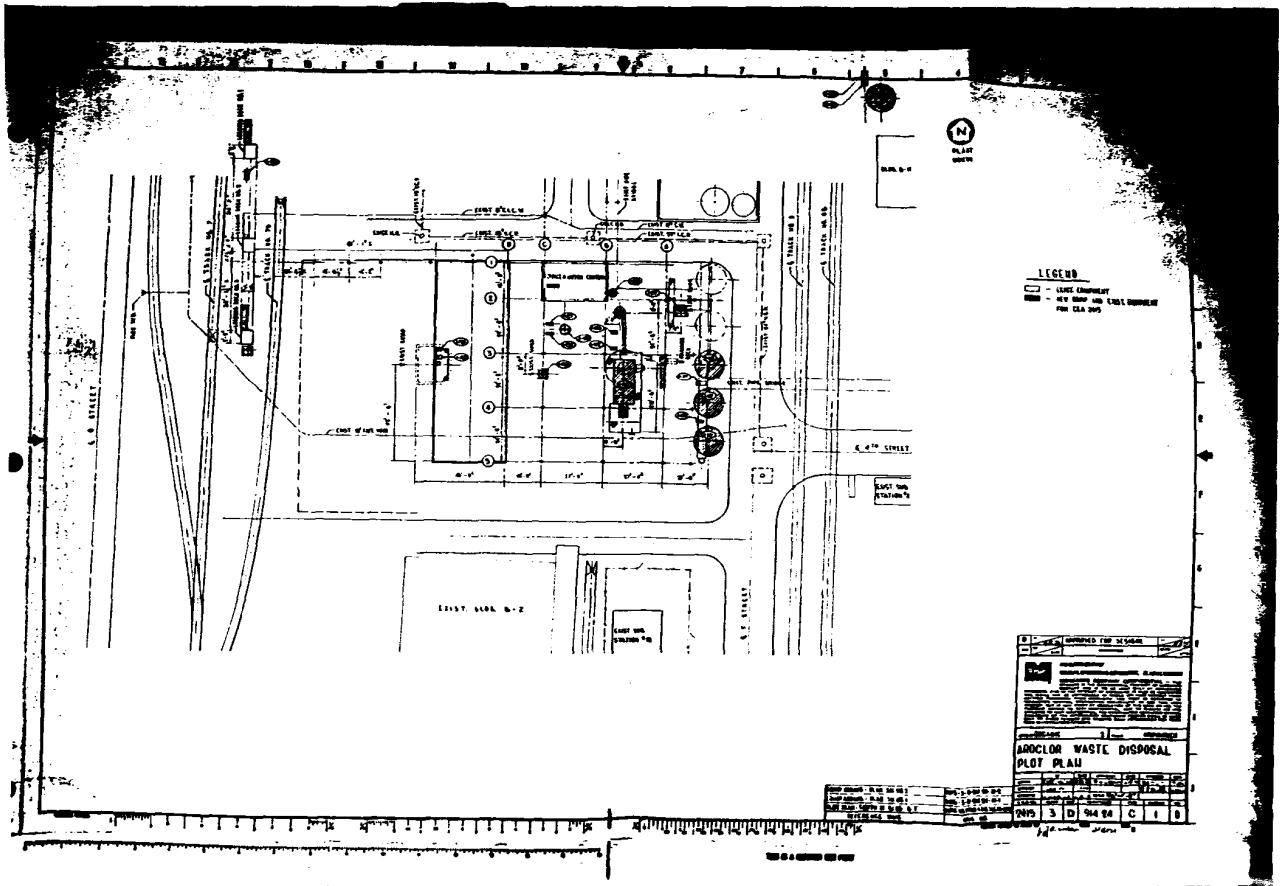
MONS 095466



PLAN
STEAM CHAMBER
FLOOR DRAIN
EXISTING SUMP
HYDRAULIC CRANE
REMOVE EXIST CURB
EXISTING CURB
EAST ELEVATION
CONVEYOR SECTION Nº 1 (P.O.# 2415-9-0024)
CONVEYOR SECTION Nº 2 (P.O.# 2415-9-0024)
CONVEYOR SECTION Nº 3 (P.O.# 2415-9-0036)
CUT END
SUPPORT
DRUM STOP
ROLLER
ARCOLOR WASTE DISPOSAL
EQUIPMENT ARRANGEMENT
DRUM HOIST & CONVEYOR

MONS 095467



APPENDIX F

UTILITIES SUMMARY

ITRAL ENGINEERING DEPARTMENT

JECT NAME	PREPARED BY	APPROVED BY	CEA NO	AREA	PAGE
AROCLOR WASTE DISPOSAL	W. G. NIEMEYER		2415		1 OF 1

UTILITY SERVICE	UNITS	INITIAL ISSUE DATE 8/5/70		REV. 1 DATE		REV. 2 DATE		REV. 3 DATE	
		AVERAGE	DESIGN	AVERAGE	DESIGN	AVERAGE	DESIGN	AVERAGE	DESIGN
TEAM (120 PSIG)	LBS/HR	200	500						
TEAM (80 PSIG)	LBS/HR	300	1000						
'OWER	INSTALLED HP	175	250						
IATURAL GAS	SCFH	5000	6000						
:UEL OIL	GPH	—	60						
VELL WATER	GPM	125	150						
:ITY WATER	GPM	5	50						

MONS 095468

SECT. D108-R2

...ment Has Not Been Checked Since Last Revision.

EQUIPMENT LIST

Item No.	Description	Material of Construction
1-101	Montar Tank Trailer	Carbon Steel
1-102	Incinerator	Refractory-Lined Carbon Steel
1-151	Quench Column	Hastelloy "C"
1-152	Quench Pot	Polyester-Lined Carbon Steel
1-153	Venturi Scrubber	Hastelloy "C" Polyester Ductwork
1-154	Packed Scrubber Column	Polyester-Lined Carbon Steel
1-155	Demister Pad	Monel
1-150	Combustion Air Blower	Carbon Steel
1-104	Incinerator Feed Pump Moyno Positive Displ.	Stator - Viton A Rotor - Chrome Plated Tool Steel Housing - Cast Iron
1-106	Scrubber Circulating Pump	Chlorimet 3 (Hastelloy "C")
1-107	Drum Heater	Structural Steel Frame; Insulating Board Enclosure
1-110	Tank Car Unloading Pump	Worthington Self-Priming (Worthite)
1-111	Tank Truck Unloading Pump	Durco A20 (Ductile Iron)
1-112	Well Water Booster Pump	Durco A-70 (Alloy 20)
1-114	Fuel Oil Storage Tank (20,000 Gallons)	Carbon Steel
1-115, 1-123	Fuel Oil Pumps	Roper Gear Cast Iron
1-116, 1-117, 1-118	Waste Storage Tanks (20,000 Gallons)	Carbon Steel
1-119	Drum Unloading Sump Pump	Taber Vertical Ductile Iron
1-120	Incinerator Area Sump Pump	Taber Vertical (304 SS)
1-121	Aroclor Sump Pump	Goulds Vertical Ductile Iron
1-122	Water Sump Pump	Taber Vertical (304 SS)
1-124	Settling Basin	Concrete
1-126	City Water Break Tank	Carbon Steel
1-127, 1-132	City Water Pumps	Patterson (Semi-Steel and Bronze)
1-128	Drum Crane Capacity 2000 lbs.	Air Technical Industries

SECT 0201-01

SPECIFICATION NO: 2415-01-102.000

1. SCOPE

1.1 The unit will oxidize waste liquid to CO_2, H_2O, HCl and CaO with auxiliary fuel and excess air at sufficient residonce time and temperature to destroy the organic components of the waste. The unit will quench and scrub the flue gases with water to remove HCl and particulates.

2. STREAM DEFINITIONS

2.1 The waste liquid will be Aroclor 1242, Aroclor 1260, Aroclors which are chlorinated at some level between 1242 and 1260, Inerteen PPO, the distillation residue in the production of Aroclor (Montar), or any combination of the Aroclors and Montars. Maximum waste rate will be 1250 pounds per hour. Vendor possesses analysis and testing results on these materials.

2.2 Auxiliary fuel will normally be natural gas available at 35 psig. However, #2 fuel oil will be used when natural gas is not available in the winter months. Natural gas will be available for the pilot at all times.

2.3 Atomizing steam will be available at 150 psig.

2.4 Hard well water will be provided at 100 psig to be used for quench and scrubber liquor. Analysis of this water is attached, Specification 2415-01-102.000A.

2.5 Effluent gases from the oxidizer shall not contain more than 0.001 pounds per hour of polychlorinated biphenyls and effluent stack gases shall not contain: more than 5 pounds of HCl per hour, more than 0.05 grains of particulates per standard cubic foot, particles larger than 20 microns in diameter, more than 50 ppm of free chlorine for 1250 pounds per hour feed rate.

2.6 Scrubber liquor will be sewered without neutralization.

3. OPERATING CONDITIONS

3.1 Unit will be capable of operating from 2000 to 2800°F for the Aroclors and from a maximum of 2000°F for the Montar at 1250 pounds of waste per hour and ten million pounds of waste per year.

MONS 095470

3.2 Combined quench and scrubber liquor makeup not to exceed 143 gpm (70 gpm to the packed bed. 68 gpm to the quench spray nozzles and weir in the quench tube, and 5 gpm to the oxidizer quench spray nozzles. System to be designed to prevent scaling and plugging due to the well water (Section 2.4) and particulates.

ES-7

4. MATERIALS TO BE SUPPLIED BY VENDOR

4.1 Equipment

A. Thermal Oxidizer

a. 9'-6" O.D. oxidizer furnace
b. Flanged exhaust
c. Bolted access door
d. Thermowell and sample connections at oxidizer outlet
e. Sight ports
f. Shop installed refractory anchors as required
g. Control connections for items specified in Section 4.2
h. Flanged burner connection
i. A283 carbon steel construction
j. Lifting lugs
k. Ladders and platforms to the burner on one end of the oxidizer and to the thermocouples and sprays on the other end, hot dip galvanized according to Specification 2415-01-102.000E
l. All external carbon steel surfaces which are not galvanized will be sandblasted and then painted with inorganic zinc primer in compliance with Monsanto Standards, Specification 2415-01-102.000B
m. Weak seam welding on rear oxidizer head, weld thickness to be one fourth of head plate thickness provided plate is three eighths of an inch minimum thickness.

B. Burner

One high intensity fuel gas-fuel oil-waste liquid burner. The burner will include the following:

a. Electric igniter
b. Gas pilot
c. Raw (natural) gas auxiliary fuel burner
d. Standby auxiliary fuel oil burner
e. Adjustable air register
f. Forced draft design
g. Secondary waste liquid burner (steam atomized)
h. Burner tile

C. Refractory

The oxidizer furnace will be lined with 6" of B-40 brick, a special high duty basic firebrick adequate for extreme temperature service and the attack of the calcium to be found in the Monters, backed with 4.5" of Kastolite. Greenchrome mortar is to be used. The burner will be lined with B40 brick. All refractory material including a reasonable amount of overage for [illegible] will be supplied by the vendor for field

4. MATERIALS TO BE SUPPLIED BY VENDOR (Continued)

4.1 Equipment (Continued)

D. Quencher

The quencher consists of a water wall direct spray contactor flanged directly beneath the oxidizer followed by a vertical, cylindrical quench pot with a horizontal flanged exhaust. Features of the quenching system are as follows:

a. 9'-6" O.D. quench pot
b. 30" O.D. contactor tube of Hastelloy C construction
c. Mechanically atomized water spray nozzles in the contactor tube capable of operating with hard well water, Specification 2415-01-102.000A.
d. Glass flaked reinforced polyester lined carbon steel construction in the quench pot, Atlac 382 resin, 100 mils minimum thickness
e. Suitable connections for a drain and the control items specified in Section 4.2
f. See Section 4.1.A.1. for procedure for painting quench pot

E. Scrubbing System and Vent Stack

A venturi type scrubber will be flanged directly to the exhaust of the quench pot. It will be fabricated from Hastelloy C. Water manifolds, jacketing and support structure will be included. The vent stack is a vertical, cylindrical, free-standing unit including a packed bed to serve as the secondary scrubber for the scrubbing of hydrogen chloride in the effluent gases. The vent stack will be flanged directly to the diffuser section following the fixed throat venturi. Design features of the vent stack are:

a. 5' O.D. stack base (packed bed diameter)
b. 15' (minimum) packed bed of 2" Intalox saddles complete with overhead spray bar designed to provide absorption efficiency without plugging due to particulates or scaling
c. A lining of firebrick in the lower part of this stack to protect the shell from erosion
d. The stack and its entrance duct complete fiberglass lined to protect the shell from corrosion
e. Mesh type monel mist eliminator at the top of the stack
f. 45' overall height
g. Necessary connections for access and controls
h. A283 carbon steel construction
i. See Section 4.1.A.1. for procedure for painting scrubber and stack external surfaces

MONS 095472

4. MATERIALS TO BE SUPPLIED BY VENDOR (Continued)

4.1 Equipment (Continued)

E. Scrubbing System and Vent Stack (Continued)

j. Two samples ports with access ladder and 180° platform to be located at top of stack. The ports will be located 90° apart at the same height. Access to mist eliminator from the top platform is to be provided. Platform and ladders are to be hot dip galvanized, Specification 2415-01-102.000E.

k. Two 18" access doors located above and below packing with step-offs from the ladder are to be provided

F. Blower

A blower will be included complete with a TEFC motor to supply the combustion air. This blower will be a Buffalo Forge Model 45-3CB or equal, complete with a 100 HP motor which complies with Specification 2415-01-102.000D.

4.2 Controls

All controls must meet FIA standards and must be models acceptable to Monsanto Specification 2415-01-102.000C. Also, electrical work must be in compliance with Specification 2415-01-102.000D. A list of the major items follows.

A. Honeywell Model 4075B UV flame detection relay
B. Honeywell Model 7012E UV scanner to scan pilot
C. Time delay relays for purge and trial for ignition
D. Ignition transformer
E. Safety shutoff solenoid valves for fuel gas, pilot gas, and fuel oil lines, manual reset
F. High and low fuel gas pressure switches and parallel fuel oil controls
G. High and low temperature switches with temperature recording controller on oxidizer
H. Auxiliary fuel gas control valve and parallel fuel oil controls
I. Waste shutoff valve
J. Pressure gauges on waste liquid line, atomizing steam line, auxiliary fuel gas line, auxiliary fuel oil line, and pilot gas line
K. Hand firing valves
L. Necessary rotameters and their associated hand valves
M. Level controls on the sumps of the quench pot and the vent stack
N. Low pressure shutoff on steam line
O. High temperature shutoff on quench pot gas phase effluent with backup Burling bi-metallic switch on venturi intake

MONS 095473

4. MATERIALS TO BE SUPPLIED BY VENDOR (Continued)

4.2 Controls (Continued)

P. Low flow shutoff switch on water supply
Q. Low flow shutoff switch on combustion air supply
R. Solenoid shutoff valve on quench water line to oxidizer
S. A pre-wired control cabinet in weatherproof construction and suitable for outdoor installation, NEMA 4, which contains all necessary instruments for operation of controls in Sections 4.2.A. through 4.2.R.

SECT. 0 201-01

Monsanto COMPANY

LOCATION

PERFORMANCE DATA
INCINERATOR FEED PUMP
PROJ [redacted] AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-104
AUTH NO. 2415 PLANT KRUMMRICH
BY W. G. NIEMEYER DATE 9/25/70
APPD N. B. Wall SHEET 1 OF 1

NAME:	INCINERATOR FEED PUMP
DESCRIPTION:	POSITIVE DISPLACEMENT PUMP
NUMBER REQUIRED	1 (1-104)
FUNCTION:	TO PUMP A MIXTURE OF WASTE AROCLOR AND MONTAR FROM STORAGE TANK (1-118) TO THE INCINERATOR WASTE LIQUID BURNER.
MATERIALS HANDLED:	A MIXTURE OF WASTE AROCLOR AND MONTAR MIXTURE MAY CONTAIN UP TO 10% (BY WT.) SOLIDS SOLIDS ARE CALCIUM OXIDE, IRON CHLORIDE & CARBON PHYSICAL PROPERTIES: SPECIFIC GRAVITY AT 100°C = 1.31 TO 1.47 DENSITY (LBS/GAL) AT 100°C = 10.9 TO 12.3 VISCOSITY (CENTIPOISE) AT 100°C = 8.6 TO 37.9 VAPOR PRESSURE (PSIA) AT 100°C = NEGLIGIBLE
DESIGN CAPACITY:	DESIGN FLOW RATE: 1250 LBS/HOUR GPM = 1.91 TO 1.70 MAX. FLOW: 2 GPM MIN. FLOW: 0.7 GPM
OPERATING CONDITIONS:	DUTY: CONTINUOUS DISCHARGE PRESSURE: NORMAL: 120 PSIG MAXIMUM: 150 PSIG MINIMUM: 100 PSIG TEMPERATURE: NORMAL: 100°C MAXIMUM: 100°C MINIMUM: 75°C
SPECIAL DESIGN CONSIDERATIONS:	1) PUMP MUST BE ABLE TO HANDLE SOLIDS AS SHOWN ABOVE 2) HAVE A TURNDOWN RATIO OF 3 TO 1
CONSTRUCTION:	MATERIALS OF CONSTRUCTION: CARBON STEEL "VITON A" RUBBER MAY BE USED IN VALVE SEATS
DRIVER:	ELECTRIC MOTOR: ALLIS CHALMERS TYPE RGZ, TEFC
	PIPING ON DISCHARGE OF PUMP WILL BE EQUIPED WITH A RELIEF VALVE.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095475

SECT. 0201-02

Monsanto COMPANY

LOCATION

SPECIFICATION
Incinerator Feed Pump
PROJ/EQUIP Aroclor Waste Disposal

EQUIP. IDENT NO. 01-104.000
AUTH NO. 2415 PLANT KRUMMRICH
BY J.H. WALDRESER DATE 12-9-70
APPD SHEET 1 OF 1

NAME: Incinerator Feed Pump

NUMBER OF UNITS: ONE

MATERIALS HANDLED:

Chlorinated organic liquid containing up to 10% (by wt) of solids - solids are calcium oxide, iron chloride, and carbon

Specific gravity @ 100°C = 1.3 to 1.5
Viscosity in centipoise @ 100°C = 8.6 to 38
Vapor Pressure @ 100°C = Negligible

CAPACITY:

Design Rate = 3.0 gpm
Normal Rate = 1.0 to 2.0 gpm

OPERATING CONDITIONS:

Normal differential pressure = 120 psig
Design differential pressure = 150 psig
Design temperature : 100°C
Normal temperature : 100°C

PUMP DESCRIPTION:

Positive displacement capable of at least a 3 to 1 turndown.
Cast iron pump housing
Use Impregnated asbestos packing

DRIVE:

3/4 HP - TEFC - U frame - include motor pulley for capacity control

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

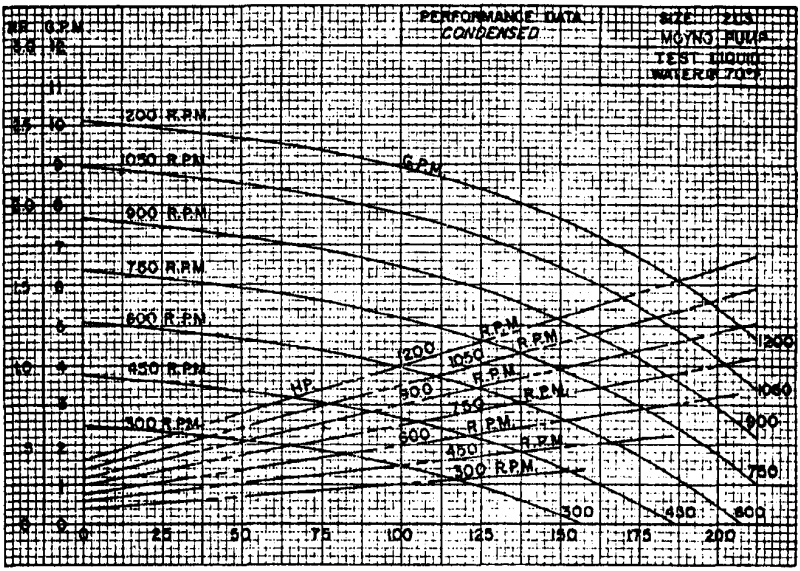
MONS 095476

EE 83 (7/67)

SECT. 0201-04

ROBBINS & MYERS, INC. - MOYNO PUMP DIVISION
Springfield, Ohio

DATE Sept. 15, 1958 SECTION 70 INDEX 70 B PAGE 4.1



CEA 2415
INCINERATOR FEED PUMP

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ [redacted] AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-106
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 10/12/70
APPD W. G. Wilk SHEET 1 OF 2

LOCATION

NAME PACKED COLUMN PUMP (NEW) NO. REQD 1

FUNCTION TO PUMP DILUTE HYDROCHLORIC ACID (2% BY WT.) FROM THE PACKED COLUMN TO THE VENTURI SCRUBBER

OPERATION CONTINUOUS FLOW TO VENTURI SCRUBBER - MANUAL FLOW CONTROL

DUTY: ☐ INTERMITTENT ☒ CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	HYDROCHLORIC ACID (2% BY WT.)	GPM	70	80	
	TOTAL				
SOLIDS / GAS	UNREACTED LIME	LBS/HR	30	94	

PROCESS DATA

PUMPING TEMPERATURE, PT.° F 180 | SP GR @ PT 0.98 @ 60 F 1.00 | CRYSTALLIZING TEMP ° F APPROX. 30°
VISCOSITY, CENTIPOISE (UNITS) @ PT 0.35 @ 60 F 1.1
VAPOR PRESSURE, PSIA, @ PT 7.51 @ 80 F 0.26 | SOLIDS @ NORMAL FLOW 0.15 % WT | DENSITY | SIZE
CORROSION/EROSION: ☐ NEGLIGIBLE ☒ MODERATE ☐ SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 70 : MAX DESIGN 80 : CONTROL ALLOWANCE*
PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM, 80
STATIC HEAD @ PT, 12 FT 5.1 PSI | EQUIPMENT LOSS, PSI: 92 NORMAL RAT
PIPE DIA, NPS: SUCTION : DISCHARGE | PIPING LOSS, PSI: NORMAL 6.5 RAT
CONTROL VALVE PRESSURE DROP, PSI: NORMAL | AVAILABLE NPSH, FT: NORMAL 18.1 RAT
RATED TDH @ PT: 273 FT 116 PSI FROM PUMP CALCULATION SHEET NO. ES 95
SYSTEM CURVE CALCULATIONS FROM SHEET NO. : DRIVER ☒ ELEC MOTOR ☐ TURBINE ☐ OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	CHLORIMET-3	PACKING	
IMPELLER	CHLORIMET-3	MECHANICAL SEAL	CRANE NO. 30
SHAFT, SHAFT SLEEVE	CHLORIMET-3	PACKING GLAND	
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS.

MOTOR: - ALLIS CHALMERS TYPE RGZ, TEFC, V-FRAME

REMARKS, SPECS, TESTS, ETC.

COUPLING GUARD TO MEET WGK PLANT STD. D 11.8 STD 2001, FIG. 1

*Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APP'D	DATE
1					
2					
3					

MONS 095478

1555 (7/67)

PACKED COLUMN PUMP

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP CALCULATION SHEET

PROJ. ARoclor Waste Disposal

PLANT

LOCATION

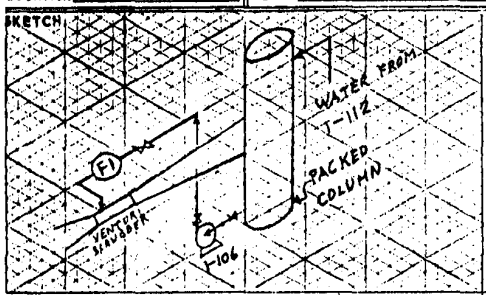
EQUIP. NO. 1-106

AUTH NO. 2415 LIGHT W&K

BY W. G. NIEMEYER DATE 10/12/70

APPD N. B. Wells SHEET 2 OF 2

SKETCH



CONDITIONS

Material Pumped HYDROCHLORIC ACID, 2% BY WT.

P.T. = Pumping Temperature 82 °C 180 °F

gpm = Flow Rate: Normal 70 Design 80

S = Specific Gravity* 0.98 Density 8.16 lb/gal

μ = Viscosity* 0.35 Centipoise

P_{vp} = Vapor Pressure* 394 mmHg 7.51 psia

ΔP: Control Valve † psi; Equip. ✱ psi

Pipe (Material POLYETHYLENE LINED CARBON STEEL Sch or Wall Thk ——)

Nominal Size 3 Suction 2 Discharge

d, Actual ID, inches 2.69 Suction 1.75 Discharge

*At Pumping Temperature

† DIAPHRAGM VALVE = 10 PSI

✱ SPRAY NOZZLE = 30 PSI MAGMETER = 2 PSI

EQUIVALENT LENGTHS Enter Type and Factor for each valve or fitting. Enter Number of each type, and line size. Multiply Factor × Size × Number and enter Feet equivalent length. See handbook for types not listed.

Factors for Valves (open) and Fittings

Gate	1.1	Plug Valve	1.5	90° I. r. or Weld ell	1.7
Globe, Lift Check	28.0	Butterfly (6" & up)	1.7	Std Tee (on run)	1.7
Wye, Angle, Diaphr	14.0	90° Std Elbow	2.5	Std Tee (side out)	5.0
Swing Check	11.0	45° Std Elbow	1.3		

Suction					Discharge				
Type	Factor	Nominal Size	Number	Feet	Type	Factor	Nominal Size	Number	Feet
PLUG	1.5	3	1	5	TEE F	1.7	2	2	7
TEE F	1.7		1	5	ELL	25		5	25
					PLUG	1.5	1	1	3
Length of straight pipe in feet				5					50
L = Total Equivalent Length, feet				15					85

FRICTION HEAD LOSS

$V = (0.408)\ gpm/d^2$, feet per second $(0.408)(80)/7.24$ $(0.408)(80)/3.06$

Re (Reynolds Number) = $(3162)\ gpm\,S/d\mu$ $(3162)(80)(0.98)/(2.69)(0.35)$ $(3162)(80)(0.98)/(1.75)(0.35)$

f = Friction Factor (See Appendix C of D14.2 Std 2) if Re < 2100 omit this step.

Δh [(Re < 2100) = 0.154 μ V/d²] [(Re > 2100) = 18.63 f V²/d] feet of fluid per 100 feet equivalent length $(18.67)(0.015)(20.4)/2.69$ $(18.67)(0.013)(114)/1.75$

	Suction	Discharge
V	4.51	10.68
Re	263,000	405,000
f	0.015	0.013
Δh	2.12	15.8
Total Friction Head Loss = Δh × L/100 × 1.15 (safety factor), feet of fluid	0.37	15.4

SUCTION AND DISCHARGE HEADS

	Suction	Discharge
Vessel Pressure (psia × 2.31/S)	(+) 35.2	(+) 40.3
Liquid Level (above pump +; below pump −)	(+) 1.0	
Static Head (above pump +; below pump −)		(+) 12.0
Total Friction Head Loss (Plus Velocity Head. See Note 4.)	(−) 0.4	(+) 15.4
DIAPHRAGM Valve (Δpsi × 2.31/S) (See Notes 1 and 2) 10 PSI	(−) 0	(+) 23.6
Orifice (Δpsi × 2.31/S) (See Note 2)	(−) 0	(+) 0
Equipment (Δpsi × 2.31/S) 92 PSI	(−) 0	(+) 217.0
Suction Head Sum, feet of fluid, abs.	35.8	
Discharge Head Sum, feet of fluid, abs.		308.3

SYSTEM HORSEPOWER (estimated)

$HP = \frac{gpm \times TDH \times S}{3960 \times E\text{(Note 3)}}$

$HP = \frac{80 \times 273 \times 0.98}{3960 \times 0.40}$

ASSUMED 40% EFFICIENCY

HP = 13.5

DYNAMIC HEAD

Discharge Head Sum	308.3
Suction Head Sum	− 35.8
TDH = Total Dynamic Head, feet of fluid	272.5

NPSH

Suction Head Sum	35.8
P_{vp} (mmHg × 0.045/S) or (psia × 2.31/S) $(7.51)(2.31)/0.98$	− 17.7
NPSH Available, feet of fluid, abs.	18.1

PUMP SELECTION

Manufacturer DURCO ; Model ; Type AVS 3 X 1½ X 10 ;

Speed 3500 rpm; Imp Size ; HP ; Eff ;

GPM ; TDH ; NPSH ;

NOTES

1. Assume control valve loss to be 70% to 100% of piping plus equipment friction loss for initial calculation. Consult instrument engineer for final selection.
2. Control valves and orifices not normally used in pump suction.
3. Use combined efficiency of pump and drive.
4. See D14.2 STD 2, a guide for the use of this calculation procedure.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					

MONS 095479

SECT. 0201-04

THE DURIRON COMPANY, INC.

DAYTON, OHIO

DURCOPUMP PERFORMANCE CHARACTERISTICS

EYE AREA	3.51 SQ. IN.
MAX. SPHERE	3/8 IN.
IMP. PATT.	CT-25313A
STD. NO.	- A05

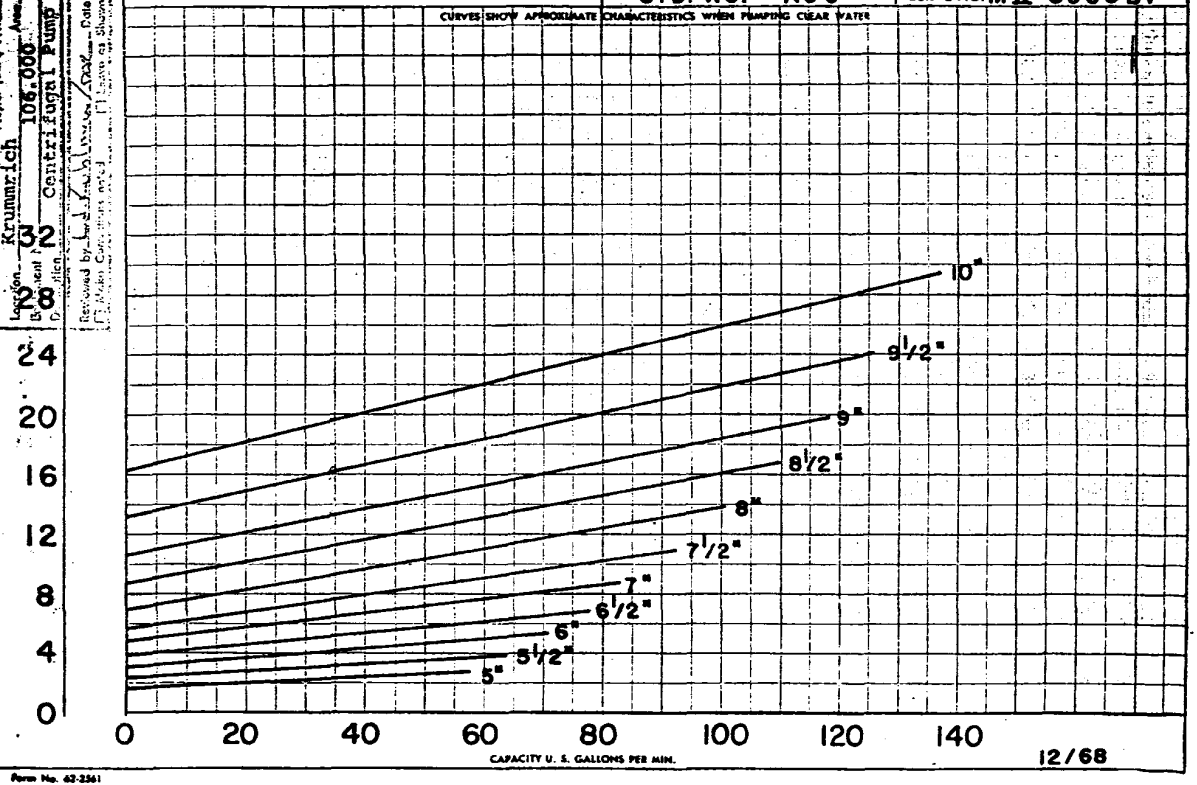
DURCO MARK I

2X1-10

SPEED 3500 R.P.M.

CURVE NO. M II 8000 BV

CURVES SHOW APPROXIMATE CHARACTERISTICS WHEN PUMPING CLEAR WATER



12/68

MONSANTO COMPANY
CENTRAL ENGR. DEPT.
Location Krummrich
Department No. 106,000
Description Centrifugal Pump
Reviewed by
Date 11-23-
Make Corrections noted
Leave as Shown

Form No. 62-2561

MONS 095480

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-110
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 10/1/70
APPD N. R. Wolk SHEET 1 OF 2

LOCATION

NAME TANK CAR UNLOADING PUMP (TO BE RELOCATED) NO. REQD 1

FUNCTION TO PUMP WASTE AROCLOR FROM A TANK CAR TO THE WASTE AROCLOR STORAGE TANKS, 1-116 AND 1-117

OPERATION INTERMITTENT PUMPING

DUTY: [X] INTERMITTENT [ ] CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	AROCLOR	GPM	100	100	
	TOTAL	GPM	100	100	
SOLIDS / GAS					

PROCESS DATA

PUMPING TEMPERATURE, PT, °F 212 | SP GR @ PT 1.31 TO 1.47 @ 60 F 1.39 TO 1.55 | CRYSTALLIZING, TEMP °F

VISCOSITY, CENTIPOISE (UNITS) @ PT 4 TO 10 @ 60 F 300 TO 100,000

VAPOR PRESSURE, PSIA, @ PT NEGL. @ 60 F NEGL. | SOLIDS % WT | DENSITY | SIZE

CORROSION/EROSION: [X] NEGLIGIBLE [ ] MODERATE [ ] SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 100 ; MAX DESIGN 100 ; CONTROL ALLOWANCE*

PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM,

STATIC HEAD @ PT. 25 FT 15.1 PSI | EQUIPMENT LOSS, PSI: NONE NORMAL RAT

PIPE DIA, NPSI: SUCTION 3" ; DISCHARGE 3" | PIPING LOSS, PSI: 9.5 NORMAL RAT

MANUAL VALVE PRESSURE DROP, PSI: 29.8 NORMAL | AVAILABLE NPSH, FT: 22.6 NORMAL RAT

RATED TDH @ PT: 92 FT 55.5 PSI FROM PUMP CALCULATION SHEET NO. ES 95

SYSTEM CURVE CALCULATIONS FROM SHEET NO. WORTHINGTON A-1660: DRIVER [X] ELEC MOTOR [ ] TURBINE [ ] OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	WORTHITE	PACKING	ASBESTOS
IMPELLER	WORTHITE	MECHANICAL SEAL	NONE
SHAFT, SHAFT SLEEVE	WORTHITE	PACKING GLAND	WORTHITE
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:

PRESSURE SWITCH TO SHUTDOWN PUMP AT LOW DISCHARGE PRESSURE

MOTOR - ALLIS-CHALMERS TYPE RGZ TEFC

REMARKS, SPECS, TESTS, ETC.

EXISTING PUMP: WORTHINGTON SELF-PRIMING SIZE 2 CNGK-84
2" SUCTION, 2" DISCHARGE x 9½" IMPELLER
1750 RPM, 7.5 HP
(PHENOL DEPT. ITEM No. 838)

MODIFICATION REQUIRED: CHANGE 7.5 HP MOTOR TO 15 HP

*Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095481

ES 55 (7/67)

TANK CAR UNLOADING PUMP SECT. 0201-01

Monsanto COMPANY

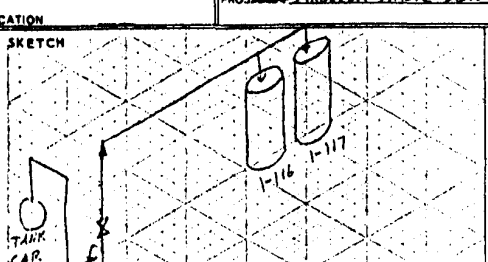
LOCATION

CENTRIFUGAL PUMP CALCULATION SHEET

PROJ. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-110
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 9/30/70
APPD N.B. Ward SHEET 2 OF 2

SKETCH



CONDITIONS

Material Pumped WASTE AROCLOR
P.T. = Pumping Temperature 100 °C 212 °F
gpm = Flow Rate: Normal 100 Design 100
S = Specific Gravity* 1.31 to 1.47 Density 10.9 to 12.2 lb/gal
μ = Viscosity* 4 TO 10 Centipoise
P_{vp} = Vapor Pressure* NEGL. mmHg NEGL. psia
ΔP: Control Valve NONE psi; Equip. NONE psi
Pipe (Material CARBON STEEL Sch ~~Wall Thk~~ 40)
Nominal Size 3" Suction 3" Discharge
d, Actual ID, Inches 3.068 Suction 3.068 Discharge
*At Pumping Temperature

EQUIVALENT LENGTHS Enter Type and Factor for each valve or fitting. Enter Number of each type, and line size. Multiply Factor × Size × Number and enter Feet equivalent length. See handbook for types not listed.

Factors for Valves (open) and Fittings					
Gate	1.1	Plug Valve	1.5	90° l. r. or Weld ell	1.7
Globe, Lift Check	28.0	Butterfly (6" & up)	1.7	Std Tee (on run)	1.7
Wye, Angle, Diaphr	14.0	90° Std Elbow	2.5	Std Tee (side out)	5.0
Swing Check	11.0	45° Std Elbow	1.3		

	Suction					Discharge				
	Type	Factor	Nominal Size	Number	Feet	Type	Factor	Nominal Size	Number	Feet
	GATE	1.1	3"	1	3	ELL	1.7	3"	10	51
	TEE (run)	1.7		1	5	GATE	1.1		3	10
	ELL	2.5		5	37	TEE (side)	5.0		3	45
						TEE (run)	1.7		2	10
Length of straight pipe in feet					30					300
L = Total Equivalent Length, feet					75					416

FRICTION HEAD LOSS

	Suction	Discharge
V = (0.408) gpm/d^2, feet per second (0.408)(100)/9.41	4.34	4.34
Re (Reynolds Number) = (3162) gpmS/dμ (3162)(100)(1.31)/(3.07)	204.00	204.00
f = Friction Factor (See Appendix C of D14.2 Std 2) If Re < 2100 omit this step.	0.029	0.029
Δh [(Re < 2100) = 0.154 fμ²L/d³S² (Re > 2100) = 18.63 f V²/d] feet of fluid per 100 feet equivalent length (18.63)(0.029)(4.34²)/3.07	3.31	3.31
Total Friction Head Loss = Δh × L/100 × 1.15 (safety factor), feet of fluid	2.85	14.4

SUCTION AND DISCHARGE HEADS

	Suction	Discharge
Vessel Pressure (psia × 2.31/S)	(+) 24.4	(+) 24.4
Liquid Level (above pump +; below pump −)	(±) 1.0	
Static Head (above pump +; below pump −)		(±) 75.0
Total Friction Head Loss (Plus Velocity Head. See Note 4.)	(−) 2.8	(+) 15.8
MANUAL ~~CONTROL~~ Valve (Δpsi × 2.31/S) (See Notes 1 and 2) 30.6 /S1	(−) 0	(−) 49.4
Orifice (Δpsi × 2.31/S) (See Note 2)	(−) 0	(+) 0
Equipment (Δpsi × 2.31/S)	(−) 0	(+) 0
Suction Head Sum, feet of fluid, abs.	27.6	
Discharge Head Sum, feet of fluid, abs.		114.6

SYSTEM HORSEPOWER (estimated)

$$HP = \frac{gpm \times TDH \times S}{3960 \times E\text{(Note 3)}}$$

$$HP = \frac{100 \times 92 \times 1.39}{3960 \times 0.35 \times 0.95 \times 0.9}$$

HP = 10.8

DYNAMIC HEAD

Discharge Head Sum	114.6
− Suction Head Sum	27.6
TDH = Total Dynamic Head, feet of fluid	92.0

NPSH

Suction Head Sum	27.6
P_{vp} (mmHg × 0.045/S) or (psia × 2.31/S)	− 0
NPSH Available, feet of fluid, abs.	27.6

PUMP SELECTION SELF-PRIMING

Manufacturer WORTHINGTON ; Model 2CNGK84 ; Type
Speed 1750 rpm; Inlet Size 9½ ; HP 15 ; Eff. 0.35 (est.)
GPM 100 ; TDH 92 ; NPSH (REQD) 2 FT.

NOTES

1. Assume control valve loss to be 70% to 100% of piping plus equipment friction loss for initial calculation. Consult instrument engineer for final selection,
2. Control valves and orifices not normally used in pump suction.
3. Use combined efficiency of pump and drive.
4. See D14.2 STD 2, a guide for the use of this calculation procedure.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095482

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

LOCATION

EQUIP. IDENT NO. 1-111
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 10/12/70
APPD N.B. Walk SHEET 1 OF 2

NAME TANK TRUCK UNLOADING PUMP (TO BE RELOCATED) NO. REQD 1

FUNCTION TO PUMP WASTE AROCLOR OUT OF STORAGE TANKS INTO RESIDUE TRAILER; TO PUMP AROCLOR-MONTAR FROM RESIDUE TRAILER INTO STORAGE TANKS; TO CIRCULATE STORAGE TANKS OR RESIDUE TRAILER

OPERATION INTERMITTENT PUMPING

DUTY: ☒ INTERMITTENT ☐ CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	AROCLOR TO TRAILER	GPM	100	100	
	AROCLOR - MONTAR TO STORAGE	GPM	100	100	
	CIRCULATE TANKS OR TRAILER	GPM	100	100	
	TOTAL				
SOLIDS / GAS					

MAXIMUM TEMP. OF AROCLOR-MONTAR 330°F

PROCESS DATA

PUMPING TEMPERATURE, PT., °F 200 | SP GR @ PT 1.32 TO 1.47 @ 60°F 1.39 TO 1.55 | CRYSTALLIZING TEMP °F —

VISCOSITY, CENTIPOISE (UNITS) @ PT 4 TO 10 @ 60°F 300 TO 100,000

VAPOR PRESSURE, PSIA, @ PT NEGL. @ 60°F NEGL. | SOLIDS % WT | DENSITY | SIZE

CORROSION/EROSION: ☒ NEGLIGIBLE ☐ MODERATE ☐ SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 100 : MAX DESIGN 100 : CONTROL ALLOWANCE*

PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM,

STATIC HEAD @ PT. 25 FT 15.1 PSI | EQUIPMENT LOSS, PSI: NONE NORMAL — RATE

PIPE DIA, NPS: SUCTION 3" ; DISCHARGE 2" | PIPING LOSS, PSI: NORMAL 21.2 RATE

VALVE PRESSURE DROP, PSI: 27.1 NORMAL | AVAILABLE NPSH, FT: NORMAL 21.7 RATE

RATED TDH @ PT: 159.9 FT 96 PSI FROM PUMP CALCULATION SHEET NO. ES 95

SYSTEM CURVE CALCULATIONS FROM SHEET NO. DURCO MII 7300V: DRIVER ☒ ELEC MOTOR ☐ TURBINE ☐ OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	DUCTILE IRON	PACKING	
IMPELLER	DUCTILE IRON	MECHANICAL SEAL	
SHAFT, SHAFT SLEEVE		PACKING GLAND	
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:

REMARKS, SPECS, TESTS, ETC.

EXISTING PUMP: DURCO A-20
SIZE: 3X2 DUCTILE IRON
IMPELLER DIA. - 11"
1750 RPM, 20HP MOTOR
(PHENOL DEPT. ITEM No. 619 or 620)

* Capacity in excess of maximum design for control purposes.

REVISION	BY	DATE	APPD	DATE
CHANGED EXIST. PUMP FROM IT. 300 TO 619 OR 620	NBW	1/22/71		

MONS 095483

Monsanto COMPANY

TANK TRUCK UNLOADING PUMP — SECT. 0201-01

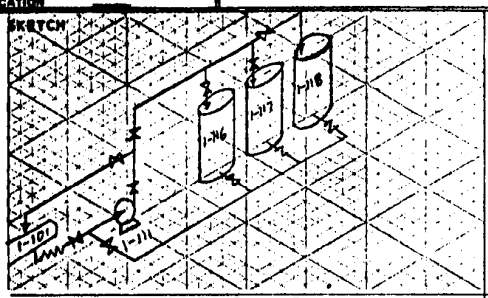
CENTRIFUGAL PUMP CALCULATION SHEET

PROJ/DEPT. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-111 | AUTH NO. 2415 | PLANT W.G.K. | BY W. G. NIEMEYER | DATE 10/7/70 | APPD | SHEET 2 OF 2

LOCATION

SKETCH



CONDITIONS

Material Pumped WASTE AROCLOR

P.T. = Pumping Temperature 93 °C 200 °F

gpm = Flow Rate: Normal 100 Design 100

S = Specific Gravity* 1.32 to 1.47 Density 11.0 to 12.3 lb/gal

μ = Viscosity* 4 TO 10 Centipoise

P_{vp} = Vapor Pressure* NEGL. mmHg NEGL. psia

ΔP: MANUAL Valve ____ psi; Equip. NONE psi

Pipe (Material CARBON STEEL Sch or Wall Thk ____

Nominal Size 3" Suction 2" Discharge

d, Actual ID, inches 3.068 Suction 2.067 Discharge

*At Pumping Temperature

EQUIVALENT LENGTHS Enter Type and Factor for each valve or fitting. Enter Number of each type, and line size. Multiply Factor × Size × Number and enter Feet equivalent length. See handbook for types not listed.

Factors for Valves (open) and Fittings					
Gate	1.1	Plug Valve	1.5	90° I. r. or Weld ell	1.7
Globe, Lift Check	28.0	Butterfly (6" & up)	1.7	Std Tee (on run)	1.7
Wye, Angle, Diaphr	14.0	90° Std Elbow	2.5	Std Tee (side out)	5.0
Swing Check	11.0	45° Std Elbow	1.3		

Suction				Discharge			
Type	Factor	Nominal Size, in.	Number	Feet	Type	Factor	Nominal Size, in.	Number	Feet
ELL	2.5	3	5	37	GATE	1.1	2	4	9
GATE	1.1		2	7	ELL	2.5		5	25
TEE (SIDE)	5.0		1	15	TEE (SIDE)	5.0		1	10
					TEE (RUN)	1.7		3	10
Length of straight pipe in feet				50					100
L = Total Equivalent Length, feet				109					154

FRICTION HEAD LOSS

	Suction	Discharge
$V = (0.408)\,gpm/d^2$, feet per second	(0.408)(100)/3.4	(0.408)(100)/4.26
Re (Reynolds Number) = (3162) gpmS/dμ	(3162)(100)(1.39)/(2.07)(7)	(3162)(100)(1.39)/(2.07)(7)
f = Friction Factor (See Appendix C of D14.2 Std 2) If Re < 2100 omit this step.		
Δh [(Re < 2100 = 0.064 μ/d²) (Re > 2100) = 18.83 f V²/d] feet of fluid per 100 feet equivalent length	(18.63)(0.026)(18.9)/3.07	(18.63)(0.024)(92)/2.07
	4.34	9.59
	20,400	30,400
	0.026	0.024
	2.98	19.9
Total Friction Head Loss = Δh × L/100 × 1.15 (safety factor), feet of fluid	3.74	35.2

SUCTION AND DISCHARGE HEADS

	Suction	Discharge
Vessel Pressure (psia × 2.31/S) (14.7)(2.3)/1.39	(+) 24.4	(+) 24.4
Liquid Level (above pump +; below pump −)	(±) 1.0	(±)
Static Head (above pump +; below pump −)		(±) 25.0
Total Friction Head Loss (Plus Velocity Head. See Note 4.)	(−) 3.7	(+) 35.2
Control Valve (Δpsi × 2.31/S) (See Notes 1 and 2)	(−) 0	(+) 45.0
Orifice (Δpsi × 2.31/S) (See Note 2)	(−) 0	(+) 0
Equipment (Δpsi × 2.31/S)	(−) 0	(+) 0
Suction Head Sum, feet of fluid, abs.	21.7	
Discharge Head Sum, feet of fluid, abs.		129.6

SYSTEM HORSEPOWER (estimated)

$HP = \frac{gpm \times TDH \times S}{3960 \times E(\text{Note 3})}$

$HP = \frac{100 \times 108 \times 1.39}{3960 \times 0.47 \times 0.9}$

HP = 9.0

DYNAMIC HEAD

Discharge Head Sum	129.6
− Suction Head Sum	21.7
TDH = Total Dynamic Head, feet of fluid	107.9

NPSH

Suction Head Sum	21.7
P_{vp} (mmHg × 0.045/S) or (psia × 2.31/S)	0
NPSH Available, feet of fluid, abs.	21.7

PUMP SELECTION

Manufacturer DURCO ; Model A 20 ; Type AVS 3 x 2 ;

Speed 1750 rpm; Imp Size 11" ; HP 20 ; Eff ____ ;

GPM 100 ; TDH 110 ; NPSH ____ .

NOTES

1. Assume control valve loss to be 70% to 100% of piping plus equipment friction loss for initial calculation. Consult instrument engineer for final selection.
2. Control valves and orifices not normally used in pump suction.
3. Use combined efficiency of pump and drive.
4. See D14.2 STD 2, a guide for the use of this calculation procedure.

SYMBOL	REVISION	BY	DATE	APPD	DATE

MONS 095484

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-112
AUTH NO. 2415 PLANT W.G.K
BY W. G. NIEMEYER DATE 10/14/70
APPD W.G.W. SHEET 1 OF 2

LOCATION

NAME WELL WATER BOOSTER PUMP (TO BE RELOCATED) NO. REQD 1

FUNCTION TO PUMP WELL WATER FROM AN UNDERGROUND WELL WATER HEADER TO THE CONTACTOR TUBE FOR QUENCH COOLING AND TO THE TOP OF THE PACKED COLUMN FOR HCl ABSORPTION

OPERATION CONTINUOUS FLOW REQUIRED

DUTY: ☐ INTERMITTENT ☒ CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	WELL WATER TO CONTACTOR TUBE	GPM	60	70	
	WELL WATER TO PACKED COLUMN	GPM	70	80	
	TOTAL	GPM	130	150	
SOLIDS				TRACE	

PROCESS DATA

PUMPING TEMPERATURE, PT, °F 50 | SP GR @ PT 1.0 @ 60 F 1.0 | CRYSTALLIZING TEMP °F 32
VISCOSITY, CENTIPOISE (UNITS) @ PT 1.3 @ 60 F 1.1
VAPOR PRESSURE, PSIA, @ PT 0.18 @ 60 F 0.26 | SOLIDS TRACE % WT | DENSITY | SIZE
CORROSION/EROSION: ☒ NEGLIGIBLE ☐ MODERATE ☐ SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 130 ; MAX DESIGN 150 ; CONTROL ALLOWANCE*
PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM,
STATIC HEAD @ PT. 15 / 30 FT 6.5 / 13 PSI | EQUIPMENT LOSS, PSI: NORMAL 1.10 RAT
PIPE DIA, NPS: SUCTION 3" ; DISCHARGE 3" & 2" | PIPING LOSS, PSI: NORMAL 9.7 RAT
CONTROL VALVE PRESSURE DROP, PSI: 10 NORMAL | AVAILABLE NPSH, FT: NORMAL 77.3 RAT
RATED TDH @ PT: 276 FT 120 PSI FROM PUMP CALCULATION SHEET NO. ES 95
SYSTEM CURVE CALCULATIONS FROM SHEET NO. Durco MII 7900V ; DRIVER ☒ ELEC MOTOR ☐ TURBINE ☐ OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	ALLOY 20	PACKING	
IMPELLER	ALLOY 20	MECHANICAL SEAL	
SHAFT, SHAFT SLEEVE		PACKING GLAND	
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:

REMARKS, SPECS, TESTS, ETC.

EXISTING PUMP : DURCO A 70
SIZE: 4 X 3 X 10, ALLOY 20
IMPELLER DIA. = 8 3/8"
3500 RPM, 75 HP
(PHENOL DEPT. ITEM No. 605)

MODIFICATION REQUIRED: INCREASE IMPELLER SIZE FROM 8 3/8" TO 9"

*Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095485

WELL WATER BOOSTER PUMP SECT. 0.201-01

Monsanto COMPANY

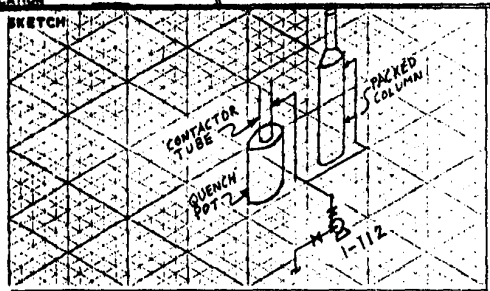
CENTRIFUGAL PUMP CALCULATION SHEET

PROJECT: ARCHER WASTE DISPOSAL

EQUIP. IDENT NO. 1-112
AUTH NO. 2415 PLANT WG.K
BY W. G. NIEMEYER DATE 10/13/70
APPD: SHEET 2 OF 2

LOCATION

SKETCH



CONDITIONS

Material Pumped: WELL WATER
P.T. - Pumping Temperature: 10 °C 50 °F
gpm = Flow Rate: Normal 130 Design 150
S = Specific Gravity*: 1.0 Density: 8.33 lb/gal
μ = Viscosity*: 1.3 Centipoise
P_{vp} = Vapor Pressure*: 9.3 mmHg 0.18 psia
ΔP: Control Valve ____ psi; Equip.* 123 psi
Pipe (Material CARBON STEEL Sch 40
Nominal Size 3" Suction 2"ø 3" Discharge
d, Actual ID, inches 3.068 Suction 2.067/3.067 Discharge
*At Pumping Temperature

* SPRAY NOZZLES = 100 PSI
FILTER = 18 PSI
ROTAMETER = 2 PSI

EQUIVALENT LENGTHS

Enter Type and Factor for each valve or fitting. Enter Number of each type, and line size. Multiply Factor × Size × Number and enter Feet equivalent length. See handbook for types not listed.

Factors for Valves (open) and Fittings					
Gate	1.1	Plug Valve	1.5	90° L. T. or Weld ell	1.7
Globe, Lift Check	28.0	Butterfly (6" & up)	1.7	Std Tee (on run)	1.7
Wye, Angle, Diaphr	14.0	90° Std Elbow	2.5	Std Tee (side out)	5.0
Swing Check	11.0	45° Std Elbow	1.3		

Suction					Discharge				
Type	Factor	Nominal Size	Number	Feet	Type	Factor	Nominal Size	Number	Feet
GATE	1.1	3	1	3					
TEE (RUN)	1.7	3	1	5					
ELL	2.5	3	3	22					
Length of straight pipe in feet				10					
L = Total Equivalent Length, feet				40					

FRICTION HEAD LOSS

	Suction	Discharge
$V = (0.408)\,gpm/d^2$, feet per second (0.408)(150)/(3.07)	6.51	
Re (Reynolds Number) = (3162) gpm S/dμ (3162)(150)(1.0)/(3.07)(1.3)	119,000	
f = Friction Factor (See Appendix C of D14.2 Std 2) if Re < 2100 omit this step.	0.021	
Δh [~~(Re < 2100) = 0.134 μ V/d²S~~ (Re > 2100) = 18.83 $f V^2/d$] feet of fluid per 100 feet equivalent length (18.83)(0.021)(42.9)/(3.07)	5.40	
Total Friction Head Loss = Δh × L/100 × 1.15 (safety factor), feet of fluid	2.48	

SUCTION AND DISCHARGE HEADS

	Suction	Discharge
Vessel Pressure (psia × 2.31/S) SUCTION 80 PSIG DISCHARGE 2.4 PSIG	(+) 80.2	(+) 39.5
Liquid Level (above pump +; below pump −)	(±) 0	
Static Head (above pump +; below pump −)		(+) 150
Total Friction Head Loss (Plus Velocity Head. See Note 4.)	(−) 2.5	(+) 22.5
MANUAL Valve (Δpsi × 2.31/S) (See Notes 1 and 2) 10 PSI	(−) 0	(+) 23.1
Orifice (Δpsi × 2.31/S) (See Note 2)	(−) 0	(+) 0
Equipment (Δpsi × 2.31/S) 120 PSI	(−) 0	(+) 277.0
Suction Head Sum, feet of fluid, abs.	77.7	
Discharge Head Sum, feet of fluid, abs.		377.1

SYSTEM HORSEPOWER (estimated)

$$HP = \frac{gpm \times TDH \times S}{3960 \times E \text{ (Note 3)}}$$

$$HP = \frac{150 \times 300 \times 1.0}{3960 \times 0.39 \times 0.9}$$

HP = 32.4

DYNAMIC HEAD

Discharge Head Sum	377.1
− Suction Head Sum	77.7
TDH = Total Dynamic Head, feet of fluid	299.4

NPSH

Suction Head Sum	77.7
P_{vp} (mmHg × 0.045/S) or (psia × 2.31/S) (0.18)(2.31)	0.4
NPSH Available, feet of fluid, abs.	77.3

PUMP SELECTION

Manufacturer: DURCO ; Model A 70 ; Type AVS 4×3×10
Speed 3500 rpm; Imp Size 9" ; HP ____ ; Eff ____
GPM 150 ; TDH 320 ; NPSH ____

NOTES

1. Assume control valve loss to be 70% to 100% of piping plus equipment friction loss for initial calculation. Consult instrument engineer for final selection.
2. Control valves and orifices not normally used in pump suction.
3. Use combined efficiency of pump and drive.
4. See D14.2 STD 2, a guide for the use of this calculation procedure.

REV NO.	REVISION	BY	DATE	APPD	DATE

MONS 095486

SECT. 0201-01

Monsanto COMPANY

TANK OR PRESSURE VESSEL PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

LOCATION

EQUIP. IDENT NO. 1-114
AUTH NO. 2415 PLANT W.G.K.
BY W.G. NIEMEYER DATE 10/1/70
APPD D.G. Wolf SHEET 1 OF 1

NAME FUEL OIL STORAGE TANK (EXISTING IN PLACE) NO. REQD 1

FUNCTION TO RECEIVE FUEL OIL AND HOLD AS AUXILIARY BACK UP FUEL FOR AROCLOR INCINERATOR

OPERATION BATCH INPUT FROM TRUCK UNLOADING & REMOTE STORAGE FLOW TO INCINERATOR BURNER DURING GAS CURTAILMENTS

MATERIALS PROCESS UTIL

MATERIAL	UNITS	MINIMUM	MAXIMUM	
No.2 FUEL OIL TO INCINERATOR	GPM	0.52	1.55	
No.2 FUEL OIL TO CIRCULATE	GPM	9.5	10.5	

PERFORMANCE INFORMATION

		UNITS	NORMAL OPERATION	DESIGN BASIS
CAPACITY	WORKING VOLUME	GAL	18620	18,620
	FREEBOARD	GAL	980	980 = 12" ST. SIDE
	TOTAL VOLUME	GAL	19,600	19600
☒ RETENTION OR ☐ CYCLE TIME		DAYS	VARIES	8.3 AT MAX. OIL RATE
INTERNAL PRESSURE			ATMOSPHERIC	ATMOSPHERIC
INTERNAL TEMPERATURE			AMBIENT	AMBIENT
DENSITY		LBS/GAL	7.4 TO 6.9	7.4 TO 6.9
AREA OF ☐ JACKET OR ☒ COIL		FT²		
HEATING OR COOLING FLUID	FLOW RATE			
	PRESSURE			
	TEMPERATURE		IN OUT	IN OUT

EQUIPMENT INFORMATION

TYPE CLASS III ☒ VERT ☐ HOR DIMENSIONS 13'-0" DD 20'-0" HIGH/LONG

MATERIALS OF CONSTRUCTION: CARBON STEEL — CORR ALLOW. ____ INCH; CORR ALLOW. ____ INCH; CORR ALLOW. ____ INCH

☐ INTERNAL COIL ☐ EXTERNAL COIL ☐ JACKET

NONE

AGITATOR NONE

INSTRUMENT CONNECTIONS ONE LEVEL INDICATOR REFERENCE DWG. No. C-13575, DATE 5/8/53

INSULATION NONE, NO GAUGE BOARD AS SHOWN IN C-13575

VENTS, PRESSURE RELIEF ONE 2" VENT

OTHER SEE REFERENCE DRAWING OF THIS EXISTING TANK, DWG. No. D-11142, DATE 5-5-48, W.G.K PLANT.

(PHENOL DEPT. ITEM No. 203)

NOZZLE SCHEDULE: SEE REFERENCE DRAWING

NOTE: THIS TANK IS EXISTING IN PLACE

MODIFICATIONS: ADD ONE INTERNAL DIP PIPE TO ONE 2" NOZZLE FOR RECIRCULATED OIL FROM 1-115 OR 1-123

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					

MONS 095487

SECT. 0201-01

Monsanto COMPANY

FUEL OIL PUMPS

PERFORMANCE DATA

PROJ. [redacted] AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-115, 1-123

AUTH NO. 2415 PLANT W.G.K.

BY W.G. NIEMEYER DATE 10/6/70

APPD N.B. Wolf SHEET 1 OF 1

LOCATION

NAME FUEL OIL PUMPS (EXISTING IN PLACE) NO. REQD 2

FUNCTION TO PUMP No. 2 FUEL OIL FROM FUEL OIL STORAGE TANK, 1-114 TO AROCLOR INCINERATOR

OPERATION TO BE USED DURING GAS CURTAILMENTS IN WINTER MONTHS

INTERMITTENT DUTY

MATERIALS HANDLED

No. 2 FUEL OIL

DESCRIPTION: POSITIVE DISPLACEMENT - ROTARY GEAR TYPE

PROCESS DATA

MAXIMUM FLOW = 1.55 GPM TO BURNER

MINIMUM FLOW = 0.52 GPM TO BURNER

DENSITY OF No. 2 FUEL OIL 7.4 TO 6.9 LBS/GAL

VISCOSITY OF No. 2 FUEL OIL @ 20°F = 48 TO 75 SSU

EQUIPMENT SPECS, MATL OF CONST, ETC.

EXISTING PUMPS: ROPER 25K15

1¼" INLET & OUTLET

2 HP, 1200 RPM

MATL. OF CONSTRUCTION

CASE: CAST IRON

GEARS: STEEL

SHAFT: STEEL

CORROSION ALLOWANCE

NOMINAL CAPACITY = 11 GPM

(PHENOL DEPT. ITEM No. 204 & 205)

REMARKS, TESTS, SPECIAL FEATURES, ETC.

EXCESS FLOW TO BE RECYCLED TO STORAGE TANK, 1-114 THRU A PRESSURE CONTROL VALVE.

NORMAL PUMP DISCHARGE PRESSURE = 100 PSIG

REV NO.	REVISION	BY	DATE	APPD	DATE

MONS 095488

SECT. 0201-01

Monsanto

TANK OR PRESSURE VESSEL PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-116
AUTH NO. 2415 PLANT W.G.K.
BY W.G. NIEMEYER DATE 9/16/70
APPD D.P. Wade SHEET 1 OF 1

LOCATION

NAME STORAGE TANK (EXISTING IN PLACE) NO. REQD.

FUNCTION TO RECEIVE AROCLOR WASTE AND HOLD FOR INCINERATION

OPERATION BATCH INPUT FROM DRUMS, TANK TRAILER & TANK CAR UNLOADING
BATCH LOADING TO TANK TRAILER OR TRANSFER TO OTHER STORAGE TANKS 1-117 AND 1-118.

MATERIALS PROCESS / UTIL

MATERIAL	UNITS	
AROCLOR TRAILER LOADING	GPM	100
AROCLOR TO TRANSFER	GPM	100
AROCLOR TO CIRCULATE	GPM	100

PERFORMANCE INFORMATION

		UNITS	NORMAL OPERATION	DESIGN BASIS
CAPACITY	WORKING VOLUME	GAL	18 620	18620
	FREEBOARD	GAL	980	980 = 12" ST. SIDE
	TOTAL VOLUME	GAL	19,600	19,600
☒ RETENTION OR ☐ CYCLE TIME		DAYS	VARIES	7.1
INTERNAL PRESSURE			ATMOSPHERIC	ATMOSPHERIC
INTERNAL TEMPERATURE		°F	200	200
DENSITY @ 200°F		LBS/GAL	11.0 TO 12.3	12.3
AREA OF ☐ JACKET OR ☒ COIL		FT²	25.8	25.8
HEATING [redacted] FLUID STEAM	FLOW RATE	LBS/HR	140	320
	PRESSURE	PSIG	80	100
	TEMPERATURE	°F	324 IN 324 OUT	338 IN 338 OUT

EQUIPMENT INFORMATION

CLASS ☐ I ☐ II ☒ III ☐ IV TYPE ☒ VERT ☐ HOR DIMENSIONS 13'-0" OD 20'-0" HIGH/[redacted]

MATERIALS OF CONSTRUCTION: CARBON STEEL, SA-285 GRADE C
CORR ALLOW. INCH
CORR ALLOW. INCH
REVIEWED WITH MATLS ENGR ☐ YES ☒ NO

☒ INTERNAL COIL ☐ EXTERNAL COIL ☐ JACKET

1'-6" DIA, 11 TURNS ON 9" PITCH, 1½" SCH. 80 STEEL PIPE

AGITATOR SIDE ENTERING, 10HP, MIXCO SPEED REDUCER

MODEL 210 VSE 10, 1750:420 RPM

INSTRUMENT CONNECTIONS ONE THERMOWELL
ONE LEVEL INDICATOR

INSULATION 1½" THICK K 11.2 STD 100

WEATHER BARRIER K 11.3 STD 65

VENTS, PRESSURE RELIEF ONE 6" VENT

OTHER SEE REFERENCE DRAWING OF THIS EXISTING TANK, DWG. No. D-105-M703 AUTH. No. 749.10-4-105

(PHENOL DEPT. ITEM No. 209)

NOZZLE SCHEDULE: SEE REFERENCE DRAWING

NOTE:
THIS TANK IS EXISTING IN PLACE

NEW EQUIP.
INTERNAL HEATING COIL AS SPECIFIED

MODIFICATIONS:
MODIFY 24" TOP MANWAY COVER FOR HEATING COIL CONNECTIONS
MODIFY LEVEL INDICATOR

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095489

SECT. 0201-01

Monsanto

TANK OR PRESSURE VESSEL PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-117
AUTH NO. 2415 PLANT W.G.K
BY W.G. NIEMEYER DATE 9/18/70
APPD N.B. Wall SHEET 1 OF 1

LOCATION

NAME STORAGE TANK (EXISTING IN PLACE) NO. REQD 1

FUNCTION TO RECEIVE AROCLOR WASTE AND HOLD FOR INCINERATION

OPERATION BATCH INPUT FROM DRUM, TANK TRAILER & TANK CAR UNLOADING
BATCH LOADING TO TANK TRAILER OR TRANSFER TO OTHER STORAGE TANKS 1-116 AND 1-118

MATERIALS PROCESS UTIL

MATERIAL	UNITS	
AROCLOR TRAILER LOADING	GPM	100
AROCLOR TO TRANSFER	GPM	100
AROCLOR TO CIRCULATE	GPM	100

PERFORMANCE INFORMATION

		UNITS	NORMAL OPERATION	DESIGN BASIS
CAPACITY	WORKING VOLUME	GAL	18620	18620
	FREEBOARD	GAL	980	980 = 12" ST. SIDE
	TOTAL VOLUME	GAL	19600	19600
☒ RETENTION OR ☐ CYCLE TIME		DAYS	VARIES	7.1
INTERNAL PRESSURE			ATMOSPHERIC	ATMOSPHERIC
INTERNAL TEMPERATURE		°F	200	200
DENSITY @ 200 °F		LBS/GAL	11.0 TO 12.3	12.3
AREA OF ☐ JACKET OR ☒ COIL		FT²	25.8	25.8
HEATING FLUID STEAM	FLOW RATE	LBS/HR	140	320
	PRESSURE	PSIG	80	100
	TEMPERATURE	°F	324 IN 324 OUT	338 IN 338 OUT

EQUIPMENT INFORMATION

CLASS ☐ I ☐ II ☒ III ☐ IV TYPE ☒ VERT ☐ HOR DIMENSIONS 13'-0" OD 20'-0" HIGH

MATERIALS CARBON STEEL, SA-285 GRADE C CORR ALLOW. INCH

DP CORR ALLOW. INCH

CONSTRUCTION REVIEWED WITH MATLS ENGR ☐ YES ☒ NO

☒ INTERNAL COIL ☐ EXTERNAL COIL ☐ JACKET

1'-6" DIA, 11 TURNS ON 4" PITCH, 1½" SCH. 40 STEEL PIPE NOZZLE SCHEDULE

AGITATOR SIDE ENTERING, 10 HP MIXCO #210 VSE10, 420 RPM

4 BAFFLES EQ. SPACED, 1'-0" X 18'-6" LONG SEE REFERENCE DRAWING

INSTRUMENT CONNECTIONS ONE THERMOWELL
ONE LEVEL INDICATOR

INSULATION 1½" THICK K11.2 STD 100
WEATHER BARRIER K11.3 STD 65

VENTS, PRESSURE RELIEF ONE 6" VENT

OTHER SEE REFERENCE DRAWING OF THIS EXISTING TANK, DWG No. D-105-M702 AUTH. No. 743.10-4-105

(PHENOL DEPT. ITEM No. 206)

NOTE:
THIS TANK IS EXISTING IN PLACE

MODIFICATIONS:
MODIFY LEVEL INDICATOR

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095490

SECT. 0201-01

Monsanto COMPANY

TANK OR PRESSURE VESSEL PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-118
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 9/18/70
APPD N.B. Wark SHEET 1 OF 1

LOCATION

NAME STORAGE TANK (EXISTING IN PLACE) NO. REQD 1

FUNCTION TO RECEIVE A MIXTURE OF MONTAR AND AROCLOR WASTE AND HOLD FOR INCINERATION

OPERATION BATCH INPUT FROM TANK TRAILER
CONTINUOUS FEED TO INCINERATOR
BATCH TRANSFER TO OTHER STORAGE TANKS 1-116 AND 1-117

MATERIALS PROCESS UTIL

MATERIAL	UNITS	
WASTE AROCLOR-MONTAR MIXTURE TO INCINERATOR	LBS/HR	1250
WASTE AROCLOR-MONTAR MIXTURE TO TRANSFEER	GPM	100

PERFORMANCE INFORMATION

		UNITS	NORMAL OPERATION	DESIGN BASIS
CAPACITY	WORKING VOLUME	GAL	18620	18620
	FREEBOARD	GAL	980	980 = 12" ST. SIDE
	TOTAL VOLUME	GAL	19600	19600
☒ RETENTION OR ☐ CYCLE TIME		DAYS	VARIES	7.1
INTERNAL PRESSURE			ATMOSPHERIC	ATMOSPHERIC
INTERNAL TEMPERATURE		°F	200	200
DENSITY @ 200°F		LBS/GAL	11.0 TO 12.3	12.3
AREA OF ☐ JACKET OR ☒ COIL		FT²	25.8	25.8
HEATING [redacted] FLUID STEAM	FLOW RATE	LBS/HR	140	320
	PRESSURE	PSIG	80	100
	TEMPERATURE	°F	324 IN 324 OUT	338 IN 338 OUT

EQUIPMENT INFORMATION

CLASS III | TYPE ☒ VERT ☐ HOR | DIMENSIONS 13'-0" OD 20'-0" HIGH

MATERIALS OF CONSTRUCTION: CARBON STEEL, SA-285 GRADE C
CORR ALLOW. ____ (INC)
CORR ALLOW. ____ (INC)
CORR ALLOW. ____ (INC)

☒ INTERNAL COIL ☐ EXTERNAL COIL ☐ JACKET

1'-6" DIA., 11 TURNS ON 4" PITCH, 1¼" SCH. 80 STEEL PIPE

AGITATOR TOP ENTERING, 15 HP FALK REDUCER, 66 RPM

4 BAFFLES EQ. SPACED, 1'-0" X 18'-6" LONG

INSTRUMENT CONNECTIONS ONE THERMOWELL, ONE LEVEL INDICATOR

INSULATION 2" THICK K11.2 STD 100

WEATHER BARRIER K11.3 STD 65

VENTS, PRESSURE RELIEF ONE 6" VENT

OTHER SEE REFERENCE DRAWING OF THIS EXISTING TANK, DWG. No. D-105-M702, AUTH. NO. 7-22.10-4-105

(PHENOL DEPT. ITEM No. 210)

NOZZLE SCHEDULE

SEE REFERENCE DRAWING

NOTE:

THIS TANK IS EXISTING IN PLACE

⚠ NEW EQUIPMENT:
INTERNAL HEATING COIL AS SPECIFIED

MODIFICATIONS:
MODIFY LEVEL INDICATOR

REV NO.	REVISION	BY	DATE	APPD	DATE
⚠	ADDED NEW HEATING COIL	W.G.N.	11/3/70	NBW	11/3/70
⚠					
⚠					

MONS 095491

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ [redacted] AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-119
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 9/24/70
APPD M. B. Wall SHEET 1 OF 2

LOCATION

NAME DRUM UNLOADING SUMP PUMP (EXISTING IN PLACE) NO. REQD 1

FUNCTION TO PUMP WASTE AROCLOR FROM THE DRUM UNLOADING SUMP TO THE WASTE AROCLOR STORAGE TANKS, I-116 AND I-117

OPERATION INTERMITTENT PUMPING

DUTY: ☒ INTERMITTENT ☐ CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	AROCLOR	GPM	50	50	
	TOTAL	GPM	50	50	
SOLIDS					
GAS					

PROCESS DATA

PUMPING TEMPERATURE, PT. °F 140 | SP GR @ PT 1.35 TO 1.50 @ 60°F 1.39 TO 1.55 | CRYSTALLIZING TEMP °F —

VISCOSITY, CENTIPOISE (UNITS) @ PT 7 TO 75 @ 60°F 300 TO 100,000

VAPOR PRESSURE, PSIA, @ PT NEGL. @ 60°F NEGL. | SOLIDS NONE % WT | DENSITY | SIZE

CORROSION/EROSION: ☒ NEGLIGIBLE ☐ MODERATE ☐ SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 50 ; MAX DESIGN 50 ; CONTROL ALLOWANCE*

PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM,

STATIC HEAD @ PT. 28 FT 17 PSI | EQUIPMENT LOSS, PSI: NONE NORMAL RATI

PIPE DIA, NPS: SUCTION NONE ; DISCHARGE 2" | PIPING LOSS, PSI: 13.4 NORMAL RATI

[redacted] VALVE PRESSURE DROP, PSI: 10.4 NORMAL | AVAILABLE NPSH, FT: 24.9 NORMAL RATI

RATED TDH @ PT: 65 FT 40 PSI FROM PUMP CALCULATION SHEET NO. ES-95

SYSTEM CURVE CALCULATIONS FROM SHEET NO. TABER CURVE ; DRIVER ☒ ELEC MOTOR ☐ TURBINE ☐ OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	DUCTILE IRON	PACKING	NONE
IMPELLER	DUCTILE IRON	MECHANICAL SEAL	NONE
SHAFT, SHAFT SLEEVE	DUCTILE IRON	PACKING GLAND	NONE
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:

LEVEL SWITCH TO TURN PUMP ON AND OFF

REMARKS, SPECS, TESTS, ETC.

EXISTING PUMP: TABER SIZE C2 - VERTICAL
1½" SUCTION, 1¼" DISCHARGE X 9"
1750 RPM, 5 HP

MODIFICATION REQUIRED: CHANGE 5 HP MOTOR TO 7.5 HP
ALLIS CHALMERS TYPE RGZ, TEFC

*Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095492

DRUM UNLOADING SUMP PUMP SEET. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP CALCULATION SHEET

PROJ. ARoclor WASTE DISPOSAL

EQUIP. IDENT NO. 1-119

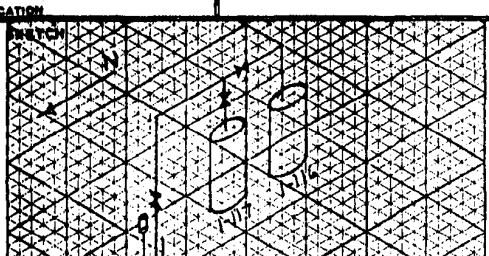
AUTH NO. 2415 PLANT W.G.K.

BY W. G. NIEMEYER DATE 9/25/70

APPD SHEET 2 OF 2

LOCATION

SKETCH



CONDITIONS

Material Pumped WASTE AROCLOR

P.T. = Pumping Temperature 60 °C 140 °

gpm = Flow Rate: Normal 50 Design 50

S = Specific Gravity* 1.35 TO 1.50 Density 11.2 TO 12.5 lb/gal

μ = Viscosity* 7 TO 75 Centipoise

P_{vp} = Vapor Pressure* NEGL mmHg NEGL psi

ΔP: Control Valve 10.4 psi; Equip. NONE psi

Pipe (Material) CARBON STEEL Sch 40

Nominal Size NONE Suction 2" Discharge

d, Actual ID, Inches NONE Suction 2.067 Discharge

*At Pumping Temperature

EQUIVALENT LENGTHS Enter Type and Factor for each valve or fitting. Enter Number of each type, and line size. Multiply Factor × Size × Number and enter Feet equivalent length. See handbook for types not listed.

Factors for Valves (open) and Fittings					
Gate	1.1	Plug Valve	1.5	90° l. r. or Weld ell	1.7
Globe, Lift Check	28.0	Butterfly (6" & up)	1.7	Std Tee (on run)	1.7
Wye, Angle, Diaphr	14.0	90° Std Elbow	2.5	Std Tee (side out)	5.0
Swing Check	11.0	45° Std Elbow	1.3		

	Suction				Discharge			
	Type	Factor	Nominal Size, in	Number	Feet	Type	Factor	Nominal Size, in	Number	Feet
						ELL	1.7	2	6	20
						GATE	1.1		1	2
						GLOBE	28.0		1	56
						TEE thru	1.7		1	4
						TEE side	5.0		1	10
Length of straight pipe in feet										100
L = Total Equivalent Length, feet										192

FRICTION HEAD LOSS

	Suction	Discharge
$V = (0.408)\,gpm/d^2$, feet per second $(0.408)(50)/(4,272)$		4.78
Re (Reynolds Number) = $(3162)\,gpmS/d\mu$ $(3162)(50)(1.42)/(2.067)(50)$		2170
f = Friction Factor (See Appendix C of D14.2 Std 2) If Re < 2100 omit this step.		
Δh $\left[\begin{matrix}(Re < 2100) = 0.154\,\mu/d^2 S \\ (Re > 2100) = 18.63/V^2 d\end{matrix}\right]$ feet of fluid per 100 feet equivalent length $(18.63)(0.048)(4.78)^2/2.067$		9.9
Total Friction Head Loss = $\Delta h \times L/100 \times 1.15$ (safety factor), feet of fluid $(9.9)(1.92)(1.15)$		21.8

SUCTION AND DISCHARGE HEADS

	Suction	Discharge
Vessel Pressure (psia × 2.31/S)	(+) 23.9	(+) 23.9
Liquid Level (above pump +; below pump −)	(+) 1.0	
Static Head (above pump +; below pump −)		(+) 28.0
Total Friction Head Loss (Plus Velocity Head. See Note 4.)	(−) 0	(+) 21.8
MANUAL Valve (Δpsi × 2.31/S) (See Notes 1 and 2)	(−) 0	(+) 17.0
Orifice (Δpsi × 2.31/S) (See Note 2)	(−) 0	(+)
Equipment (Δpsi × 2.31/S)	(−) 0	(+) 0
Suction Head Sum, feet of fluid, abs.	24.9	
Discharge Head Sum, feet of fluid, abs.		90.7

SYSTEM HORSEPOWER (estimated)

$HP = \dfrac{gpm \times TDH \times S}{3960 \times E\,(\text{Note 3})}$

$HP = \dfrac{50/0.98 \times 65.8/0.94 \times 1.42}{3960 \times 0.90 \times 0.74}$ (CORR. FOR VISCOSITY)

HP = 4.3

DYNAMIC HEAD

Discharge Head Sum	90.7
− Suction Head Sum	24.9
TDH = Total Dynamic Head, feet of fluid	65.8

NPSH

Suction Head Sum	24.9
− P_{vp} (mmHg × 0.045/S) or (psia × 2.31/S)	0
NPSH Available, feet of fluid, abs.	24.9

PUMP SELECTION

Manufacturer _____; Model _____; Type _____;

Speed _____ rpm; Imp Size _____; HP _____; Eff _____;

GPM _____; TDH _____; NPSH _____.

NOTES

1. Assume control valve loss to be 70% to 100% of piping plus equipment friction loss for initial calculation. Consult instrument engineer for final selection.
2. Control valves and orifices not normally used in pump suction.
3. Use combined efficiency of pump and drive.
4. See D14.2 STD 2, a guide for the use of this calculation procedure.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					

MONS 095493

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ: AROCLOR WASTE DISPOSAL

LOCATION

EQUIP. IDENT NO. 1-120
AUTH NO. 2415 PLANT W. G. K.
BY W. G. NIEMEYER DATE 9/23/70
APPD V. B. W. SHEET 1 OF 1

NAME INCINERATION FLOOR DRAIN SUMP PUMP (EXISTING IN PLACE) NO. REQD 1

FUNCTION TO PUMP A MIXTURE OF WATER, AROCLOR & MONTAR FROM FLOOR DRAIN SUMP TO THE AROCLOR - WATER SUMP, 1-124

OPERATION INTERMITTENT PUMPING
WATER FROM RAIN AND FLOOR WASHING
AROCLOR AND MONTAR FROM PUMP LEAKAGE AND SPILLS

DUTY: ☒ INTERMITTENT ☐ CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	WATER - AROCLOR MIXTURE	GPM	100	100	
LIQUID	AROCLOR	GPM		50	
LIQUID	TOTAL				
SOLIDS / GAS					

PROCESS DATA

PUMPING TEMPERATURE, FT, °F 60 | SP GR @ PT 1.0 @ 60 F 1.0 | CRYSTALLIZING, TEMP °F 32
VISCOSITY, CENTIPOISE (UNITS) @ PT 1.1 @ 60 F 1.1
VAPOR PRESSURE, PSIA, @ PT 0.26 @ 60 F 0.26 | SOLIDS TRACE % WT | DENSITY | SIZE
CORROSION/EROSION: ☒ NEGLIGIBLE ☐ MODERATE ☐ SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 100 ; MAX DESIGN 100 ; CONTROL ALLOWANCE*
PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM, 100
STATIC HEAD @ FT, 20 FT 8.7 PSI | EQUIPMENT LOSS, PSI: NONE NORMAL RATI
PIPE DIA, NPS: SUCTION NONE ; DISCHARGE 2" | PIPING LOSS, PSI: 7.6 NORMAL RATI
CONTROL VALVE PRESSURE DROP, PSI: NONE NORMAL | AVAILABLE NPSH, FT: 35 NORMAL RAT
RATED TDH @ PT: 45 FT 19.5 PSI FROM PUMP CALCULATION SHEET NO.
SYSTEM CURVE CALCULATIONS FROM SHEET NO. ; DRIVER ☒ ELEC MOTOR ☐ TURBINE ☐ OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	304 SS	PACKING	NONE
IMPELLER	304 SS	MECHANICAL SEAL	NONE
SHAFT, SHAFT SLEEVE	304 SS	PACKING GLAND	NONE
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:
LEVEL SWITCH TO TURN PUMP ON AND OFF

STEAM SPARGE INTO FLOOR SUMP

REMARKS, SPECS, TESTS, ETC.
EXISTING PUMP: TABER SIZE C2 - VERTICAL
1½" SUCTION, 1¼" DISCHARGE x 9", 304 SS
1750 RPM, 5 HP

(PHENOL DEPT. ITEM No. 217)

*Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APPD	DATE
1	MANUAL VALVE ΔP 4 PSI FOR WATER @ 100 GPM				
2	21 PSI FOR AROCLOR @ 50 GPM				
3					

MONS 095494

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJECT: AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-121
AUTH NO. 2415 PLANT W.G.K.
BY W.G. NIEMEYER DATE 9/23/70
APPD N.B. Wolk SHEET 1 OF 1

LOCATION

NAME AROCLOR SUMP PUMP (EXISTING IN PLACE) NO. REQD 1

FUNCTION TO PUMP ACCUMULATED AROCLOR FROM THE BOTTOM OF THE AROCLOR - WATER SUMP, 1-124, BACK INTO WASTE AROCLOR STORAGE TANKS, 1-116 AND 1-117.

OPERATION INTERMITTENT PUMPING

DUTY: ☒ INTERMITTENT ☐ CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	AROCLOR	GPM	30	50	
	TOTAL	GPM	30	50	
SOLIDS / GAS					

PROCESS DATA

PUMPING TEMPERATURE, PT., °F 140 | SP GR @ PT 1.35 TO 1.50 @ 60 F 1.39 TO 1.55 | CRYSTALLIZING TEMP °F —

VISCOSITY, CENTIPOISE (UNITS) @ PT 7 TO 75 @ 60 F 300 TO 100,000

VAPOR PRESSURE, PSIA, @ PT NEGL. @ 60 F — | SOLIDS NONE % WT | DENSITY | SIZE

CORROSION/EROSION: ☒ NEGLIGIBLE ☐ MODERATE ☐ SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 30 : MAX DESIGN 50 : CONTROL ALLOWANCE*

PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM,

STATIC HEAD @ PT. 25 FT 15.3 PSI | EQUIPMENT LOSS, PSI: NONE NORMAL RATE

PIPE DIA, NPS: SUCTION NONE : DISCHARGE 2" | PIPING LOSS, PSI: NORMAL 14 RATE

MANUAL VALVE PRESSURE DROP, PSI: 12.3 NORMAL | AVAILABLE NPSH, FT: 25.9 NORMAL RATE

RATED TDH @ PT: 65 FT 40 PSI FROM PUMP CALCULATION SHEET NO. GOULDS CDS 1249-3 PUMP CURVE

SYSTEM CURVE CALCULATIONS FROM SHEET NO. GOULDS CDS 1249-3 ; DRIVER ☒ ELEC MOTOR ☐ TURBINE ☐ OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	DUCTILE IRON	PACKING	NONE
IMPELLER	DUCTILE IRON	MECHANICAL SEAL	NONE
SHAFT, SHAFT SLEEVE	STEEL / 11-13% CHROME	PACKING GLAND	NONE
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:

LEVEL SWITCH TO TURN PUMP ON AND OFF

STEAM HEATING COIL TO BE ADDED TO SUMP, 1-124

REMARKS, SPECS, TESTS, ETC.

EXISTING PUMP: GOULDS VERTICAL PUMP, MODEL 3171
SIZE: 1½ X 2 X 8, DUCTILE IRON
IMPELLER DIA. = 8¼"
1750, 5HP TEFC MOTOR

MODIFICATION REQUIRED: CHANGE 5HP MOTOR TO 10HP
MOTOR: ALLIS CHALMERS TYPE RGZ, TEFC

(PHENOL DEPT. ITEM No. 626)

*Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095495

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-122
AUTH NO. 2415 PLANT W.G.K.
BY W.G. NIEMEYER DATE 10/6/70
APPD N.B. Wolk SHEET 1 OF 1

LOCATION

NAME WATER SUMP PUMP (TO BE RELOCATED) NO. REQD 1

FUNCTION TO PUMP THE WATER LAYER OUT OF THE AROCLOR-WATER SUMP, 1-124 TO A PLANT SEWER

OPERATION INTERMITTENT PUMPING

DUTY: ☒ INTERMITTENT ☐ CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	WATER	GPM	100	100	
	TOTAL				
SOLIDS / GAS					

PROCESS DATA

PUMPING TEMPERATURE, PT, °F 40 TO 140 | SP GR @ PT 1.0 TO 0.98 @ 80 F 1.0 | CRYSTALLIZING, TEMP °F 32

VISCOSITY, CENTIPOISE (UNITS) @ PT 0.5 TO 1.4 @ 60 F 1.1 | VAPOR PRESSURE, PSIA, @ PT 0.12 TO 2.89 @ 80 F 0.26 | SOLIDS % WT | DENSITY | SIZE

CORROSION/EROSION: ☒ NEGLIGIBLE ☐ MODERATE ☐ SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 100 ; MAX DESIGN 100 ; CONTROL ALLOWANCE*

PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM,

STATIC HEAD @ PT. 12 FT 5.2 PSI | EQUIPMENT LOSS, PSI: NONE NORMAL RAT

PIPE DIA, NPS: SUCTION NONE ; DISCHARGE 2" | PIPING LOSS, PSI: APPROX. 3.0 NORMAL RAT

MANUAL VALVE PRESSURE DROP, PSI: 11.2 NORMAL | AVAILABLE NPSH, FT: 28.3 NORMAL RAT

RATED TDH @ PT: 45 FT 19.5 PSI FROM PUMP CALCULATION SHEET NO.

SYSTEM CURVE CALCULATIONS FROM SHEET NO. TABER CURVE ; DRIVER ☒ ELEC MOTOR ☐ TURBINE ☐ OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	304 SS	PACKING	NONE
IMPELLER	304 SS	MECHANICAL SEAL	NONE
SHAFT, SHAFT SLEEVE	304 SS	PACKING GLAND	NONE
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:

REMARKS, SPECS, TESTS, ETC.

EXISTING PUMP: TABER, SIZE C2, SERIES NO. 227 - VERTICAL
1½" SUCTION, 1¼" DISCHARGE X 9", 304 S.S.
1750 RPM, 5 HP

(PHENOL DEPT. ITEM No. 518)

*Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095496

SECT. 0201-01

Monsanto COMPANY

TANK OR PRESSURE VESSEL PERFORMANCE DATA

PROJ. [redacted] AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-124
AUTH NO. 2415 PLANT W.G.K.
BY W.G. NIEMEYER DATE 10/6/70
APPD [illegible] SHEET 1 OF 1

LOCATION

NAME AROCLOR - WATER SUMP (EXISTING IN PLACE) NO. REQD. 1

FUNCTION TO RECEIVE AN AROCLOR-WATER MIXTURE, SEPARATE THE PHASES BY SETTLING, AND HOLD FOR PUMPOUT

OPERATION INTERMITTENT INPUT FROM INCINERATION FLOOR DRAIN SUMP PUMP 1-120
INTERMITTENT PUMPOUT OF AROCLOR LAYER TO STORAGE TANKS 1-116, 1-117
INTERMITTENT PUMPOUT OF WATER LAYER TO SEWER

MATERIALS

	MATERIAL	UNITS	
PROCESS	AROCLOR	GPM	30
PROCESS	WATER	GPM	100
UTIL			

PERFORMANCE INFORMATION

		UNITS	NORMAL OPERATION	DESIGN BASIS
CAPACITY	WORKING VOLUME	GAL	11,910	11,910
	FREEBOARD	GAL	1490	1490 = 12" ST. SIDE
	TOTAL VOLUME	GAL	13,400	13,400
☒ RETENTION OR ☐ CYCLE TIME		DAYS	VARIES	VARIES
INTERNAL PRESSURE			ATMOSPHERIC	ATMOSPHERIC
INTERNAL TEMPERATURE		°C / °F	4 TO 60 / 40 TO 140	4 TO 60 / 40 TO 140
DENSITY		LBS/GAL	11.6 TO 13.0	12.0
AREA OF ☐ JACKET OR ☒ COIL		FT²	94	94
HEATING OR COOLING FLUID STEAM	FLOW RATE	LBS/HR	250	250
	PRESSURE	PSIG	80	100
	TEMPERATURE	°C / °F	162 / 324 IN 162 / 324 OUT	170 / 338 IN 170 / 338 OUT

EQUIPMENT INFORMATION

TYPE CONCRETE 16'-0" X 13'-0" X 9'-0" DEEP ☒ VERT ☐ HOR DIMENSIONS ____ OD ____ HIGH/LONG

MATERIALS OF CONSTRUCTION — CORR ALLOW. ____ INCH

☒ INTERNAL COIL ☐ EXTERNAL COIL ☐ JACKET 5-FLAT HAIRPINS, 14'-0" LONG, 12" OFF BOTTOM, 6" APART, 2" SCH. 80, CARBON STEEL PIPE

AGITATOR NONE

NOZZLE SCH. SEE REF. DRAWINGS

INSTRUMENT CONNECTIONS 1 FOR AROCLOR PUMP
TEMPERATURE INDICATOR 6" FROM BOTTOM

NEW EQUIP.

INSULATION NONE

HEATING COIL AS SPECIFIED

VENTS, PRESSURE RELIEF

MODIFICATIONS

OTHER SEE REFERENCE DRAWINGS OF THIS EXISTING SUMP DWG. NOS.
1092-3-D-810.40 S-107-1
1092-3-D-810.40 S-151-3
1092-3-D-810.40 S-152-1

MODIFY STEEL FLOOR PLATE TO ALLOW INSTALLATION OF:
WATER SUMP PUMP
HEATING COIL & LEVEL INDICATOR
CLOSE TRENCH ENTRANCE & PROVIDE OVERFLOW TO SEWER

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095497

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ. AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-125
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 10/19/70
APPD W. G. Walk SHEET 1 OF 2

LOCATION

NAME UNLOADING DOCK SUMP PUMP (EXISTING IN PLACE) NO. REQD 1

FUNCTION TO PUMP A LARGE AROCLOR SPILL TO STORAGE TANKS 1-116, 1-117, & 1-118

OPERATION INTERMITTENT PUMPING

DUTY: [X] INTERMITTENT [ ] CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	DESIGN	REMARKS
LIQUID	AROCLOR CONTAMINATED WITH PHENOL & WATER	GPM	50	75	
	TOTAL				
SOLIDS / GAS					

PROCESS DATA

PUMPING TEMPERATURE, PT, °F 140 | SP GR @ PT 1.35 TO 1.50 @ 60 F 1.39 TO 1.55 | CRYSTALLIZING, TEMP °F —

VISCOSITY, CENTIPOISE (UNITS) @ PT 7 TO 75 @ 60 F 300 TO 100,000

VAPOR PRESSURE, PSIA, @ PT NEGL @ 60 F NEGL | SOLIDS TRACE % WT | DENSITY | SIZE

CORROSION/EROSION: [X] NEGLIGIBLE [ ] MODERATE [ ] SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 50 : MAX DESIGN 75 : CONTROL ALLOWANCE*

PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM,

STATIC HEAD @ PT. 30 FT PSI | EQUIPMENT LOSS, PSI: NONE NORMAL RATE

PIPE DIA, NPS: SUCTION NONE : DISCHARGE 3" | PIPING LOSS, PSI: NORMAL 9.1 RATE

MANUAL ~~CONTROL~~ VALVE PRESSURE DROP, PSI: 9.9 NORMAL | AVAILABLE NPSH, FT: NORMAL 24.9 RATE

RATED TDH @ PT: 60 FT 36.8 PSI FROM PUMP CALCULATION SHEET NO. ES 95

SYSTEM CURVE CALCULATIONS FROM SHEET NO. TABER CURVE : DRIVER [X] ELEC MOTOR [ ] TURBINE [ ] OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	304 S.S.	PACKING	NONE
IMPELLER	304 S.S.	MECHANICAL SEAL	NONE
SHAFT, SHAFT SLEEVE	304 S.S.	PACKING GLAND	NONE
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:

MANUAL START - STOP OPERATION

REMARKS, SPECS, TESTS, ETC.

EXISTING PUMP: TABER SIZE C2 SERIES No. 227 - VERTICAL
1½" SUCTION, 1¼" DISCHARGE
1750 RPM, 7.5 HP

*Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095498

UNLOADING DOCK SUMP PUMP

SECT. 0201-01

Monsanto COMPANY

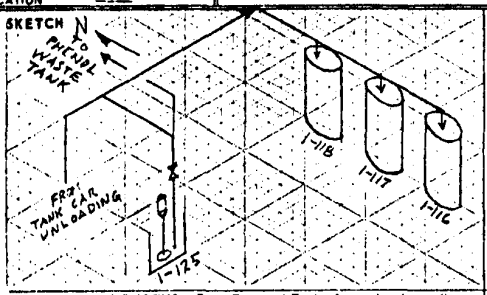
LOCATION ——

CENTRIFUGAL PUMP CALCULATION SHEET

PROJ/DEPT AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-125
AUTH NO. 2415 PLANT W.G.K
BY W.G. NIEMEYER DATE 10/19/70
APPD N.B. Wall SHEET 2 OF 2

SKETCH



CONDITIONS

Material Pumped WASTE AROCLOR
P.T. - Pumping Temperature 60 °C 140 °F
gpm - Flow Rate: Normal 50 Design 75
S - Specific Gravity* 1.35 TO 1.50 Density 11.2 To 12.5 lb/gal
μ - Viscosity* 7 to 75 Centipoise
P_{vp} - Vapor Pressure* NEGL mmHg NEGL. psia
ΔP: MANUAL Valve 9.9 psi; Equip. NONE psi
Pipe (Material CARBON STEEL Sch ~~Wall~~ 40)
Nominal Size NONE Suction 3" Discharge
d, Actual ID, inches — Suction 3.067 Discharge
*At Pumping Temperature

EQUIVALENT LENGTHS Enter Type and Factor for each valve or fitting. Enter Number of each type, and line size. Multiply Factor × Size × Number and enter Feet equivalent length. See handbook for types not listed.

Factors for Valves (open) and Fittings					
Gate	1.1	Plug Valve	1.5	90° I. r. or Weld ell	1.7
Globe, Lift Check	28.0	Butterfly (6" & up)	1.7	Std Tee (on run)	1.7
Wye, Angle, Diaphr	14.0	90° Std Elbow	2.5	Std Tee (side out)	5.0
Swing Check	11.0	45° Std Elbow	1.3		

	Suction				Discharge			
	Type	Factor	Nominal Size	Number	Feet	Type	Factor	Nominal Size	Number	Feet
						ELL	1.7	6"	10	51
						GATE	1.1		3	10
						TEE (S	5.0		3	45
						TEE (R	1.7		2	10
Length of straight pipe in feet										300
L_e - Total Equivalent Length, feet										416

FRICTION HEAD LOSS

$V = (0.408)\ gpm/d^2$, feet per second (0.402)(175)/(9.41)
Re (Reynolds Number) = $(3162)\ gpm\,S/d\mu$ (3162)(75)(1.42)/(3.07)(50)
f = Friction Factor (See Appendix C of D14.2 Std 2) if Re < 2100 omit this step.

Δh ~~(Re < 2100) = 0.154 μ V/d² S~~ (Re > 2100) = 18.63 (V^2/d) feet of fluid per 100 feet equivalent length (18.63)(0.048)(10.6)/3.07 →

Total Friction Head Loss = $\Delta h \times L_e/100 \times 1.15$ (safety factor), feet of fluid (3.09)(4.16)(1.15) →

	Suction	Discharge
		3.25
		2190
		0.048
		3.09
		14.8

SUCTION AND DISCHARGE HEADS

	Suction	Discharge
Vessel Pressure (psia × 2.31/S)	(+) 23.9	(+) 23.9
Liquid Level (above pump +; below pump −)	(+) 1.0	
Static Head (above pump +; below pump −)		(+) 30.0
Total Friction Head Loss (Plus Velocity Head. See Note 4.)	(−) 0	(+) 14.8
MANUAL ~~Control~~ Valve (Δpsi × 2.31/S) (See Notes 1 and 2) 9.9 PSI	(−) 0	(+) 16.2
Orifice (Δpsi × 2.31/S) (See Note 2)	(−) 0	(+) 0
Equipment (Δpsi × 2.31/S)	(−) 0	(+) 0
Suction Head Sum, feet of fluid, abs.	24.9	
Discharge Head Sum, feet of fluid, abs.		84.9

SYSTEM HORSEPOWER (estimated)

$HP = \dfrac{gpm \times TDH \times S}{3960 \times E\ (\text{Note 3})}$

$HP = \dfrac{75 \times 60.94 \times 1.42}{3960 \times 0.40 \times 0.74 \times 0.9}$

HP = 6.6

DYNAMIC HEAD

Discharge Head Sum	84.9
Suction Head Sum	− 24.9
TDH - Total Dynamic Head, feet of fluid	60.0

NPSH

Suction Head Sum	24.9
P_{vp} (mmHg × 0.045/S) or (psia × 2.31/S)	− 0
NPSH Available, feet of fluid, abs.	24.9

PUMP SELECTION

Manufacturer ____; Model ____; Type ____
Speed ____ rpm; Imp Size ____; HP ____; Eff ____
GPM ____; TDH ____; NPSH ____

NOTES

1. Assume control valve loss to be 70% to 100% of piping plus equipment friction loss for initial calculation. Consult instrument engineer for final selection.
2. Control valves and orifices not normally used in pump suction.
3. Use combined efficiency of pump and drive.
4. See D14.2 STD 2, a guide for the use of this calculation procedure.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095499

SECT. 0201-01

Monsanto COMPANY

TANK OR PRESSURE VESSEL PERFORMANCE DATA

PROJ [redacted] AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-126
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 10/17/70
APPD N. B. Wall SHEET 1 OF 1

LOCATION

NAME CITY WATER BREAK TANK (EXISTING IN PLACE) NO. REQD 1

FUNCTION TO RECEIVE AND HOLD CITY WATER TO BE USED AS EMERGENCY WATER SUPPLY TO QUENCH COMBUSTION GAS FROM INCINERATOR

OPERATION CONTINUOUS IN PUT FROM CITY WATER SUPPLY
CONTINUOUS OUT PUT TO CITY WATER BREAK TANK PUMPS 1-127 AND 1-132

MATERIALS PROCESS

MATERIAL	UNITS	NORMAL	MAXIMUM
WATER TO PROCESS	GPM	8 TO 13	68-73

UTIL

PERFORMANCE INFORMATION

		UNITS	NORMAL OPERATION	DESIGN BASIS
CAPACITY	WORKING VOLUME	GAL	282	282
	FREEBOARD	GAL	94	94 = 12" ST. SIDE
	TOTAL VOLUME	GAL	376	376
☒ RETENTION OR ☐ CYCLE TIME				
INTERNAL PRESSURE			ATMOSPHERIC	ATMOSPHERIC
INTERNAL TEMPERATURE		°F	50	40
DENSITY @ 50°F		LBS/GAL	8.33	8.33
AREA OF ☐ JACKET OR ☐ COIL				
HEATING OR COOLING FLUID	FLOW RATE			
	PRESSURE			
	TEMPERATURE		IN OUT	IN OUT

EQUIPMENT INFORMATION

CLASS III TYPE ☒ VERT ☐ HOR DIMENSIONS 4'-0" OD 4'-0" HIGH/

MATERIALS OF CONSTRUCTION: CARBON STEEL
CORR ALLOW. ____ INC
CORR ALLOW. ____ INC
CORR ALLOW. ____ INC

☐ INTERNAL COIL ☐ EXTERNAL COIL ☐ JACKET

NONE

AGITATOR NONE

INSTRUMENT CONNECTIONS LEVEL CONTROLLER

INSULATION NONE

VENTS, PRESSURE RELIEF OPEN TOP

OTHER

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095500

SECT. 0201-01

Monsanto COMPANY

CENTRIFUGAL PUMP PERFORMANCE DATA

PROJ. [redacted] ARDCO LER WASTE DISPOSAL

EQUIP. IDENT NO. 1-127, 1-132
AUTH NO. 2415 PLANT W.G.K.
BY W. G. NIEMEYER DATE 10/20/70
APPD M.B.Wolf SHEET 1 OF 2

LOCATION

NAME CITY WATER BREAK TANK PUMPS (EXISTING IN PLACE) NO. REQD 2

FUNCTION TO PUMP CITY WATER TO THE CONTACTOR TUBE WEIR AND THE THERMAL OXIDIZER
TO PROVIDE EMERGENCY WATER SUPPLY TO THE CONTACTOR TUBE

OPERATION CONTINUOUS

DUTY: ☐ INTERMITTENT ☒ CONTINUOUS HOURS PER YEAR

MATERIALS HANDLED

	COMPONENT	UNITS	NORMAL	[redacted] EMERGENCY	DESIGN	REMARKS
LIQUID	WATER TO CONTACTOR WEIR	GPM	8	8	8	
	WATER RECYCLE TO BREAKTANK	GPM	15	0	15	
	WATER TO THERMAL OXIDIZER	GPM	0.1 TO 5	5	5	
	EMERGENCY WATER TO CONTACTOR	GPM	0	34	34	
	TOTAL	GPM	23 TO 28	47	62	
SOLIDS						
GAS						

PROCESS DATA

PUMPING TEMPERATURE, PT, °F 50 | SP GR @ PT 1.0 @ 60 F 1.0 | CRYSTALLIZING, TEMP °F

VISCOSITY, CENTIPOISE (UNITS) @ PT 1.3 @ 60 F 1.1 | VAPOR PRESSURE, PSIA, @ PT 0.18 @ 60 F 0.26 | SOLIDS NONE % WT | DENSITY | SIZE

CORROSION/EROSION: ☒ NEGLIGIBLE ☐ MODERATE ☐ SEVERE

ESTIMATED PERFORMANCE REQUIREMENTS

CAPACITY, USGPM: NORMAL 23 TO 28 ; MAX DESIGN 62 ; CONTROL ALLOWANCE*

PUMP RATED CAPACITY (MAXIMUM DESIGN CAPACITY PLUS CONTROL ALLOWANCE), USGPM,

STATIC HEAD @ PT, 20 FT 8.7 PSI | EQUIPMENT LOSS, PSI: 102 NORMAL 102 RAT

PIPE DIA, NPS: SUCTION 1½" ; DISCHARGE 1½" | PIPING LOSS, PSI: NORMAL 23.1 RAT

RIFICE [redacted] PRESSURE DROP, PSI: 57.1 NORMAL | AVAILABLE NPSH, FT: NORMAL 21.9 RAT

RATED TDH @ PT: 475 FT 206 PSI FROM PUMP CALCULATION SHEET NO. ES 95

SYSTEM CURVE CALCULATIONS FROM SHEET NO. ; DRIVER ☒ ELEC MOTOR ☐ TURBINE ☐ OTHER

PUMP DATA

MATERIALS OF CONSTRUCTION:

CASING AND NOZZLES	SEMI-STEEL	PACKING	
IMPELLER	BRONZE	MECHANICAL SEAL	
SHAFT, SHAFT SLEEVE	STAINLESS STEEL	PACKING GLAND	
LINERS		BASE PLATE	

CONSTRUCTION FEATURES REQUIRED FOR PROCESS OR PERFORMANCE CONSIDERATIONS:

LOW FLOW SWITCH ON PUMP DISCHARGE INTERLOCKED TO SHUT DOWN INCINERATOR BURNER SYSTEM

REMARKS, SPECS, TESTS, ETC.

EXISTING PUMP: PATTERSON, NAS TYPE
SIZE: 1½" SUCTION, 1¼" DISCHARGE, 6¾" IMPELLER
15 HP
3550 RPM

* Capacity in excess of maximum design for control purposes.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

[illegible] WATER BREAK TANK PUMPS SECT. 0201-01

Monsanto COMPANY

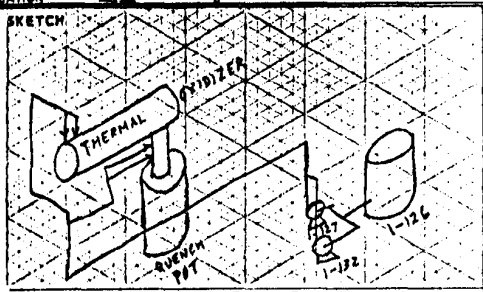
LOCATION

CENTRIFUGAL PUMP CALCULATION SHEET

PROJ. [redacted] AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-127, 1-132
AUTH NO. 2415 PLANT W. G. K.
BY W. G. NIEMEYER DATE 10/20/70
APPD N. B. Walk SHEET 2 OF 2

SKETCH



CONDITIONS

Material Pumped WATER
P.T. = Pumping Temperature 10 °C 50 °F
gpm = Flow Rate: Normal 23 TO 28 Design 62
S = Specific Gravity* 1.0 Density 8.33 lb/gal
μ = Viscosity* 1.3 Centipoise
P_{vp} = Vapor Pressure* _____ mmHg 0.18 psia
ΔP: ~~Conservative~~ ORIFICE 57.1 psi; Equip.* 102 psi
Pipe (Material CARBON STEEL Sch ~~or Wall Thk~~ 40)
Nominal Size 1½" Suction 1½" Discharge
d, Actual ID, inches 1.50 Suction 1.50 Discharge
*At Pumping Temperature
* STRAY NOZZLE = 100
ROTAMETER = 2

EQUIVALENT LENGTHS Enter Type and Factor for each valve or fitting. Enter Number of each type, and line size. Multiply Factor × Size × Number and enter Feet equivalent length. See handbook for types not listed.

Factors for Valves (open) and Fittings					
Gate	1.1	Plug Valve	1.5	90° l. r. or Weld ell	1.7
Globe, Lift Check	28.0	Butterfly (6" & up)	1.7	Std Tee (on run)	1.7
Wye, Angle, Diaphr	14.0	90° Std Elbow	2.5	Std Tee (side out)	5.0
Swing Check	11.0	45° Std Elbow	1.3		

Suction Type	Factor	Nominal Size	Number	Feet	Discharge Type	Factor	Nominal Size	Number	Feet
GATE	1.1	1.5 in.	2	3	GATE	1.1	1.5 in.	1	2
ELL	1.7		4	10	TEE (R)	1.7		2	5
TEE (S)	5.0		1	8	TEE (S)	5.0		1	8
					ELL	1.7		6	15
Length of straight pipe in feet				10					100
L = Total Equivalent Length, feet				31					130

FRICTION HEAD LOSS

	Suction	Discharge
V = (0.408) gpm/d², feet per second (0.408)(62)/2.25	11.2	11.2
Re (Reynolds Number) = (3162) gpmS/dμ (3162)(62)(1.0)/1.50(1.3)	101,000	101,000
f = Friction Factor (See Appendix C of D14.2 Std 2) if Re < 2100 omit this step.	0.023	0.023
Δh ~~[(Re < 2100) = 0.154 μV²/d²S]~~ (Re > 2100) = 18.63 fV²/d (18.63)(0.023)(125)/1.50 feet of fluid per 100 feet equivalent length	35.7	35.7
Total Friction Head Loss = Δh × L/100 × 1.15 (safety factor), feet of fluid	12.7	53.4

SUCTION AND DISCHARGE HEADS

	Suction	Discharge
Vessel Pressure (psia × 2.31/S)	(+) 34.0	(+) 40.9
Liquid Level (above pump +; below pump −)	(+) 1.0	
Static Head (above pump +; below pump −)		(+) 20.0
Total Friction Head Loss (Plus Velocity Head. See Note 4.)	(−) 12.7	(+) 53.4
Control Valve (Δpsi × 2.31/S) (See Notes 1 and 2)	(−) 0	(+)
Orifice (Δpsi × 2.31/S) (See Note 2)	(−) 0	(+) 132.0
Equipment (Δpsi × 2.31/S) (102)(2.31)	(−) 0	(+) 236.0
Suction Head Sum, feet of fluid, abs.	22.3	
Discharge Head Sum, feet of fluid, abs.		482.3

SYSTEM HORSEPOWER (estimated)

$$HP = \frac{gpm \times TDH \times S}{3960 \times E \text{ (Note 3)}}$$

$$HP = \frac{62 \times 460 \times 1.0}{3960 \times 0.51}$$

HP = 14.1

DYNAMIC HEAD

Discharge Head Sum	482.3
Suction Head Sum	− 22.3
TDH = Total Dynamic Head, feet of fluid	460.0

NPSH

Suction Head Sum	22.3
P_{vp} (mmHg × 0.045/S) or (psia × 2.31/S) (0.18)(2.31)	− 0.4
NPSH Available, feet of fluid, abs.	21.9

PUMP SELECTION

Manufacturer _____; Model _____; Type _____;
Speed _____ rpm; Imp Size _____; HP _____; Eff _____;
GPM _____; TDH _____; NPSH _____

NOTES

1. Assume control valve loss to be 70% to 100% of piping plus equipment friction loss for initial calculation. Consult instrument engineer for final selection.
2. Control valves and orifices not normally used in pump suction.
3. Use combined efficiency of pump and drive.
4. See D14.2 STD 2, a guide for the use of this calculation procedure.

REV NO.	REVISION	BY	DATE	APPD	DATE
1					
2					
3					

MONS 095502

SECT. 0201-01

Monsanto COMPANY

LOCATION

PERFORMANCE DATA
VENT BLOWER
PROJ [redacted] AROCLOR WASTE DISPOSAL

EQUIP. IDENT NO. 1-130
AUTH NO. 2415 PLANT W.G.K.
BY W.G. NIEMEYER DATE 10/13/70
APPD N.B. Wyatt SHEET 1 OF 1

NAME:	VENT BLOWER (TO BE RELOCATED)
DESCRIPTION:	CENTRIFUGAL BLOWER, SIDE INLET
NUMBER REQUIRED:	1 (1-130)
FUNCTION:	TO BLOW AIR CONTAMINATED WITH SOLVENT VAPOR FROM DRUM UNLOADING SUMP SHELTER TO ASMOSPHERE
MATERIALS HANDLED:	AIR CONTAMINATED WITH SOLVENT VAPOR
DESIGN CAPACITY:	AT LEAST 2 AIR CHANGES PER MINUTE
OPERATING CONDITIONS:	DUTY: INTERMITTENT SERVICE (WHEN DUMPING DRUMS) AIR TEMPERATURE: 0 TO 100°F
SPECIAL DESIGN CONSIDERATIONS:	BLOWER MUST BE ABLE TO HANDLE FLAMMABLE MIXTURES OF AIR & SOLVENTS
MATERIAL OF CONSTRUCTION:	CARBON STEEL
	EXISTING BLOWER: CHICAGO BLOWER No. 9LS 18 INCH DIAMETER 2 HP MOTOR
	(PHENOL DEM. ITEM No. 22D)
	MODIFICATIONS REQUIRED: MOTOR MAY NEED TO BE EXPLOSION PROOF. TO BE REVIEWED BY K.J. JOHNSTON.

REV NO.	REVISION	BY	DATE	----	DATE
1					
2					
3					

MONS 095503

SECT. 0202-01
Project Manual, Sect.
CEA:- 2415
Date: 10/8/70
Author: C. R. Lepper
Approved by: R. G. Corley

INSTRUMENT DESIGN BASIS

for the

INSTRUMENT FACILITIES

within the

W. G. KRUMMRICH PLANT

PROJECT: Aroclor Waste Disposal
DIVISION: Organic Chemicals
PLANT LOCATION: Sauget, Illinois

INSTRUMENT DESIGN SECTION
CENTRAL ENGINEERING DEPARTMENT
MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MISSOURI 63166

MONS 095504

TABLE OF CONTENTS

1. General Description of Project
2. Reference Documents
3. Scales, Charts, and Units of Measurement
4. Decisions and Selections Affecting Project Areas
   4.1 Control Philosophy
   4.2 Instrument Applications
5. Control Room Instruments
   5.1 General Comments
   5.2 Panel Mounted Vendor Preference
6. Field Mounted Instruments
   6.1 Flow
   6.2 Pressure
   6.3 Level
   6.4 Temperature
   6.5 Field Mounted Vendor Preference
7. Valves
   7.1 Control Valves
   7.2 Safety Valves
   7.3 Rupture Discs
   7.4 Solenoids
   7.5 Valve Vendor Preference
8. Pneumatic Signal Tubing
9. Instrument Air
10. Electrical Wiring
   10.1 Wire Specifications
   10.2 Reducing Electrical Interference
   10.3 Tagging
   10.4 Instrument Connections
11. Instrument Decisions Effecting Electrical Work
12. Instrument Installations
13. Control Rooms and Panels
14. Documents

1. GENERAL DESCRIPTION OF PROJECT

The primary objective of the project is to thermally decompose all used liquid Aroclors and Montar fed semi-continuously to the incinerator, at a capacity of 10M lbs./yr., producing harmless by-products which have sewer stream contamination less than 0.29 lbs./day of PCB's. Atmospheric effluent shall be less than 7.5 lbs./hr. of HCl.

The secondary objective is to provide these same facilities for possible future incineration of other plant wastes.

A package of an incinerator and scrubber column is to be provided by purchase. Storage, dumping, sump, and fuel oil storage is to be provided by utilization of as much existing equipment and instruments made available by dismantling of the Phenol process as possible.

2. REFERENCE DOCUMENTS

The following documents have been used in the preparation of this design basis:

Project Scope Report - dated 8/6/70
Notes Project Strategy Meeting - dated 8/14/70
Preliminary Process Flow Diagram
"L" Manual for W. G. Krummrich Plant

The Scope Report included an Equipment Information Summary, as Instrument Information Summary, and a preliminary Plot Plan.

3. SCLAES, CHARTS, AND UNITS OF MEASUREMENT

Quantity	Units	Scale	Chart
Level	%	0-100	0-100
Pressure	PSIG or Inch of W.C.	D.R.	D.R.
Vacuum or Absolute Pressure	mm Hg	D.R.	D.R.
Temperature	^{o}C (3), (5)	D.R.(6)	D.R.(6)
Flow			
Process Vapor	LBS/HR	D.R.	
Process Liquid	GPM	D.R.	
Steam	LBS/HR	D.R.	0-10(2)
Utility Air	SCFM	D.R.	(4)
Utility Water	GPM	D.R.	

NOTES:

(1) D.R. - Direct Reading

(2) Square Root or uniform as required by signal. 0-10 is uniform or 0-100 is uniform, depending whichever is standard with the manufacturer.

(3) Iron-Constantan or Chromel-Alumel preferred as applicable.

(4) With applicable multiplier on nameplate.

(5) Degrees F for power house or refrigeration service.

(6) When using IC thermocouples with instruments whose outputs are linear with millivolts a linear chart or scale is not satisfactory for spans of 100°C, and above, and may not be considered "direct reading". For 50°C spans, and smaller, the difference between the linear and direct calibration is almost negligible; and in most cases, the linear scale may be considered "direct reading". For spans between 50 and 100°C the application will dictate whether the linear chart or scale may be considered D.R.

4. DECISIONS OR SELECTIONS AFFECTING PROJECT AREA

4.1 Control Philosophy

This project will utilize considerable existing and relocated equipment; for instance, the 3 waste aroclor storage tanks exist in place, the aroclor water sump exists but new interface detection instrumentation must be provided, also the water pump is to be relocated, and the existing fuel oil storage tank is to be used.

In all cases existing or relocated equipment will be utilized where available. For used items each will be dismantled, inspected and refurbished if economically feasible. When new instrument items, are required, the preference lists included will be adhered to.

4.2 Instrument Applications

The degree of automation will be based on the premise that:

1. Full time coverage is required to set up and oversee the semi-continuous operations.
2. Interlocks and alarms to the incinerator panels will be provided from critical process sensors and loops,
3. In general, the instrumentation will be pneumatic. The major exception will be the utilization of flow, level, and temperature switches,
4. A panel for incinerator operation will be provided by the vendor. This panel will be externally located near the incinerator.

4.2.1 Aroclor-Water Sump

Operation of the existing 10K gallon sump (item 1-124) provides for handling of a two phase (water/heavy organic) collection system. Material will be collected from spills or from the incinerator floor sump (item 1-120). Water will overflow the sump until such time as the aroclor reaches the

4. DECISIONS OR SELECTIONS AFFECTING PROJECT AREA (Continued)

4.2 Instrument Applications (Continued)

4.2.1 Aroclor-Water Sump (Continued)

set level, evidenced by local level gauge and remote alarm. When the full water sump pump (item 1-122) will be started amd the water layer pumped to the sewer. When water is gone, the steam will be introduced to the heater coil in the sump and the aroclor layer heated to a pumpable viscosity. The aroclor sump pump (item 1-121) will be turned on until the organic phase is pumped to storage tank 1-116 or 1-117. Steam to the heater will be turned off when the sump reaches minimum level interlock.

4.2.2 City Water Break Tank

The level in the tank (item 1-126) is sensed by displacer and used to operate a control valve to make up water as required. A pressure switch will be used to signal low level.

4.2.3 Packed Column Recirculation

The pressure and flow of well water to the packed column will be indicated to permit manual adjustment at such a rate to insure that the escape of HCL content from the packed column stack is less than 7.5 lb./hr.

4.2.4 Pressure Gages

Local pressure gages are provided for indication on the discharge of all pumps. Where corrosion is no problem isolation valves with built in ball checks are provided. In areas where corrosion is a problem chemical seals will be provided to isolate the gages from the process fluids.

4. DECISIONS OR SELECTIONS AFFECTING PROJECT AREA (Continued)

4.2 Instrument Applications (Continued)

4.2.5 Level Indication of Storage Tanks

Local indication will be provided on the aroclor storage tank by the use of pneumatic differential pressure transmitters using a fluid specific gravity of 1.35.

The existing varec level indicator on the fuel oil storage tank (item 1-114) will be cleaned, re-calibrated and reused.

4.2.6 Incinerator Package

The incinerator-scrubbler system includes: incinerator, quench pot, venturi scrubber, packed column, demister pad, and air blower.

Controls to be provided are: flame safeguard, temperature controls, and water flow controls. All provided with fail safe feature to protect personnel and equipment.

4.2.7 Drum Unloading Station

Due to the possibility of flamible contaminants in the returned material drums, all electrical equipment should be Class I, Division II electrical classification.

4.2.8 Pumps

The drum unloading sump and the incinerator floor drain sump are both to be controlled with auto start of pump from level float, but will be provided with a manual-auto-off station to permit manual operation.

5. CONTROL ROOM INSTRUMENTS

5.1 Power supply to all instruments will be 115 VAC ±10% and 60 Hz.

Instrument air pressure will be 20 ±0.5 PSIG. All annunciator alarm circuits to be normally closed.

Nameplates will be provided with a suitable title and instrument numbers for each panel mounted instrument. Nameplates shall be made from laminated plastic so that engraving through top layer will be a clear legend on a contrasting background.

5.2 Panel Vendor Preference List

1.	Indicators	
	pneumatic	Foxboro Series 50
	electronic	Foxboro ECI
2.	Indicating controllers	
	pneumatic	Foxboro MS2
	electronic	No preference
3.	Recording controllers	
	pneumatic	Foxboro M54 W M58
	electronic	Foxboro ECI
4.	Multipoint Recorders	Honeywell 153 Series
5.	Annunciators	Tigerman
6.	Totalizers	Foxboro
7.	MV/I converter	Foxboro
8.	MV/P converter	Foxboro

6. FIELD MOUNTED INSTRUMENTS

All field mounted instruments shall meet the electrical classification of the area involved.

All field mounted instruments will be installed in accordance with Monsanto Standards in the R (instrument) Manual. These are in Sections R1.2 (instrument connections), R2.2 (flow instruments), R3.2 (level instruments), R4.2 (pressure instruments), R5.2 (temperature instruments), and R17.2 (instrument piping).

Due to atmospheric corrosion aluminum cased instruments are to be used only in the event that steel or epoxy coated instruments are not available.

6.1 Flow Instruments

A meter range shall in general be no greater than 100 inches W.C.

Metering rangeability for d/p instruments shall not exceed 3 to 1 full scale.

All flow meters shall generally be the dry type.

Differential pressure transmitters for flow measurements are to be the forced balance type with 1500 psi stainless steel body, 316 stainless diaphragm, 1/2 inch NPT process connections, universal pipe mounting bracket, and have a continuously adjustable range. Transmitters shall withstand over-range pressure equivalent to meter body rating. Wetted parts will be compatable with piping specifications and process fluids.

MONS 095512

Field mounted flow controllers shall be pneumatic, the indicating type, with a 10-200% proportional band with reset action. Meter shall generally be the bellows type with minimum 500 PSIG carbon steel body with stainless steel

6. FIELD MOUNTED INSTRUMENTS (Continued)

6.1 Flow Instruments (Continued)

Flow alarm switches shall generally be a pressure mounted on the output of d/p transmitter. Other types of line mounted flow switches may be used for "Flow-No Flow" service.

Magnetic flow meters can be used for high temperature or other special services; shall be coal tar epoxy coated.

Field mounted flow indicators to be a 6" receiver gage on the output of a d/p transmitter or a bellows type with a direct mechanical linkage to the 6" gage. Integrators, where required, are to be of weather proof design.

6.2 Pressure Instruments

Indicating Pressure gages shall generally be of the bourdon tube type, bottom connected, with 4½" nominal diameter dials. Dials of smaller sizes may be used in pneumatic instrument circuits and for auxiliary services on mechanical equipment. Dials should be white with black numerals and pointer. Damping devices shall be provided for gages subjected to pulsating service. Process gages shall be provided with safety blowout backs. Gages shall be provided with drawn alloy steel Bourdon tubes for pressure ranges of 1000 psig or less, and bored alloy steel, or drawn type 403 or type 4130 steel for ranges greater than 1000 psig. When required by service conditions, other materials may be used. Bronze tubes for steam, water, or air service under 400 psig. For operating pressures under 10 psig, bellows type pressure elements may be used.

6. FIELD MOUNTED INSTRUMENTS (Continued)

6.2 Pressure Instruments (Continued)

All pressure transmitters shall be the force balance type. Process connections to be ¼" or ½" female NPT and instrument to be equipped with pipe mounting yoke. Over-range protection of 1.5 times the maximum scale range is the minimum requirement for pressure elements. Materials used for pressure elements shall be selected for compatability with process stream or otherwise be sealed.

Fluid pressure transmitters should be provided with a 3½" output gage and 0-100% uniform scale.

All instruments used for handling viscous or corrosive materials are to be sealed or purged - seals preferred. Seals may be of the liquid type employing seal pots, or the chemical type employing a diaphragm and a silicone fill between the diaphragm and the pressure element of the instrument. The bottom housing of the diaphragm sealing device shall be of a material suitable for handling the process stream. The diaphragm seals are preferred for applications within the temperature and pressure limitations of this type seal. Capillary tubing, if required, shall be armoured stainless steel with plastic covering.

Pressure switches shall be DPDT (preferred) or SPDT with adjustable set point and suitable for the electrical classification of the area where used. Switches used in conjunction with transmitted air signals shall be SPDT. Pressure elements of bronze with switches having adjustable set points.

MONS 095514

Self-actuated pressure regulators (not including pilot operated) shall be used only on those services where a variation of 10% or more is not objectionable. Bypass [illegible] shall not be used except where necessary for

6. FIELD MOUNTED INSTRUMENT (Continued)

6.2 Pressure Instruments (Continued)

emergency operations. A local pressure indicator shall be provided at each regulator to facilitate control point adjustment.

Mercury switches using mechanical linkage shall not be used in general.

6.3 Level Instruments

Vessel mounted liquid level switches shall have 300 psig minimum steel float chambers and stainless steel float. Connections to be 1". Switches to be DPDT. Other alloys used as necessary to meet process requirements.

Float type level indicators to be used where local indication on storage tanks required. Do not use fixed float guides on agitated vessels.

Controllers shall have 5-100% minimum proportional band. If automatic reset selected use 200% PB.

Both transmitters and controllers shall be provided with flanged rotable head for orientation. Radiation fins provide for service in excess of 450°F.

Differential pressure level transmitters shall be in accordance with flow transmitter standards. Range suppression provided, if required. Transmitter output shall increase with increase in level.

6. FIELD MOUNTED INSTRUMENT (Continued)

6.4 Temperature

Thermocouples may be either bare wire with ceramic insulators or metal sheathed type with magnesium oxide insulation. Couples shall be installed in thermowells except where excessive time lags cannot be tolerated.

Sheathed type couples and resistance bulb assemblies shall be spring loaded.

Duplex TC assemblies used where separate temperature indication is required for checking critical temperature controllers may be fabricated, using bare wire and 4 hole ceramic insulators or the magnesium oxide sheathed type may be used.

Filled capillary systems liquid filled. Wherever possible bulbs are to be stainless steel 3/8" diameter, bendable neck, and adjustable union connection. Capillary to be copper with flexible bronze armour with overall plastic jacket or stainless steel with flexible SS armour and plastic coating.

Filled systems shall not be used where startup or shut-down conditions may exceed the normal over-range limits of these systems.

Pneumatic transmitters shall be the narrow span force balance type. Spans of 50°, 100° or 200° shall be used for temperature control applications. Output 3-15 psig.

6. FIELD MOUNTED INSTRUMENTS (Continued)

6.4 Temperature (Continued)

Electronic transducers, if used, shall convert a thermocouple input signal to a proportionate milliampere d-c output. Cold junction compensation shall be incorporated for TC inputs. Transmitters shall be fixed range type with upscale burnout protection. For spans less than 100°F resistance thermometer type shall be used.

Field mounted controllers shall be pneumatic, indicating type and shall have a minimum 5-50% proportional band. Reset and rate action included when required by process conditions.

Temperature switches may be DPDT or SPDT, preferably DPDT, and shall be suitable for the area electrical classification. Bi-metallic and snap action switches should be used wherever possible. When filled systems are used they should conform to the paragraph on filled systems.

Thermowell should be of 304 stainless steel with minimum of 1" screwed or flanged process connection. Other materials are used as warrented by process conditions. Test wells shall be equiped with brass plug and chain.

Dial thermometers should be of the bi-metallic or filled type and generally be the all-angle universal type. Dial size to be 5" diameter.

Separable sockets should be provided to facilitate removal of thermometers.

6. FIELD MOUNTED INSTRUMENTS (Continued)

6.5 Vendor Preference List

	Instrument	Manufacturer
1.	Filled temperature controllers/ transmitters	Taylor/Foxboro
2.	Pressure transmitters	Foxboro
3.	d/p transmitters	Foxboro
4.	Rotameters	Fisher-Porter
5.	In line flow switches	McDonald-Miller
6.	I/P transducers	Fisher
7.	Temperature transducers	Rosemont
8.	Turbine flow meters	Invalco
9.	Magnetic flow meters	Foxboro
10.	Level, displacer or float type	Fisher/Brooks
11.	Level, d/p cell	Foxboro
12.	Level, tank gage	Varec
13.	Pressure gages, bourdon	Ashcroft
14.	Chemical gage seals	Mansfield-Green
15.	Dial thermometers bimetallic type filled type	 Ashcroft Palmer
16.	Conservation vents	Varec
17.	Process pressure switches	Mercoid/Ashcroft
18.	Orifices	Daniel

7.0 VALVES

7.1 Control Valves

Diaphragm operated standard control valves will be flanged with 1" minimum body size, except for low flows. Piping specifications will be followed on body materials.

Iron body will be restricted to utilities and 80 psi steam. Standard trim will be 316 SS and Hardened SS trim will be used on steam above 140 psi.

7. VALVES

7.1 Control Valves (Continued)

Separable steel flanges will be used on all split body valves.

Ball valves will be used in on-off service around filter and for throttling such as polymer slurry.

Valves will be sized as per each manufacturer's recommendations.

Valve positioners will generally be side mounted, direct acting, with 3 gages and by-pass. Positioners will be supplied with control valves in the following service:

1. Temperature control valves
2. Valves with pressure drop 150 psi or more.
3. Valves operating at 450°F or higher.
4. Valves in flashing service.
5. Valves in split range service (no by-pass).
6. Valves where solids may deposit on stem, or where deep stuffing boxes required.

I/P transducers will have high volume pilots. Where multiple valves are used on one signal, one transducer only will be used. Transducers will be separate from the positioner, but will be mounted on the valve.

7.2 Safety Relief Valves

Flanged relief valves construction in general shall be enclosed spring, bolted bonnet, screwed cap, full nozzle type with stainless steel nozzle, disc, guide and spindle and cast steel bodies. Alloy steel bodies and trim may be used when particular service dictates. Body pressure ratings for flanged valves shall be the same as the

7. VALVES (Continued)

7.2 Safety Relief Valves (Continued)

rating of the inlet flange. Area of discharge opening shall not be less than four times the area of the valve seat. Screwed valves may have screwed bonnets and may be used where small orifice areas are required, if allowed by the piping specifications.

No lifting levers are required for process valves. Carbon steel springs are to be supplied for valves in service of 450°F and below. Tungsten steel springs are to be supplied for valves in 450°F relieving temperature service.

Pressure balances valves shall be used for varying back pressure applications and where back pressure exceeds 10% of the set pressure of the relief valve. These valves shall have stainless steel bellows. A rupture disc may be installed between a relief valve and the vessel provided it meets all requirements set forth in paragraph UG-127(d), Section VIII of ASME code.

7.3 Rupture Discs

Generally, the safety head fitting shall be of the type with a diameter that fits inside the bolt circle, such as the "BS&B Quick-Sert". This type of head shall be used on all flanged connections. Flange type safety heads may be used in screwed pipe where rupture of the disc is infrequent. Materials of construction shall be equal to the pipe specs.

All rupture discs, except those in special applications shall be interchangeable with all safety head fittings for a particular size and shall have vacuum supports.

7. VALVES (Continued)

7.3 Rupture Discs (Continued)

The selection of the disc type depends on the application involved (DV, PLVD - BS&B notations). Where a material can be selected that is corrosion resistant to the process side and the venting side, the DV type disc is satisfactory, providing the materials are in the desired pressure range. Generally, the PLDV type is preferred since its construction features provide a superior resistance to corrosion. Maximum bursting pressure of the disc shall not exceed the maximum allowable working pressure of the protected system.

In most cases, the rupture disc, is located such that the disc temperature remains at or near ambient. In these cases the disc shall be rated at 72°F. When disc temperature is definitely above 72°F, a design temperature selection is made which will be near and below the temperature of the fluid. When disc temperature is definitely below 72°F, a design temperature is selected which will be near and above the fluid temperature.

A tapped opening and pressure gage will be installed on the outlet flange of a rupture disc used in series with a relief valve.

7.4 Solenoid Valves

Solenoid valves will be of the continuous duty type with encapsulated coils, and shall meet the area electrical classification.

7. VALVES (Continued)

7.5 Vendor Preference

Instrument	Manufacturer
Relief Valves	Consolidated/Farris
Rupture Discs	BS & B/Carbone
Control Valves	Fisher
Control Valves Butterfly	Fisher Continental

8. PNEUMATIC SIGNAL PIPING

Individual pneumatic tubing may be ¼" 0.D X 0.030" wall copper tubing coated with 1/32" thick coating of polyethylene, or ¼" 0.D X 0.040" wall high density black polyethylene tubes enclosed in electrical conduit and terminating in a junction box. For vertical runs on towers where individual tubing support is difficult, the latter is preferred.

Polyethylene tubing shall not be used in hot locations or where localized hot spots occur.

Major instrument tubing runs shall be multiple bundles consisting of 4 to 9 high density black polyethylene ¼" 0.0 X 0.040" wall thickness contained in an asbestos wrapped extruded vinyl sheath of minimum 3/16" thickness. All tubing bundles shall contain approximately 15% spare tubes for future use.

Tubing bundle transitions from large to smaller size or to individual tube leads shall be made inside of galvanized steel junction boxes. Individual leads emanating from junction boxes shall employ bulkhead tubing fittings installed in the junction box wall.

Fittings will be Swagelock on SS, copper or plastic tubing.

9. INSTRUMENT AIR SUPPLY

The desired pressure for instrument air is 80 psig minimum and rated at 100 psig with a dew point of -40°F. All air users shall operate satisfactorily if supply pressure drops to 60 psig.

Each air use will be provided with ½" pipe and cut off valves at the header. Connections from the instrument regulator to the instrument shall be tubing. Connections to the main air header are to be from the top.

An air supply pressure gage will be supplied at either the regulator or the instrument.

10. ELECTRIC SIGNAL WIRING

10.1 Wire Specifications

Thermocouple extension wire shall be single pair #16 solid conductor, twisted pair with aluminum mylar shield, and PVC primary insulation and jacket, 80°C minimum.

Multipair Cable - up to 24 pair #20 solid conductor, individually twisted pairs, shielded and insulated as above.

Analog signal wire other than thermocouples shall be single pair, #16 stranded copper wire twisted with aluminum-mylar tape shield, and PVC insulation, 80°C minimum.

Multipair cable - up to 36 pairs, #20 stranded copper, individually twisted, shielded, and insulated as above.

10. ELECTRIC SIGNAL WIRING (Continued)

10.2 Reducing Electrical Interference

All instrument signal and alarm circuit wire will be in separate conduit from 115 VAC wiring runs, and will be separated by at least 6".

Thermocouple and other low energy signals will be kept separate from alarm circuits and current signals.

10.3 Tagging

All wires and cables will be tagged with an assigned number.

10.4 Instrument Connections

Open 16 gage shielded cable will be run from rigid conduit near the instrument with water tight cable connectors at the conduit and instrument.

If used, blind transmitters will have a phone type jack ac a 1 ohm resistor in series with the transmitter for checking and calibrating the transmitter.
Indicators may be used for critical applications.

11. INSTRUMENT DECISIONS AND ELECTRICAL WORK

Stand-by electric power is not required, however, fail-safe hookup should be used to guard against electrical failure.

Electric heat for instruments may be provided where necessary.

Noise-free power requires no special precautions.

12. INSTRUMENT INSTALLATIONS

All field instruments shall be installed in accordance with the R (instrument) Manual standards.

13. CONTROL ROOMS AND PANELS

No instrument connections from lines or vessels containing process fluid or gases shall run directly into control houses.

All conduits entering a control house from process areas will be sealed to prevent entry of hazardous materials.

An existing control house adjacent to the incinerator area will be utilized for installation of the required alarm annunciators.

The incinerator fabricator will provide any necessary field panels for local incinerator controls.

Electric power will be 115 VAC $\pm$10% at 60 Hz, supplied from a breaker panel used for instruments and control logic only.

Voltage regulators will be provided as required.

Power for 2 wire transmitters will be from individual isolated power supplies. These power supplies will be housed with the controllers, except for loop without control, then the power supply will be with a recorder or indicator.

Terminal strips for analog signal connections will be screw barrier, 7/16" centers.

13. CONTROL ROOMS AND PANELS (Continued)

No. 16 twisted unshielded wire will be issued for analog signals and annunciators. No. 16 single wire will be used for relays and switches. All signal wire will be separated from 115 VAC wire.

14. DOCUMENTS

The following schedules and drawings will be prepared:

Drawing	Size	Description
-	11 x 17	Instrument Performance Data
-	11 x 17	Instrument Index
-	8½ x 11	Instrument Specifications
I	4 on D	Instrument Schematics
E	D	Annunciator Schematics
I	7 on D	Instrument Installation Details
I	D	Instrument Details
I	D	Layout-Instrument Panel
I	D	Layout-Annunciator Panel
E	D	Electrical Interconnection
I	D	Instrument Interconnection
E	D	Conduit Layout
I	D	Tubing Layout
E	D	Wiring Instrument Panels & Junction Boxes
I	D	Tubing Instrument Panels & Junction Boxes
E	D	Electrical Details (Connection to Instrument)
-	8½ x 11	Nameplate List

SECT. 0202-03

Monsanto COMPANY	* ANNUNCIATOR SPECIFICATIONS	DIVISION: ORGANIC	PLANT: WGK	* SPEC NO.: IS 2415-10
LOCATION		AUTH NO.: 2415	DEPT OR AREA: 914.24	SHEET 1 OF ___ REV

Instrument No.		LA121-1	LA126-1	FA127-2	
Service		PUMP PROCLOR	CITY WATER	EMERG H_2O	
		SIGNAL	LOW	LOW FLOW	
Location		1-124	1-126	1-CW-2-F202-1½	
CABINET	Type				
	*Rows High				
	*Columns Wide				
	Window Size				
	Bulls Eyes No/Point & Color				
	Mounting				
	Material				
	Nema Rating	NEMA IV	→	→	
	Conduit Hub or Knock Out Size				
RELAYS	Model No.				
	Location				
	Nema Rating				
	Contact Arrangement SPST, SPDT, DPDT, Other				
	Coil Voltage – DC-AC – Frequency	AC	→	→	
	Sequence: Normal Light / Horn	OFF / OFF	→ / →	→ / →	
	Sequence: Abnormal Light / Horn	ON / ON	→ / →	→ / →	
	Sequence: Acknowledge Light / Horn	ON / OFF	→ / →	→ / →	
	Sequence: Rtn. to Normal Light / Horn	OFF / OFF	→ / →	→ / →	
ACCESSORIES	Flasher No.	LIGHT	→	→	
	Horn				
	Pushbuttons: Acknowledge	✓	✓	✓	
	Pushbuttons: Reset				
	Pushbuttons: Test				
REMARKS	Accessories or Special Features	HORN, LIGHT, ACK			
		SUPPLIED			
		BY INCIN			
		VENDOR	→	→	
	Nameplate Schedule (Engraving)				
PURCH.	Manufacturer	J ZINK	→	→	
	*Catalog No.				
	P.O. No.	—	—	—	
	Price	—	—	—	

REV. DATE					
0	SPEC PREPARED	11-10-70	CL	4	
1				5	
2				6	
3				7	

MONS 095527

SECT. 0202-03

Monsanto COMPANY	INSTRUMENT SPECIFICATIONS	DIVISION	PLANT	SPEC NO.
LOCATION		ORGANIC	WGK	IS 2415-91
		AUTH NO.	DEPT OR AREA	SHEET / REV
		2415	919.24	___ OF ___

Instrument No. SY127-5

Service RECIRCULATING VALVE (ON-OFF)

Equipment No. or Line No. & Size 1-CW-7-FZC2- 1/2"

Process Material CITY WATER

SOLENOID VALVE

BRASS BODY
1/2" SCREWED CONNECTIONS
MAX OPERATING PRESSURE DIFFERENTIAL 300PSIG
SAFE BODY OPERATING PRESSURE 300 PSIG
ORIFICE 6/8"
ELECTRICAL SUPPLY 115VAC 60HZ
CLASS F COIL

NEMA 4 ELECTRICHL CLASSIFICATION

PURCHASING						
Manufacturer		ASCO				
Catalog No.		S211C7				
P.O. No.						
Price		45.00				

REV.	DATE					
0		SPEC PREPARED	11-5-70	CL	0	
1					1	
2					2	

MONS 095528

SECT. 0202-03

Monsanto COMPANY

LOCATION

*DIFFERENTIAL PRESSURE *INSTRUMENT SPECIFICATIONS

DIVISION	PLANT	*SPEC NO.
ORGANIC	W&K	IS 2415-32
AUTH NO.	DEPT OR AREA	SHEET / REV
2415	914.24	1 of

1	Instrument No.			LT 116-2			LT 117-2			LT 118-2					
	Service			STORAGE TANK LEVEL			″			″					
	Equipment No. or Line No. & Size			3"-150#-2F			″								
	Process Material			WASTE AROCLOR			″			″					
3	CASE	Blind, Indicating, Record, Control, Transmit		INDICATING			″								
		Mounting: Flush, Surface Yoke													
		CHART	Size and Type												
			Range												
			Drive / Speed												
		SCALE	Size & Type	SEE SPEC			″								
			Range	IS-2415-50			″								
7*	DIFFERENTIAL UNIT	Flow, Level, Pressure		LEVEL			″								
		Bellows, Diaphragm, Other		STAINLESS STL			″								
		*Span & Units		265" H_2O			″								
		Range Limits		0-850"			″								
		Body Rating @ 60°F		1500# @ 200°F			″								
6*		*Body Material		CARBON STEEL			″								
		Element Material													
		Wetted Parts Material		STAINLESS			″								
		Extended Diaph. Length		"											
		Fluid Sp. Gr.		1.30			″								
	SIGNALS	PROCESS INPUT	Liquid, Gas, Cond. Vapor	LIQUID			″								
			Operating Pressure	ATM			″								
		INSTRUM. OUTPUT	Range & Units	3-15 PSIG			″								
			To	INDIC-RECVR			″								
		Power Supply – Electrical, Pneumatic		PNEUMATIC			″								
		Electrical Area Classification													
	CONTROLLER	Proportional Band %													
		Auto-Reset Mode		NO	SLOW	FAST	NO	SLOW	FAST	NO	SLOW	FAST	NO	SLOW	FAST
		Rate Mode		YES	NO		YES	NO		YES	NO		YES	NO	
		Auto-Manual By Pass		YES	NO		YES	NO		YES	NO		YES	NO	
		On Measurement Increase Instrument Output		INC.	DEC		INC.	DEC		INC.	DEC		INC.	DEC	
		Pipe & M*d Air Supply Reg.		YES	~~NO~~		YES	NO		YES	NO		YES	NO	
		Output Gage, 3½" Size		~~YES~~	NO		~~YES~~	NO		YES	NO		YES	NO	
	REMARKS	Accessories or Special Features		CALIBR											
				0 = 2'0"											
				100% = 19'0" SHT											
		STD INSTRUMENT DETAIL		LT-1.5-FX			″								
2	PURCH	Manufacturer		FOXBORO			″								
		Catalog No.		13F											
		P.O. No. 2415-9-								EXISTS					
		Price													
	EV. DATE	0 SPEC PREPARED		10-13-70 CR			0								
		1					1								
		2					2								

MONS 095529

SECT. 0202-03-

Monsanto COMPANY	*FLOW MEASURING *ELEMENT SPECIFICATIONS	DIVISION ORGANIC	PLANT WGK	*SPEC NO. IS-2415-33	
LOCATION		AUTH NO. 2415	DEPT OR AREA 914.24	SHEET OF	REV

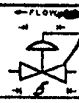
Instrument No.			FI 106-2	FQ102-1	FQ123-1	
Service			MAGNETIC FLOW METER	GAS METER	OIL METER	
Process Material			2% HCl	NAT GAS	#2 FUEL OIL	
Line No.			1-106-1-QPIM101	1-FG-1-FIC1-	1-118-1	
Line Size, Schedule			2"	1"	1"	
SERVICE	Upstream Operating Conditions	Flowing Press. P_f	100 PSIG	20 PSIG	80 PSIG	
		Flowing Temp T_f	180°F			
		Sp. Gr. @ T_f				
		Viscosity CP @ T_f	0.38 cp			
		Sp. Gr. @ 60°F	1.0	0.6	0.88	
		Supercompr. Factor @ T_f				
		Steam Quality, %				
		Steam Superheat, F				
	Flow at Base Conditions 60F & 14.73 PSIA Barometric Pressure at Location ____ In. Hg.	Liquid, Gas or Steam	LIQ	GAS	LIQ	
		Minimum Flow				
		Normal Flow	70		0.7	
		Maximum Flow	80	13,000	1.55	
		Units of Flow	GPM	CFH	GPM	
		Meter Range				
FLANGES	*Size & Type – W.N., S.O., Scrd., Van Stone(1)					
	*Rating & Facing					
	Material – Flange & R.T.J. Ring or Gasket(1)					
	Taps – Type, Size & Orientation (R2.3 Std)					
ORIFICE PLATE	Type of Plate (R2.3 Std)					
	Plate Material & Thickness					
	Pipe ID (D), In.					
	Orifice ID (d), In.					
	d/D Ratio (β)					
	Meter Range – Inches Water Dry					
	Type of Meter					
	Drain or Vent Hole					
	Chart or Scale Range					
	Chart Factor					
	Calculation Sheet No.					
REMARKS						
	All orifice handles to be stamped on upstream side with "Inlet", bore dia, nom pipe ID, flange rating, instrument number and plate material					
PURCH.	Manufacturer		FISCHER PORTER	AMERICAN		
	*Catalog Number		10D1418A	AL 5000		
	Purchase Order Number		EXIST	EXIST	EXIST	
	Price		—	—	—	
REV	0	SPEC PREPARED	11-20-70	CO		
	1					
	2					

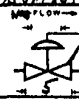
MONS 095530

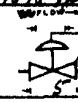
SECT. 0202-03

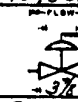
Monsanto COMPANY	*DIRECT OPERATED *PRESSURE REGULATING *VALVE SPECIFICATIONS	DIVISION: ORGANIC	PLANT: WGK	SPEC NO.: IS 2415-42
LOCATION		AUTH NO.: 2415	DEPT OR AREA	SHEET 1 OF ___ REV

Valve No.		PCV123-2	PRV102-2	PRV102-3	PRV102-4
Service		OIL PRESSURE CONTROL	ATOMIZING STEAM PRESS	GAS TO PILOT AND BURNER	STEAM FOR COOLING
Line Number & Size		1-123-F2C46-1"	1-SM-1-F3C11-1/2"	1-FG-1-F1C1-1"	1-SL-7-F2C2-1/2"
Process Material		#2 FUEL OIL	STEAM	NATURAL GAS	STEAM
Operating Data	Flow Temperature				
	Working Pressure (PSIG Inlet)				
	Valve to Close Against (PSIG.)	100	200	35	80#
	Sp. Gr. @ Flow Temp.			0.60	
Design Conditions Gas @ 60°F 14.7 PSIA Liquid @ Flow Temp.	Normal Flow	10 GPM			
	Max. Flow	15 GPM	360	5800	
	Units: SCFM, SCFH, GPM or #/Hr.		#/HR	SCFH	
	Fluid	LIQ. ~~GAS~~ ~~STM~~	~~LIQ.~~ ~~GAS~~ STM	~~LIQ.~~ GAS ~~STM~~	~~LIQ.~~ ~~GAS~~ STM
	Inner Valve Travel, % @ Design Flow				
	ΔP Cv (Calc.) @ Design Cond.		100	15	60#
	Calculation Sheet No.				
Valve Specifications	*Valve Body Size	1 INCH	→	→	1/2 INCH
	Valve Port Size	9/16 INCH	→	→	3/8"
	Body Rating & Conn. Size	300 PSIG - 1" NPT	→	→	300 PSIG - 1/2" NPT
	Body Material	CAST STEEL	→	→	→
	Trim Material	STAINLESS	STAINLESS	NEOPRENE	STAINLESS
	Type Inner Valve				STAINLESS
	Seats (Double or Single)	SP ~~DP~~	SP ~~DP~~	SP ~~DP~~	SP ~~DP~~
	Valve actuator (Diaph ~~or Piston~~)	DIAPH ~~PISTON~~	DIAPH ~~PISTON~~	DIAPH ~~PISTON~~	DIAPH ~~PISTON~~
	Matl of Const (Diaph ~~or Piston~~)	STAINLESS	STAINLESS	NEOPRENE	STAINLESS
	Lubricator / Isolating Valve				
	Packing				
	Guiding	SKIRT TOP BTM	SKIRT TOP BTM	SKIRT TOP BTM	SKIRT TOP BTM
Spring Setting		100 PSIG	100	20	20
*Spring Range		70 - 140	RED SPRING	RED SPRING	RED SPRING
On Increased Pressure Valve		OPENS ~~CLOSES~~	~~OPENS~~ CLOSES	~~OPENS~~ CLOSES	~~OPENS~~ CLOSES
Type of Regulator		RELIEF	DIAPHRAGM	DIAPHRAGM	DIAPHRAGM
REMARKS	Accessories or Special Features				
			10% OFFSET	10% OFFSET	10% OFFSET
DIMENSIONS		FLOW 9 7/16 5	FLOW 9/16 5	FLOW 9/16 5	FLOW 6 1/8 3 7/8
PURCHASING	Manufacturer	FISCHER	FISHER	FISHER	FISHER
	*Catalog No.	98H	95H	95L	95L
	P.O. No. 2415-9-				
	Price	150.00	125.00	155.00	155









REV. DATE				
0	SPEC PREPARED	10-2-70	CL	4
1				5
2				6
3				7

MONS 095531

SECT. 0202-03

Monsanto COMPANY	*FLOW MEASURING *ELEMENT SPECIFICATIONS	DIVISION ORGANIC	PLANT WGK	*SPEC NO. IS-2415-46
LOCATION ———		AUTH NO. 2415	DEPT OR AREA 91424	SHEET OF / REV

	Instrument No.		FØ 112-3	FØ 112-4	FØ 127-3	FØ 127-4
	Service		FLOW RESTR	→	→	→
	Process Material		WELL WATER	→	CITY WATER	→
	Line No.		1-WW-1-F2C4L	1-WW-3-F2C4L	1-CW-5-F2C2	1-CW-3-F2C2
	Line Size, Schedule		2"	→	1½"	→
SERVICE	Upstream Operating Conditions	Flowing Press. P_f	120 PSIG	→	205 PSIG	→
		Flowing Temp T_f	50°F	→	→	→
		Sp. Gr. @ T_f	1.0	→	→	→
		Viscosity CP @ T_f				
		Sp. Gr. @ 60°F				
		Supercompr. Factor @ T_f				
		Steam Quality, %				
		Steam Superheat, F				
	Flow at Base Conditions 60F & 14.73 PSIA Barometric Pressure at Location ____ In. Hg.	Liquid, ~~Gas or Steam~~	LIQUID	→	→	→
		Minimum Flow				
		Normal Flow	60	70	5	8
		Maximum Flow	70	80	10	15
		Units of Flow	GPM	→	→	→
		Meter Range				
FLANGES	*Size & Type – W.N., S.O., Scrd., Van Stone(1)		2"	→	1½"-SCRD	→
	*Rating & Facing		150#, RF	→	→	→
	Material – Flange & R.T.J. Ring or Gasket(1)		CARBON STEEL	→	→	→
	Taps – Type, Size & Orientation (R2.3 Std)		NONE	→	→	→
ORIFICE PLATE	Type of Plate (R2.3 Std)		PADDLE	→	→	→
	Plate Material & Thickness		304 SS - 1/8"	→	→	→
	Pipe ID (D), In.		2.067	→	1.610	→
	Orifice ID (d), In.		0.546	0.585	0.288	0.320
	d/D Ratio (β)		0.262	0.280	0.180	0.200
	Meter Range – Inches Water Dry					
	Type of Meter					
	Drain or Vent Hole					
	Chart or Scale Range					
	Chart Factor					
	Calculation Sheet No.					
REMARKS	FOXBORO METER SLIDE RULE USING PIPE TAP d/D SCALE		→	→	→	→
	All orifice handles to be stamped on upstream side with "Inlet", bore dia, nom pipe ID, flange rating, instrument number and plate material					
PURCH.	Manufacturer		DANIEL	→	→	→
	*Catalog Number		520	→	→	→
	Purchase Order Number					
	Price		13.00	13.00	13.00	13.00

REV					
0	SPEC PREPARED	11-5-70	CL	4	
1				5	
2				6	

MONS 095532

SECT. 0202 - 03

Monsanto COMPANY

LOCATION ____

PROCESS ACTUATED * SWITCHES SPECIFICATIONS

DIVISION	PLANT	* SPEC NO.
ORGANIC	W&K	IS 2415-97
AUTH NO.	DEPT OR AREA	SHEET / REV
2415	9428	1 OF ____

Instrument No.					PS110-1		PS126-1					
Service					TANK CAR UNLOADING		CITY WATER LEVEL					
Equipment No. or Line No. & Size					3/4"		1/4"					
Process Material					WASTE AMOCLOR		INSTR. AIR					
GENERAL	Press. Temp. – Level Flow Switch – Relay				PRESURE		→					
	Temperature	Normal	Max.		75°C	100°C	60°F					
	Pressure	Normal	Max.		35PSIK	60	5	15				
	Fluid (Level Only)	Upper	Lower									
	Sp. Gr. @ Oper. Temp.	Upper	Lower		1.37	1.47	1.0	1.0				
ELEMENT	*Range & Units				0-60 PSIG		0-15 PSIG					
	Pressure	Type Element & Material			SNL STL - VITON		STN STL - BUNA-N					
		Conn. Size	Orientation		1/2" NPT	BOTTOM	→					
	Temp.	Fill – Gas, Mercury, etc.										
		Capillary – Length	Material									
		Armor Material										
		Bulb-Diameter	Length									
		Bulb Type – Plain, Union										
		Bulb Conn. – Size & Rating										
		Well Material										
		Well Conn. Size & Rating										
		Lgth below Thread or Flange "U" (SEE NOTE)										
		Lagging Extension "T" (SEE NOTE)										
	Level	Type & Material										
		Connection Size & Rating										
		Connection Arrangement										
		Cooling Fin or Extension										
		Float Material & Size										
	Flow	Connection or Body Size										
		Type Element & Matl.										
		Disc or Paddle Size										
SWITCH	Type – Mercury, Micro, etc.				SNAP ACTION		→					
	Contact Arrangement	Rating – Volts & Amps			SPDT	115V-15A	→	→				
	Set Point				10 PSIG		3-4 PSIG					
	On Measurement Increase Switch				OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES
	Electrical Area Classification				NEMA IV		→					
	Conduit Conn. Size & Hub or K.O.				1/2" NPT		→					
	Differential Range – Fixed, Adjustable				ADJ.		→					
REMARKS	Accessories or Special Features											
PURCH.	Manufacturer				ASHCROFT		→					
	*Catalog No.				6080		→					
	P.O. No.	2459-										
	Price				20.00		20.00					

REV.					
0	SPEC PREPARED	10-5-70	CL	0	
1				1	
2				2	

MONS 095533

SECT. 0202-03

Monsanto COMPANY	PROCESS ACTUATED * SWITCHES SPECIFICATIONS	DIVISION: ORGANIC	PLANT: WGK	*SPEC NO.: IS-2415-47
LOCATION		AUTH NO.: 2415	DEPT OR AREA: 914 24	SHEET: 2 OF ___ REV

Instrument No.				FS 127-2							
Service				LOW FLOW PROTECTION							
Equipment No. or Line No. & Size				1-CW-2-FC2-1½"							
Process Material				CITY WATER							
GENERAL	Press. Temp. – Level Flow Switch – Relay			FLOW							
	Temperature	Normal	Max.	60°F							
	Pressure	Normal	Max.								
	Fluid (Level Only)	Upper	Lower	8.0	5.9						
	Sp. Gr. @ Oper. Temp.	Upper	Lower	1.0							
ELEMENT	*Range & Units			5.9 – 11.0 GPM							
	Pressure	Type Element & Material									
		Conn. Size	Orientation								
	Temp.	Fill – Gas, Mercury, etc.									
		Capillary – Length	Material								
		Armor Material									
		Bulb-Diameter	Length								
		Bulb Type – Plain, Union									
		Bulb Conn. – Size & Rating									
		Well Material									
		Well Conn. Size & Rating									
		Lgth below Thread or Flange "U" (SEE NOTE)									
		Lagging Extension "T" (SEE NOTE)									
	Level	Type & Material									
		Connection Size & Rating									
		Connection Arrangement									
		Cooling Fin or Extension									
		Float Material & Size									
	Flow	Connection or Body Size		1¼" NPT							
		Type Element & Matl.		STAINLESS STL							
		Disc or Paddle Size									
SWITCH	Type – Mercury, Micro, etc.			SNAP ACTION							
	Contact Arrangement	Rating – Volts & Amps		SPDT 115V 7.5a							
	Set Point			<13 GPM							
	On Measurement Increase Switch			OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES
	Electrical Area Classification			NEMA IV							
	Conduit Conn. Size & Hub or K.O.			⅞" UNTAPPED							
	Differential Range – Fixed, Adjustable			ADJUSTABLE							
REMARKS	Accessories or Special Features										
PURCH.	Manufacturer			McDONALD-MILLER							
	*Catalog No.			FS7-4							
	P.O. No.	2415-9-									
	Price										
REV.	0	SPEC PREPARED		10-15-70	CL	4					
	1					5					
	2					6					

MONS 095534

SECT. 0202-03

Monsanto COMPANY	PROCESS ACTUATED * SWITCHES SPECIFICATIONS	DIVISION: ORGANIC	PLANT: WGK	*SPEC NO.: IS-2415-47
LOCATION: —		AUTH NO.: 2415	DEPT OR AREA: 714.24	SHEET: 3 OF ___ REV

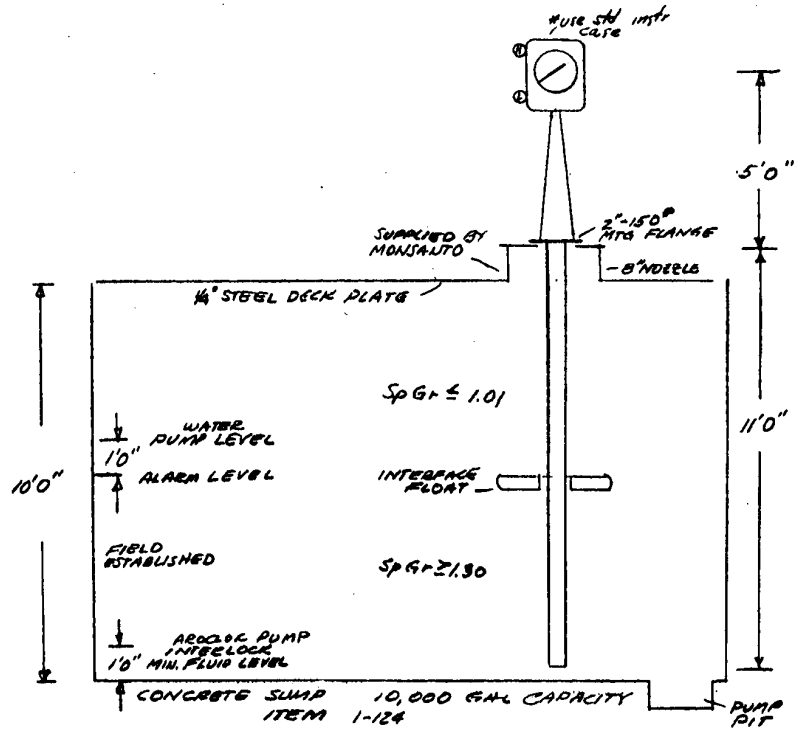
Instrument No.			LS 119-1		LS 120-1		LS 121-1			
Service			START-STOP		→		→			
			SUMP PUMP		→		→			
Equipment No. or Line No. & Size										
Process Material			WASTE AROCLOR		WATER		AROCLOR-WATER			
GENERAL	Press. Temp. – Level Flow Switch – Relay		LEVEL		→		→			
	Temperature	Normal / Max.	40°F	AMB	AMB	AMB	→	140°F		
	Pressure	Normal / Max.					ATM			
	Fluid (Level Only)	Upper / Lower	3'6"	6"	→	→	FIELD ADJUST	1'0"		
	Sp. Gr. & Oper. Temp.	Upper / Lower	1.55	1.30	1.02	0.98	1.55	1.39		
ELEMENT	*Range & Units									
	Pressure	Type Element & Material								
		Conn. Size / Orientation								
	Temp.	Fill – Gas, Mercury, etc.								
		Capillary – Length / Material								
		Armor Material								
		Bulb-Diameter / Length								
		Bulb Type – Plain, Union								
		Bulb Conn. – Size & Rating								
		Well Material								
		Well Conn. Size & Rating								
		Lgth below Thread or Flange "U" (SEE NOTE)								
		Lagging Extension "T" (SEE NOTE)								
	Level	Type & Material	FLOAT 304SS		→		STEEL SHAFT			
		Connection Size & Rating	3/4" NPT		→					
		Connection Arrangement	5"-150# RF		→		2"-150#			
		Cooling Fin or Extension					5'0"			
		Float Material & Size	304SS - 3½"		→		TEFLON/POLYPROP COATED			
	Flow	Connection or Body Size								
		Type Element & Matl.								
		Disc or Paddle Size								
SWITCH	Type – Mercury, Micro, etc.		MERCURY		→					
	Contact Arrangement	Rating – Volts & Amps	SP-ST	115V-10A	→					
	Set Point		6" & 3'6"		→		HI-FIELD ADJ. LOW - 1'0"			
	On Measurement Increase Switch		OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES	OPENS	CLOSES
	Electrical Area Classification		CLASS I DIV I		NEMA III		→			
	Conduit Conn. Size & Hub or K.O.		3/4" NPT		→					
	Differential Range – Fixed, Adjustable		ADJUSTABLE		→		→			
REMARKS	Accessories or Special Features		4' GUIDES		→		HI LEVEL-ALARM			
							LO LEVEL-PUMP INTER.			
PURCH.	Manufacturer		MERCOID		→		BROOKS			
	*Catalog No.		401-1EV		401-1W		MAG LINK			
	P.O. No.	2415-9-					0003			
	Price		$225		185.00		620.00			

REV.					
0	SPEC PREPARED	10-14-71	CL	4	
1				5	
2				6	

MONS 095535

SECT. 0202 – 03

Monsanto COMPANY	INSTRUMENT INSTALLATION DETAIL	AUTH NO. 2415	SPEC NO. IS 2415-47a
LOCATION	AROCLOR-WATER SUMP	DIVISION ORGANIC	PLANT W. G. KAUMMRICH
			DEPT/AREA 919.24



PO-2415-4-0003

QTY	MK	MATL	RATING	DESCRIPTION	QTY	MK	MATL	RATING	DESCRIPTION
1		STEEL WITH INDICATOR & SWITCHES		BROOKS MAG-LINK					
1		TEFLON OR POLYPROPYLENE COATED STEEL		INTERFACE FLOAT					
2		MERCURY		LEVEL SWITCHES					

MONS 095536

NO.	DATE	DESCRIPTION	BY	CKD	APP
A	12-3-70	FOR PURCHASE			

SECT. 0202 - 03

Monsanto COMPANY	*PRESSURE GAUGE SPECIFICATIONS	DIVISION: ORGANIC	PLANT: WGK	*SPEC NO.: IS 2415 -49
LOCATION: —		AUTH NO.: 2415	DEPT OR AREA: 914.24	SHEET: 1 OF ___ REV

GENERAL NOTES:

INSTRUMENT NOS.	*PI120-2	PI 110-1	PI 106-1	PI111-1
		PI 119-2	PI 106-3	PI112-1
		PI 122-1		PI112-2
		PI 121-2		PI115-1
ELEMENT: *Span & Units	0-30 PSIG	0-60 PSIG	0-160 PSI	→
Type	BOURDON	→	→	→
Element Material	STEEL	→	→	→
Socket Material	STEEL	→	→	→
Connection Size & Type	1/4" NPT	→	→	→
Connection Orientation	BOTTOM	→	→	→
CASE: *Dial Size	4½"	→	→	→
Dial Color Scheme	WHITE FACE BLACK NUMERALS	→	→	→
Case Material (Style Case)	STAINLESS STL	→	→	→
Ring Type	SNAP	→	→	→
Mounting Type	STEM	→	→	→
Crystal Material	GLASS	→	→	→
Micrometer Zero Adjustment	YES	→	→	→
Safety Release Type				
MOVEMENT: Movement Material	STAINLESS	→	→	→
Guaranteed Accuracy	1%	→	→	→
CHEMICAL SEAL: Body Material			POLY TRIFLUOROETHYLENE WETTED - STL BODY	
Diaphragm Material			HASTALLOY C	
Fill Liquid / Cleanout Connection			SILICONE	
Proc. Temp °C / AMB. Temp °C			82°C AMB	
Process Connections Size & Type			1-150# RF	
Manufacturer's Type & Model			MOORE GEN - IC	
REMARKS: Accessories & Special Features			PE4HCQP1	
	PG7B 30#	PG7B 60#	PG7B 160	PG7B-160#
PURCH.: Manufacturer	ASHCROFT	→	→	→
*Catalog No.	1020B	→	→	→
P.O. No. 2415-9-			CANCELLED 11-2-70	
Quantity Required				
Price	$20	20	80.00	20

V. DATE					
0	SPEC PREPARED	10-15-70	CL	4	
1				5	
2				6	

MONS 095537

SECT. 0202 - 03

Monsanto COMPANY	*PRESSURE GAUGE SPECIFICATIONS	DIVISION: ORGANIC	PLANT: WGK	*SPEC NO.: IS-2415-49
LOCATION:		AUTH NO.: 2415	DEPT OR AREA: 914.24	SHEET: 2 OF ___ REV

GENERAL NOTES:

		INSTRUMENT NOS.			
		*PI104-2	PI127-1		
ELEMENT	*Span & Units	0-160 PSIG	0-300 PSIG		
	Type	BOURDON	→		
	Element Material	STEEL	→		
	Socket Material	STEEL	→		
	Connection Size & Type	1/4" NPT	→		
	Connection Orientation	BOTTOM	→		
CASE	*Dial Size	4 1/2	→		
	Dial Color Scheme	WHITE FACE BLACK NUMERALS	→		
	Case Material (Style Case)	STAINLESS STL	→		
	Ring Type	SNAP	→		
	Mounting Type	STEM	→		
	Crystal Material	GLASS	→		
	Micrometer Zero Adjustment	YES	→		
	Safety Release Type				
MOVEMENT	Movement Material	STAINLESS			
	Guaranteed Accuracy	1%			
CHEMICAL SEAL	Body Material	CARBON STEEL			
	Diaphragm Material	316 STAINLESS			
	Fill Liquid / Cleanout Connection	SILICONE			
	Proc. Temp °C / AMB. Temp °C	100 °C			
	Process Connections Size & Type	1" FLE LAP JOINT			
	Manufacturer's Type & Model	MANSAND-GREEN SC			
REMARKS	Accessories & Special Features	PG4 TEL			
		PG7B 160#	PG7B-300#		
PURCH.	Manufacturer	ASHCROFT	→		
	*Catalog No.	10208	→		
	P.O. No.				
	Quantity Required				
	Price	$80.00	20.00		

V. DATE					
3	SPEC PREPARED	10-19-70	CR	4	
1				5	
2				6	

MONS 095538

SECT. 0202-03

Monsanto COMPANY	RECEIVER – CONTROLLER SPECIFICATION ELECTRONIC – PNEUMATIC	DIVISION	PLANT	SPEC NO. IS-2415-50
LOCATION		AUTH NO.	DEPT OR AREA	SHEET ___ OF ___ REV

Instrument No.			LI 116-2			LI 117-2			LI 118-2			LI 114-1				
Service			WASTE STORAGE			→			→			#2 FUEL OIL				
Location – Panel or Equipment No.			1-116			1-117			1-118			1-114				
RECEIVER	Record Indicate Control		INDICATE			→			→							
	*Number of Points		1			→			→							
	Chart	Size & Type														
		Range														
		Drive / Speed														
	Scale	Size & Type	4½"			→			→							
		Range	0-100 UN			→			→			0-20'				
	Ratio, Cascade, Computer – Set															
	Auto – Manual By Pass		YES	NO		YES	NO		YES	NO		YES	NO			
CONTROLLER	Location		INTEG.	REMOTE		INTEG.	REMOTE		INTEG.	REMOTE		INTEG.	REMOTE			
	Proportional Band %															
	Auto-Reset Mode		NO	SLOW	FAST	NO	SLOW	FAST	NO	SLOW	FAST	NO	SLOW	FAST		
	Rate Mode		YES	NO		YES	NO		YES	NO		YES	NO			
	On Measurement Increase Instrument Output		INC.	DEC		INC.	DEC		INC.	DEC		INC.	DEC			
SIGNALS	Measurement Input	Range & Units	3-15 PSIG			→			→							
		From	LT 116-2			LT 117-2			LT 118-2							
	Controller Output	Range & Units														
		To														
	Set Point	Range & Units														
		From														
	Power Supply – Electric, Pneumatic		PNEUM			→			→							
	Electrical Area Classification															
REMARKS	Accessories or Special Features															
PURCH.	Manufacturer		FOXBORO			→			→			VIPREC				
	*Receiver Catalog No.		MR-5			→			→			2500				
	*Controller Catalog No.	2415-9-														
	P.O. No.								EXIST?			EXIST				
	Price											—				

EV. DATE					
0	SPEC PREPARED	10-14-70	CL	4	
1				5	
2				6	
3				7	

MONS 095539

SECT. 0202-03

Monsanto COMPANY

LOCATION

INDICATING THERMOMETERS – THERMOWELL SPECIFICATIONS

DIVISION	PLANT	SPEC NO.
ORGANIC	WGK	IS-2415-51
AUTH NO.	DEPT OR AREA	SHEET / REV
2915	914.29	1 of

GENERAL NOTES:

	INSTRUMENT NOS.		
	TI 121-3	TI 116-1 TI 117-1 TI 118-1	TI 101-1
LOCATION	JUMP 1-124	1-116, 1-117,	TRAILER 180
THERMOMETER			
Type	MERCURY	BIMETHALLIC	→
Span & Units	0-240°C	0-250°F	→
Dial Size / Color	5in / WHITE	5" / WHITE	→ / →
Case Material	STAINLESS-GLASS		
Actuation			
3 → Connection Size & Type	WALL MOUNTED	ALL ANGLE	→
Stem Material	STAINLESS	→	→
Stem Position	ANY ANGLE	→	→
Stem Length	6" PLAIN w/ 15' OF CABLE	12"	→
WELL			
Well Material	BULB & CABLE	STAINLESS	→
Process Connection – Construction			
Process Connection – Size & Rating	½" DIAMETER	2" - 150#	1" NPT
Process Connection – Material	STAINLESS	CARBON STL	→
And 4 → Length Below Thread or Flange "U"		10"	→
Female Thread Size		2" - 150#	¾" NPT
Lagging Extension "T"		NONE	→
Plug & Chain Req'd / Material			
Stamping			
REMARKS			
	TG5 240°F	TG3 250°F	→
	BENDABLE STEM	TWT 12" - 2" FLGD	TWT 12" - ¾" NPT
	ARMOR BULB		
	WITH ARMORED		
	CABLE		
PURCH.			
2 3 Manufacturer	PALMER	ASHCROFT	→
*Catalog No.	50B	50-6060ENT	→
P.O. No. 2415-5-			
Quantity Required		3	1
Price	$ 78.00	$ 80.00	80.00

REV.	DATE				
1		SPEC PREPARED	11-9-70	CR	
2					
3					
4					

MONS 095540

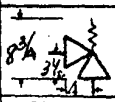
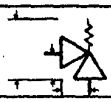
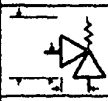
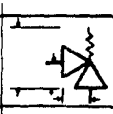
SECT. 0202-03

Monsanto COMPANY

LOCATION

*RELIEF VALVE SPECIFICATIONS

DIVISION	PLANT	SPEC NO.
ORGANIC	WGK	IS-2415-52
AUTH NO.	DEPT OR AREA	SHEET / REV
2415	914.24	1 OF

Instrument No.			PSV 104-1							
Service			RELIEF OF							
			FEED PRESSURE							
Equipment No. or Line No. & Size			1-104-2-F2C46							
Process Material			AROCLOR WASTE							
DESIGN	Source of Relieving Pressure		INCINERATOR FEED PUMP							
	Normal Operating Press. & Temp.		120PSIG-200°F							
	Specific Grav. (Air-Water = 1.0)	Molecular Weight	1.55							
	Super Compressibility Factor	Viscosity		8.6/38						
	CP/CV Nozzle Gas Constant									
	*Factory Set Pressure									
	Back Pressure	Constant	ATM							
		Developed								
	Pressure at which Valve Opens		150PSIG							
	Accumulation in %	PSIG	10	165						
	Total Relieving Press. (Incl. Accum) PSIG.		150 PSIG							
	Maximum Relieving Temperature									
	Equipment Design Pressure									
	Equipment Design Temperature									
	Code Reference									
	Capacity – Maximum Required		8 GPM							
	Capacity of Valve Selected		12.2 GPM							
	Orifice Area – Calculated	Selected	0.03	0.06						
CONSTRUCTION	*Connections	*In – Size, Rating, Style	1½"-150#							
		*Out – Size, Rating, Style	1"-150#							
	Materials Of Construction	Body / Bonnet	STEEL	STEEL						
		Trim–Nozzle & Disc. / Other Parts		VITON						
		Spring	CARBON STEEL							
	Details Of Manufacture	Type Lifting Gear								
		Pressure Balanced								
		Code Stamp Req.	~~YES~~	NO	YES	NO	YES	NO	YES	NO
	Calculation Sheet No.		FARRIS SELECT OUT							
REMARKS	Accessories & Special Features									
DIMENSIONS										
PURCH.	Manufacturer		FARRIS							
	*Catalog No.		2750 FORGED							
	P.O. No.	2415-7-								
	Price		100#							

REV. DATE					
0	SPEC PREPARED	10-8-70	CR	4	
1				5	
2				6	
3				7	

MONS 095541

Monsanto	INSTRUMENT ACCESSORIES	AUTH NO. 2415	SPEC NO. IS-2415-55	SECT. 0202-03
LOCATION	PROJ/DEPT ARDOLOK WASTE DISPOSAL PLANT WSK	ISSUED BY CREPPER	DATE 10-8-70	APPD / REV NO. / DATE

FLAME ARRESTER

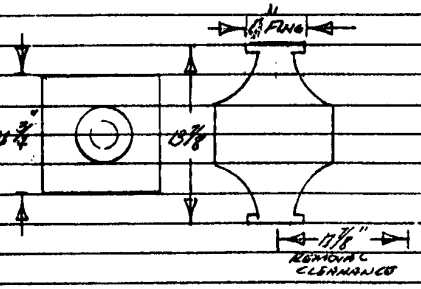
TAG NO: 2415-XE116-3
-XE117-3
-XE118-3

3 INCH FLANGED CONNECTIONS

MTL: ALL CAST IRON

MFG PREFERRED: VAREC
MODEL 50SG
WITH CONSERVATION VENT SERIES 482

PRESSURE SETTING = 2 oz./in²
VACUUM SETTING = 1 oz./in²



MONS 095542

PO # 2415-9-
SPEC PREPARED 10-12-70 CR

J.Z. SPEC.110-B

SECT. 0203-00

J.Z. SPECIFICATION
FOR
FIREBRICK LINING
(2½" OR 6 " THICKNESS)

FIREBRICK LINING
FOR
CYLINDRICAL VESSELS

JOHN ZINK COMPANY
TULSA, OKLA.

MONS 095543

SECT. 0203-00

I GENERAL

A SCOPE

1 THIS SPECIFICATION IS FOR FIRE BRICK LAID UP IN MORTAR. IT COVERS:

A THE APPLICATION AND CURING OF THE REFRACTORY BY APPLYING CONTRACTOR. (SECTION II).

B THE DRYING OUT PROCEDURE BY OPERATING STAFF. (SECTION III).

C SUBSTITUTION OF MATERIAL. (SECTION IV).

II APPLICATION AD CURING OF THE REFRACTORY

A MATERIALS

* 1 Fire Brick

* 2 A. P. GREEN Mortar or equal

3 WATER SUITABLE FOR DRINKING, UNLESS IT IS KNOWN BY TEST OR EXPERIENCE THAT IT IS SATISFACTORY.

4 SUITABLE CASTABLE MIX FOR THE OPERATING TEMPERATURE.

B PREPARATION

1 ALL SURFACES SHOULD BE CLEANED OF FOREIGN MATERIAL.

2 NOZZLE EXTENSIONS, SLEEVE LINERS AND OTHER ITEMS WITHIN THE LIMITS OF THE LINING, SHALL BE WRAPPED WITH TWO LAYERS OF EXPANSION MATERIAL.

3 ALL OPENINGS IN THE VESSEL SHALL BE CLOSED BY MEANS OF HARDWOOD OR METAL JACKETED PLUGS, SLIGHTLY TAPERED, AND OF SUCH DIMENSIONS THAT THEY WILL EXTEND BEYOND THE FINISHED SURFACE OF THE LINING AND FIT SNUGLY INTO THE OPENINGS. THEY SHALL BE LIGHTLY COATED WITH GREASE OR TAR. WHERE FEASIBLE, THE OPENINGS MAY BE COVERED WITH PLATE HELD IN POSITION BY LIGHT TACK WELDS.

C APPLICATION

1 PRECAUTIONS

A DURING COLD WEATHER, THE BRICK AND THE SURFACE TO WHICH IT IS APPLIED, SHALL BE KEPT AT A TEMPERATURE ABOVE 40° F DURING APPLICATION AND FOR AT LEAST 48 HOURS THEREAFTER. IF REQUIRED, SUITABLE MEANS FOR HEATING SHALL BE PROVIDED; HOWEVER, LIVE STEAM SHALL NOT BE USED FOR THIS PURPOSE.

* Revised II. A. 1 & II. A. 2, A.K.R., 6/15/70

B ALL TOOLS USED IN MIXING AND APPLYING SHALL BE KEPT CLEAN AND FREE OF SUCH SUBSTANCES AS MAY COLLECT THEREON DURING APPLICATION.

2 MIXING

A THE MORTAR SHOULD BE THOROUGHLY MIXED WITH WATER TO THE CONSISTENCY OF THICK CREAM. THE MIXING SHOULD BE DONE WITH A POWER MIXER.

WHEN PROPERLY MIXED, A NEW FIRE BRICK WILL FLOAT WITH THREE QUARTERS OF ITS THICKNESS OUT OF THE MIXTURE.

3 PLACEMENT

A ONLY QUALIFIED PERSONNEL THOROUGHLY FAMILIAR AND EXPERIENCED WITH BRICK REFRACTORIES, SHALL BE EMPLOYED FOR THIS WORK.

B LAY TWO ROWS OF FIRE BRICK TO THE DIMENSION SPECIFIED ON THE JOB DRAWING, LEAVING AN ANNULUS BETWEEN THE BRICK AND THE VESSEL SHELL. FILL THIS ANNULUS WITH CASTABLE WITHIN 2" OF THE TOP OF THE BRICK AND TAMP CASTABLE WITH A 1" X 2" BOARD TO PREVENT AIR POCKETS. LAY TWO MORE ROWS OF BRICK AND FOLLOW WITH THE CASTABLE. CONTINUE THIS PROCEDURE UNTIL THE SECTION IS LINED. ONE SIDE AND ONE END OF THE BRICK SHOULD BE DIPPED IN THE SAIRSET. THEN RAP THE BRICK WITH A BRICK HAMMER TO SECURE A BRICK JOINT NOT TO EXCEED 1/16", PREFERABLY LESS.

C ALL NOZZLES AND SLEEVES ARE TO BE GROUTED WITH SUITABLE CASTABLE MIX FOR THE TEMPERATURE SERVICE.

D SPECIAL ARCH BRICK ARE SUPPLIED TO FORM THE BURNER OPENINGS.

4 INTERRUPTION OF APPLICATION

A. DURING PERIODS OF INTERRUPTION OF APPLICATION, ALWAYS REMOVE EXCESS MORTAR ON EXPOSED SURFACE TO PREVENT UNEVEN JOINTS.

5 CURING

A THE LINING SHALL BE AIR CURED ONLY DURING PRELIMINARY CURE.

B ONCE STARTED, THE AIR CURING SHALL BE CONTINUED WITHOUT INTERRUPTION FOR AT LEAST 24 HOURS AFTER THE LAST PORTION OF THE LINING HAS BEEN APPLIED.

III DRYING OUT

A PROCEDURE

1 FOLLOWING THE ATMOSPHERIC DRYING PERIOD, THE LINING SHALL BE FURTHER DRIED BY RAISING THE TEMPERATURE WITHIN THE VESSEL TO 300° F OVER A PERIOD OF ONE HOUR. HOLD THIS TEMPERATURE FOR SIX HOURS. THEN RAISE THE TEMPERATURE, WITHIN THE VESSEL, 50° F PER HOUR UNTIL IT REACHES 1000° F. HOLD THIS TEMPERATURE FOR TEN HOURS. THEREAFTER, THE TEMPERATURE MAY BE RAISED OR LOWERED, WITHIN THE LIMITS OF THE NORMAL OPERATING RANGE, FURTHER HEAT UP OR COOL DOWN, SHOULD BE DONE AT THE RATE OF 200° F PER HOUR.

IV SUBSTITUTION OF MATERIALS

A THIS SPECIFICATION IS BASED ON THE USE OF MATERIALS THAT ARE READILY AVAILABLE IN THE UNITED STATES.

B IT IS APPRECIATED THAT MATERIALS SPECIFIED HEREIN ARE NOT ALWAYS OBTAINABLE OUTSIDE OF THE UNITED STATES AND QUITE OFTEN CANNOT BE PROCURED WITHOUT UNDUE COST AND DELAY.

C IN SUCH CASES, IT MAY BE FOUND ADVANTAGEOUS TO SUBSTITUTE REFRACTORIES FROM LOCAL SOURCES. HOWEVER, BEFORE PROCEEDING ON THIS BASIS, THE CONTRACTOR SHALL SUBMIT TO JOHN ZINK COMPANY FOR APPROVAL OR COMMENTS, COMPLETE INFORMATION AS TO THE PROPERTIES OF THE PROPOSED SUBSTITUTION, INCLUDING:

1 SETTING TIME

2 MAXIMUM SERVICEABLE TEMPERATURE

3 DRIED DENSITY

4 FIRED DENSITY*

5 THERMAL CONDUCTIVITY*

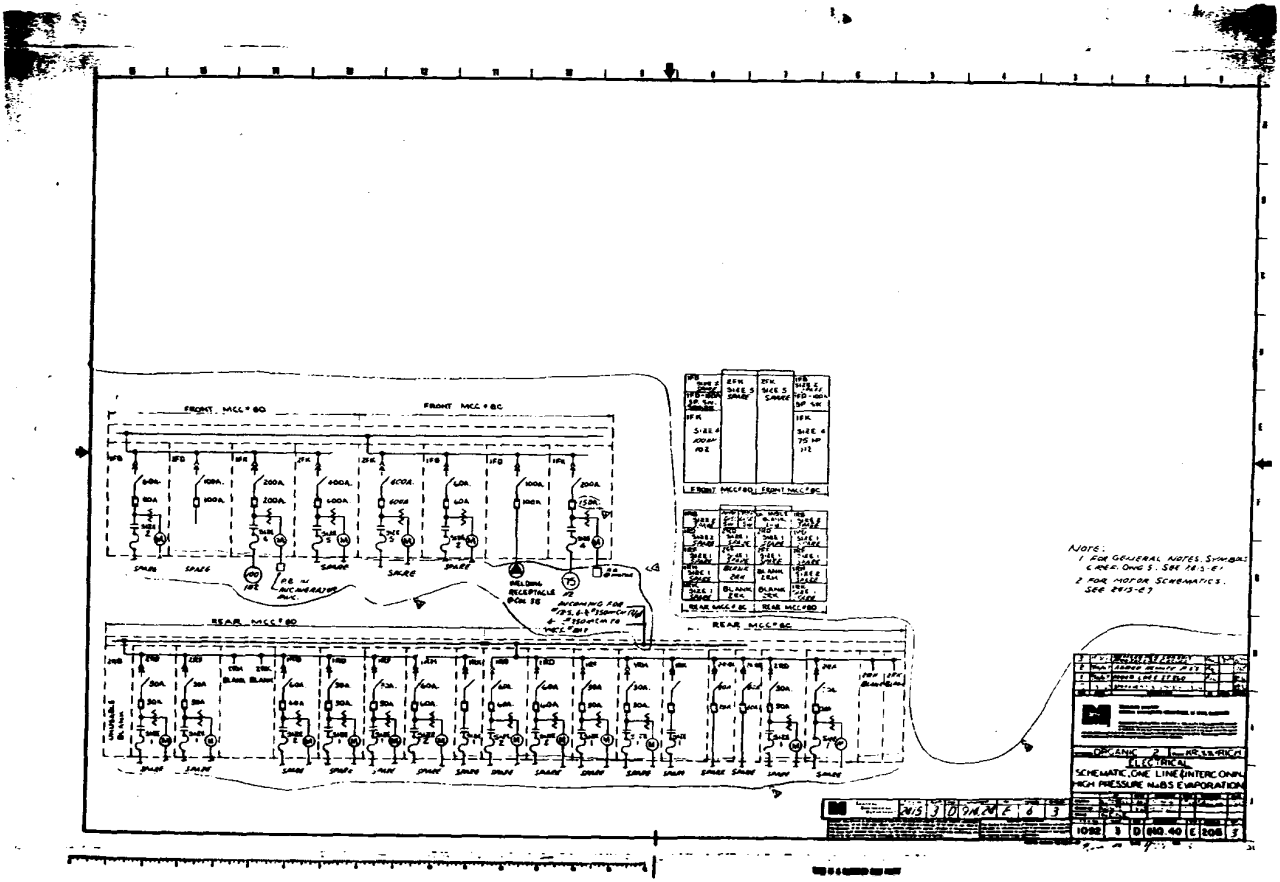
6 CRUSHING STRENGTH (FIRED)*

7 PER CENT LINEAR CHANGE (FIRED)*

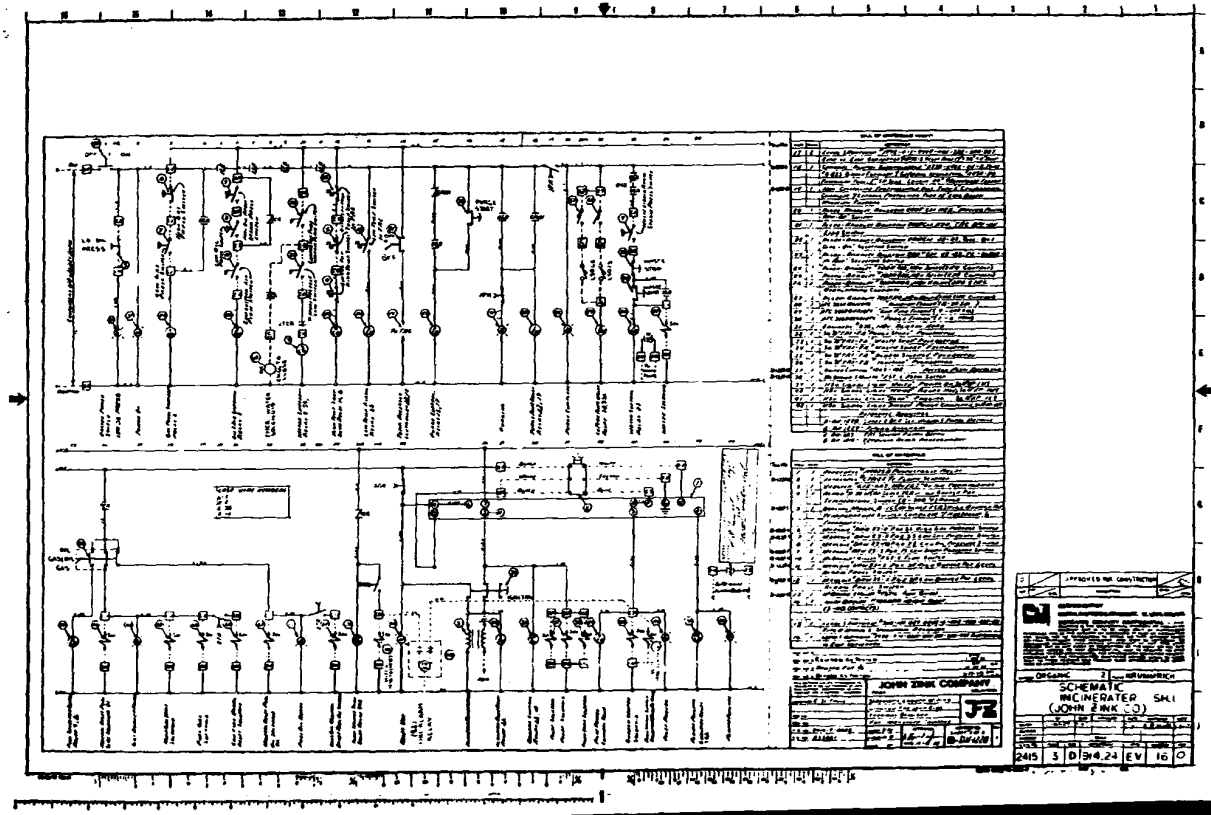
*STATE TEMPERATURE AT WHICH TEST IS MADE.

D CONTRACTOR SHALL ALSO FURNISH JOHN ZINK COMPANY WITH INFORMATION AS TO WHERE AND LENGTH OF TIME THAT THE PROPOSED SUBSTITUTE MATERIALS HAVE BEEN USED IN SIMILAR SERVICE.

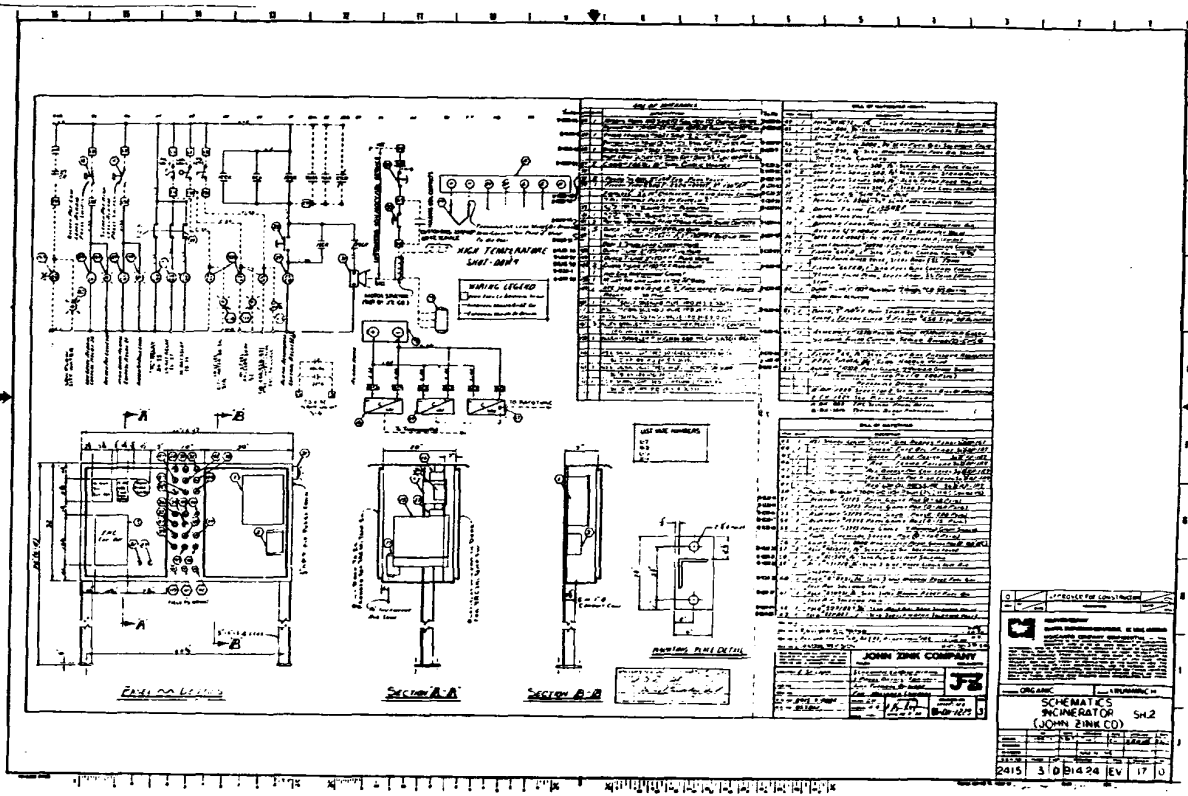
MONS 095547


FRONT MCC #80
REAR MCC #80
NOTES:
1 FOR GENERAL NOTES, SYMBOLS & ABBR. SEE 785-E1
2 FOR MOTOR SCHEMATICS, SEE 893-E7
ELECTRICAL
SCHEMATIC, ONE LINE & INTERCONN.
HIGH PRESSURE N.BS EVAPORATION

MONS 095548



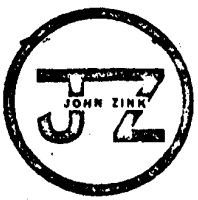
MONS 095549


HIGH TEMPERATURE SHUT-DOWN
WIRING LEGEND
JOHN ZINK COMPANY
SCHEMATICS INCINERATOR (JOHN ZINK CO)
SH.2

J Z SPEC. 122
SECT. 0203-00

J.Z. SPECIFICATION
FOR
MONOLITHIC LINING
(3½" THRU 6" THICKNESS)

GREENCRETE "C" CASTABLE
FOR
CYLINDRICAL VESSELS



JOHN ZINK COMPANY
TULSA, OKLA.

MONS 095550

SECT. 0203-00

I GENERAL

A SCOPE

1 THIS SPECIFICATION IS FOR PNEUMATICALLY APPLIED GREENCRETE "C" LINING FOR CYLINDRICAL VESSELS. IT COVERS:

a THE INSTALLATION OF ANCHORS (SECTION II).

b THE APPLICATION AND CURING OF THE CASTABLE BY APPLYING CONTRACTOR (SECTION III).

c THE DRYING OUT PROCEDURE BY OPERATING STAFF (SECTION IV).

d SUBSTITUTION OF MATERIALS (SECTION V).

II INSTALLATION OF ANCHORS

A MATERIALS

1 ANCHORS OF NO. 8 GAUGE GATEWAY ERECTOR ANCHOR OR EQUAL (INDIVIDUAL) AS SHOWN IN FIGURE 120-1. ANCHOR SHALL BE 316 STAINLESS STEEL UNLESS SPECIFIED ELSEWHERE, IN WHICH CASE, THEY SHALL BE COLD DRAWN TYPE 304 STAINLESS.

2 COVERED WELDING ELECTRODES IN ACCORDANCE WITH THE LATEST EDITION OF JOINT SPECIFICATIONS AWS A51, ASTE A 233, INCO-WELD A, TYPE 310 (25 - 20) OR TYPE 309 (25 - 12) IN ORDER OF PREFERENCE FOR USE WITH ALLOY ANCHORS.

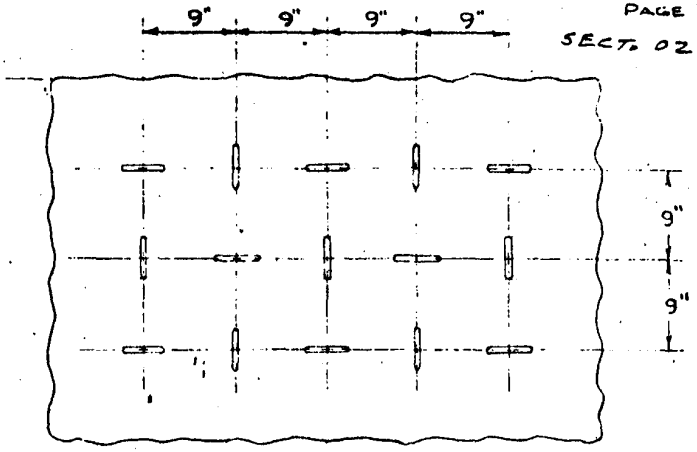
B INSTALLATION

1 WELD THE LINING ANCHORS TO THE WALL OF THE VESSEL AS ILLUSTRATED ON PAGE 2.

2 PREPARE THE SURFACE FOR THE LINING BY REMOVING ALL LOOSE SCALE OR OTHER FOREIGN MATERIALS. POWER BRUSHING FOLLOWED BY AIR JET CLEANING IS RECOMMENDED. SANDBLASTING MAY BE SUBSTITUTED.

3 AFTER THESE STEPS HAVE BEEN COMPLETED, THE SURFACE SHALL BE INSPECTED FOR CLEANLINESS.

4 NOTE: THE ABOVE SEQUENCE IS FOR NEW CONSTRUCTION. IN THE CASE OF LINING REPLACEMENT, IN WHOLE OR PART, SANDBLASTING SHALL BE PERFORMED PRIOR TO INSTALLATION OF THE ANCHORS.



LINING ANCHOR SPACING AND ARRANGEMENT

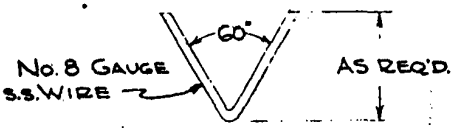
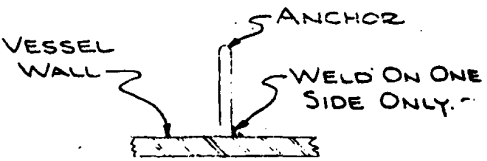
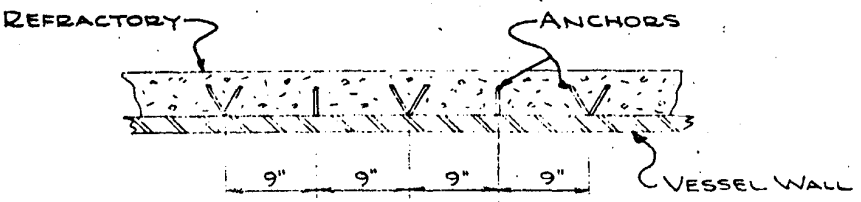


FIG. 120-1 ANCHOR



ANCHOR WELDING



SECTION

III APPLICATION AND CURING OF REFRACTORY

A MATERIALS

1 GREENCRETE "C" – PACKED IN BAGS CONTAINING 100# NET WEIGHT.

2 WATER SUITABLE FOR DRINKING, UNLESS IT IS KNOWN BY TEST OR EXPERIENCE THAT IT IS SATISFACTORY.

B PREPARATION

1 NOZZLE EXTENSIONS, SLEEVE LINERS AND OTHER ITEMS WITHIN THE LIMITS OF THE LINING, SHALL BE WRAPPED WITH TWO LAYERS OF EXPANSION MATERIALS TO PREVENT THE REFRACTORY FROM BECOMING BONDED TO THEM. THIS IS TO PERMIT SUCH MEMBERS TO EXPAND FREELY WITHOUT RUPTURING THE LINING.

2 ALL OPENINGS IN THE VESSEL SHALL BE CLOSED BY MEANS OF HARDWOOD OR METAL JACKETED PLUGS, SLIGHTLY TAPERED, AND OF SUCH DIMENSION THAT THEY WILL EXTEND BEYOND THE FINISHED SURFACE OF THE LINING AND FIT SNUGLY INTO THE OPENINGS. THEY SHALL BE LIGHTLY COATED WITH HEAVY GREASE OR TAR TO PREVENT BONDING AND SHALL NOT BE REMOVED FROM THE OPENINGS OR DISTURBED UNTIL THE REFRACTORY HAS DEVELOPED ITS FINAL SET. WHERE FEASIBLE, THE OPENINGS MAY BE COVERED WITH PLATE HELD IN POSITION BY LIGHT TACK WELDS.

C APPLICATION

1 PRECAUTION

A DURING COLD WEATHER, THE REFRACTORY AND THE SURFACE TO WHICH IT IS APPLIED, SHALL BE KEPT AT A TEMPERATURE ABOVE 60° F DURING APPLICATION AND FOR AT LEAST 72 HOURS THEREAFTER. IF REQUIRED, SUITABLE MEANS FOR HEATING SHALL BE PROVIDED; HOWEVER, LIVE STEAM SHALL NOT BE USED FOR THIS PURPOSE.

B DURING HOT, SUNNY WEATHER, THE REFRACTORY MATERIALS SHALL BE STORED IN A SHADY PLACE UNTIL USED, AND THE EXTERIOR SURFACE OF THE VESSEL SHALL BE EITHER SHADED OR COOLED BY SPRAYING WITH WATER WHILE THE REFRACTORY IS BEING APPLIED AND DURING THE CURING PERIOD.

C DO NOT ADD OTHER CEMENTS, LIME, ETC., TO THE MIXTURE. ALL TOOLS USED IN MIXING AND APPLYING SHALL BE KEPT CLEAN AND FREE OF SUCH SUBSTANCE AS MAY COLLECT DURING APPLICATION.

2 PROPORTIONS

A THE PROPORTIONS SHALL BE AS FOLLOWS:

GREENCRETE "C" – 100# (ONE BAG)
WATER PER MACHINE MANUFACTURER'S RECOMMENDATIONS.

3 MIXING

A FOR DRY GUN APPLICATION, THOROUGHLY MIX THE GUN MIX IN A DRUM TYPE CONCRETE MIXER, OR PREFERABLY, A REVOLVING BLADE TYPE MORTAR MIXER BEFORE CHARGING THE HOPPER. PREDAMPENING WATER OF AT LEAST ONE QUART PER 100 POUNDS SHOULD BE USED.

B FOR WET GUN APPLICATION, THE GUN MIX IS CHARGED WITHOUT PRE-MIXING DIRECTLY TO THE MACHINE WITH THE REQUIRED AMOUNT OF WATER.

4 A APPLICATION SHALL BE MADE BY PNEUMATICALLY OPERATED EQUIPMENT, THE SIZE, SPECIFICATIONS AND OPERATING PROCEDURE OF WHICH SHALL BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE SUPPLIER OF THIS EQUIPMENT.

B ONLY QUALIFIED PERSONNEL THOROUGHLY FAMILIAR AND EXPERIENCED WITH PNEUMATIC APPLICATION OF INSULATING REFRACTORY SHALL BE EMPLOYED FOR THIS WORK.

C THE COMPRESSED AIR AND WATER SHALL BE SUPPLIED AT A STEADY PRESSURE.

D THE MIX SHALL BE APPLIED IN HORIZONTAL, NARROW BANDS, WORKING UPWARD FROM THE BOTTOM OF THE SECTION TO BE LINED. THE FULL FINAL THICKNESS SHALL BE DEVELOPED IN ONE BAND BEFORE PROCEEDING TO THE NEXT ONE.

IT IS IMPORTANT THAT THE BOTTOM OF EACH SUCCESSIVE BAND BE SECURELY BONDED TO THE TOP OF THE PRECEDING ONE BEFORE THE LATTER HAS DEVELOPED ITS INITIAL SET. THEREFORE, THE HEIGHT OF THE BANDS WILL BE GOVERNED BY THE DIAMETER OF THE VESSEL AND BY ATMOSPHERIC CONDITIONS.

A GENERAL RULE IN THIS REGARD IS THAT A BAND SHALL BE COMPLETED IN ABOUT FOUR HOURS. IN LARGE DIAMETER VESSELS THIS MAY REQUIRE TWO CREWS OPERATING SIMULTANEOUSLY. THE CONTRACTOR APPLYING THE LINING SHALL TAKE SPECIAL NOTE OF THIS REQUIREMENT.

E SCREED THE REFRACTORY TO THE FINAL REQUIRED THICKNESS. THIS OPERATION SHALL BE PERFORMED DIRECTLY AFTER APPLICATION AND ANY DEFICIENCIES SHALL BE IMMEDIATELY CORRECTED. THIS SCREEDED FINISH IS ALL THAT IS REQUIRED. SMOOTHING, FLOATING OR TROWELING SHALL BE AVOIDED.

F NO REBOUND MATERIAL SHALL BE ALLOWED TO ACCUMULATE ON THE COMPLETED LINING.

G UNDER NO CIRCUMSTANCES WATSOEVER, SHALL ANY REBOUND MATERIAL BE REUSED.

5 INTERRUPTION OF APPLICATION

A WHEN THE APPLICATION IS INTERRUPTED BEFORE COMPLETION OF THE ENTIRE LINING, THE CONCRETE SHALL BE CUT BACK IMMEDIATELY TO THE VESSEL WALL WITH A STEEL TROWEL. THIS CUT SHALL BE MADE AT A RIGHT ANGLE TO THE WALL OF THE VESSEL, AND SHALL BE MADE AT LOCATIONS WHERE THE FULL FINAL THICKNESS HAS ALREADY BEEN APPLIED. ALL MATERIAL BEYOND THE CUT SHALL BE DISCARDED.

B DURING THE PERIOD OF INTERRUPTION IN APPLICATION, THE WATER CURING SCHEDULE FOR THE CONCRETE ALREADY APPLIED SHALL BE STRICTLY FOLLOWED IN ACCORDANCE WITH ITEM 6 OF THIS SECTION.

C IMMEDIATELY PRIOR TO RESUMING APPLICATION, THE EXPOSED SURFACES OF THE CONCRETE TO WHICH A BOND MUST BE MADE SHALL BE THOROUGHLY WETTED.

6 CURING

A THE LINING SHALL BE CURED BY BEING KEPT MOIST DURING ITS PERIOD OF HARDENING. THE CURING SHALL CONSIST OF LIGHT APPLICATIONS OF CLEAN, COOL WATER AND SHALL BE STARTED AS SOON AS THE EXPOSED SURFACE IS HARD ENOUGH TO PERMIT SPRAYING WITHOUT WASHING OUT THE CEMENT. CARE MUST BE EXERCISED IN AVOIDING A STREAM OF WATER THAT IS TOO HARSH. THE SPRINKLING SHALL CONSIST MERELY OF A FINE MIST.

B DURING HOT, DRY WEATHER IT MAY BE FOUND NECESSARY TO START SPRAYING THREE OR FOUR HOURS AFTER THE LINING HAS BEEN APPLIED. AT NO TIME DURING THE CURING PERIOD SHALL THE INTERVALS BETWEEN SPRAYING BE GREATER THAN 30 MINUTES.

AN INEXPENSIVE LATEX PAINT MAY BE APPLIED TO THE NEA REFRACTORY TO INHIBIT DRYING OUT. THIS WILL REPLACE "A" AND "B" ABOVE.

C ONCE STARTED, THE CURING SHALL BE CONTINUED WITHOUT INTERRUPTION FOR AT LEAST 24 HOURS AFTER THE LAST PORTION OF THE LINING HAS BEEN APPLIED.

7 POINTING UP

A IF ANY POINTING UP IS REQUIRED, IT SHALL BE DONE IMMEDIATELY AFTER THE CURING PERIOD WHILE THE SURFACES ARE STILL MOIST.

B MORTAR FOR POINTING UP SHALL BE OF THE SAME MIX AS USED IN THE ORIGINAL APPLICATION.

C SUFFICIENT WATER SHALL BE ADDED TO GIVE THE MIXTURE THE DESIRED CONSISTENCY.

D BATCHES SHALL BE IN AMOUNTS THAT CAN BE APPLIED WITHIN A PERIOD OF 20 MINUTES. DO NOT USE MORTAR THAT HAS TAKEN AN INITIAL SET.

IV DRYING-OUT

A PROCEDURE

1 AFTER THE WATER CURING HAS BEEN COMPLETED, THE LINING SHALL BE ALLOWED TO DRY UNDER ORDINARY ATMOSPHERIC CONDITIONS FOR AS LONG AS POSSIBLE, BUT NOT LESS THAN 24 HOURS.

2 FOLLOWING THE ATMOSPHERIC DRYING PERIOD, THE LINING SHALL BE FURTHER DRIED BY RAISING THE TEMPERATURE WITHIN THE VESSEL TO 300° F OVER A PERIOD OF ONE HOUR. HOLD THIS TEMPERATURE FOR SIX HOURS. THEN RAISE THE TEMPERATURE WITHIN THE VESSEL 50° F PER HOUR UNTIL IT REACHES 1000° F. HOLD THIS TEMPERATURE FOR TEN HOURS. THEREAFTER, THE TEMPERATURE MAY BE RAISED OR LOWERED, WITHIN THE LIMITS OF THE NORMAL OPERATING RANGE. FURTHER HEAT UP OR COOL DOWN SHOULD BE DONE AT THE RATE OF 200° F PER HOUR.

V SUBSTITUTION OF MATERIALS

A THE SPECIFICATION IS BASED ON THE USE OF MATERIALS THAT ARE READILY AVAILABLE IN THE UNITED STATES.

B IT IS APPRECIATED THAT MATERIALS SPECIFIED HEREIN ARE NOT ALWAYS OBTAINABLE OUTSIDE OF THE UNITED STATES AND QUITE OFTEN CANNOT BE PROCURED WITHOUT UNDUE COST AND DELAY.

C IN SUCH CASES, IT MAY BE FOUND ADVANTAGEOUS TO SUBSTITUTE MIXES FROM LOCAL SOURCES. HOWEVER, BEFORE PROCEEDING ON THIS BASIS, THE CONTRACTOR SHALL SUBMIT TO JOHN ZINK COMPANY FOR APPROVAL OR COMMENTS, COMPLETE INFORMATION AS TO THE PROPERTIES OF THE PROPOSED SUBSTITUTION, INCLUDING:

1 SETTING TIME
2 MAXIMUM SERVICEABLE TEMPERATURE
3 DRIED DENSITY
4 FIRED DENSITY*
5 THERMAL CONDUCTIVITY*
6 CRUSHING STRENGTH (FIRED)*
7 PER CENT LINEAR CHANGE (FIRED)*

*STATE TEMPERATURE AT WHICH TEST IS MADE.

D CONTRACTOR SHALL ALSO FURNISH JOHN ZINK COMPANY WITH INFORMATION AS TO WHERE AND LENGTH OF TIME THAT THE PROPOSED SUBSTITUTE MATERIALS HAVE BEEN USED IN SIMILAR SERVICE.

SECT. 0211-03

Monsanto STANDARDS — TENTATIVE

PIPING MANUAL
PIPING SYSTEM SPECIFICATIONS
125 LB STEEL CLASS C GENERAL SERVICE
Threaded & Buttweld – Threaded Brass & Flanged IBBM Valves – 350 F

MAN. SECT PART	
P2.2 STD F1C1	
ISSUE 1	DATE 8/69
PAGE 1	OF 2

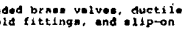
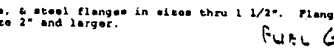
This standard has been changed in the area(s) marked. CED Material Control System. It has been judged essential for initial use by a select review panel. It will be submitted for comprehensive review on an early date.

1. APPLICATION: This specification is intended for use in Class C fluid services (see P2.1 STD 1). Fluids must be non-corrosive and not sensitive to copper.
1.1 Service Range: See Figure 1 & Table I.
1.2 Use Limitations: System is limited by the Teflon seat ball valve, & Teflon trim brass globe valve. When Teflon trim valves are omitted from system, the cast iron valves limit the system to 400 F max.

2. CONSTRUCTION: Threaded brass valves, ductile iron fittings, & steel flanges in sizes thru 1 1/2". Flanged cast iron valves, buttweld fittings, and slip-on flanges in size 2" and larger.

FUEL GAS

3. PIPING COMPONENTS:

	NOMINAL PIPE SIZE	½	¾	1	1¼	2	3	4	6	8	10	12	14	16	18	20	24	Over 30
PIPE	PIPE: SCH OR WEIGHT; MATERIAL ASTM SPECIFICATION	Sch 80;carbon steel A106 Grade B				Sch 40; CS A53 Type S Grade B				Sch 20;CS			Sch 10;carbon steel					
	NIPPLE: SCHEDULE AND SPEC	Sch 80;CS, A106 Gr B																
FITTINGS	FITTINGS: RATING; MATERIAL SPECIFICATION; DIMENSIONS	3001b;ductile iron, A445;B16.3			thrd	Sch 40;CS, BW A234 Grade WPB; B16.9				Sch 20;CS, BW			Sch 10;CS BW					
	STUDS/NOR: SCHEDULE; TYPE SPECIFICATION																	
	COUPLINGS: RATING; MATERIAL ASTM SPECIFICATION	3000lbFCS, thrd A181 Gr I																
	OUTLETS: RATING, MATERIAL ASTM SPECIFICATION	Std wt;forged CS, thrd A105 Gr II				Std wt;forged CS, buttwelded A105 Gr II												
	USE THESE RUN SIZES	Do not use				Use as shown in Table IB or for thermowell connections												
	BRANCH CONSTRUCTION	THREADED TEES 				USE TABLE IA BRANCH CONSTRUCTION UNLESS DESIGN PRESSURE EXCEEDS ALLOWABLE PRESSURE SHOWN. FOR ANY SUCH BRANCHES USE FULL STRENGTH CONSTRUCTION TABLE IB. 											
JOINTS	UNIONS: RATING; MATERIAL ASTM SPECIFICATION	3001b;MI, thrd A197;all iron trim																
	FLANGES: RATING, MATERIAL ASTM SPEC; USAS DIMENSIONS FACING	150lb;forged CS, thrd A181 Gr I;B16.5 1/16" raised face				150lb;forged CS,slip-on A181 Gr I;B16.5 1/16" raised face												
	BOLTING: MATERIAL AND SPEC	A307 Gr B heavy hex bolts with heavy hex nuts																
	GASKETS: MATERIAL AND DIM	1/8" thick compressed asbestos, graphited, flat ring; Garlock 7021 (typical)																
FIELD	ELECTRODES: SAME COATED	A559 Class E60R-2 A233 E60 series																
MISC. CONN	PRESSURE – CONNECTION – VALVE	Det P1 1/2" BL107		3/4"BL107		Det P5												
	VENT –	Det V1				Det V21; 3/4" BA1												
	DRAIN – CONNECTION – VALVE	Det D17 1/2" BA1				Det D21 1" BA1				1 1/2" BA			2" BA1					
	TEMPERATURE – TW CONNECTION	Det T1, T25				3.25 T11, T25			T11, T29, T33									
VALVES	GATE	BA1 150lb thrd (400 F max)				RN46 125lb flg FF (400 F max) (48" max size)											not for steam or condensate. 150 F max temperature.	
	GLOBE	BB17 150lb thrd (350 F max)				RB41/BA1 125lb flg FF (400 F max)												
	CHECK: SWING (VERTICAL OR HOR USE)	BC1 200lb thrd (500 F max)				RC41 125lb flg FF (400 F max) (30" max size)											not for steam or condensate. 150 F max temperature.	
	CHECK: LIFT (HORIZONTAL USE)	BC1 150lb thrd (400 F max)																
	BALL	BF12 200lb thrd (350 F max)				BF12 150lb flg RF (400 F max)												

4. SERVICE RESTRICTIONS: See Figure 1 page 2 for pressure-temperature limits. See also the fluid directory for service temperature and other limits applicable to specific fluids.
4.1 Water and Air: Water service is restricted to the area to the left of the steam vapor pressure curve in Figure 1. Air should preferably be limited to 125 psig max.
4.2 Steam and Condensate: Steam is limited to 125 psig max saturated or superheated to not over 400 F. Condensate should be limited to 125 psig max.

5. DESIGN AND CONSTRUCTION FEATURES:
5.1 Bends: Standard bends are not required for threaded or buttwelded construction. Field cold bending of pipe is permissible. Facilities for bending must be verified by the Project Engineer on each project. Bends and fitting required must be shown on each drawing.
5.2 Flanges: Use weld neck flanges adjacent to buttweld fittings only.
5.3 Vents: Vents are not required on air lines.
5.4 Pipe Layout and Design: See P1.2 STD 2.
5.5 Steam Mains: All branches take-off top of steam main. Drip pockets with steam traps shall be provided every 1000 feet and at the bottom of risers.
5.6 Thread Lubricant: For threaded piping joints use Teflon Thread sealing and lubricating compound. Do not backweld Teflon lubricated joints. For bolt threads use "Molykote Type U" or equal.
5.7 Stress Analysis: Not normally required up to 350 F except where the configuration suggests overstress.
5.8 Construction: See P3.2

* The details for these connections are found in P6.5.

SOURCE CEA 0519; Valves: P4.2 STDS 6.8. & 9; Pipe & Fitting: P3.1 Stds. F1 & F41.

MONS 095557

SECT. 0211-03

Monsanto STANDARDS — TENTATIVE

PIPING MANUAL
PIPING SYSTEM SPECIFICATIONS
150 LB STEEL CLASS C GENERAL SERVICE
Threaded, Mach. Flared & Buttweld – Threaded Brass & Flanged Steel Valves – 350 F

MAN. SECT PART			
P2.2 STD F2C2			
ISSUE 1	DATE 8/69		
PAGE 1	OF 2		

This standard has been adopted as the requirements of the CED Material Control System. It has been judged suitable for mill use by a select review panel. It will be enhanced by engineering review as use is daily done.

1. APPLICATION: This specification is intended for use in Class C fluid services (see P2.1 STD 1). Fluids must be non-corrosive and not sensitive to copper.
1.1 Service Range: See Figure 1 & Table 1.
1.2 Use Limitations: System is limited by the Teflon sleeve plug, and the Teflon seat ball valve. When Teflon trim valves are omitted from system, the piping components limit the system to 500 F max.

2. CONSTRUCTION: Threaded brass valves, ductile iron fittings in sizes thru 1 1/2". Flanged steel valves, buttweld fittings 2" and larger. Formed-on-pipe laps with slip-on back-up flanges in sizes 2" thru 4". Threaded flanges thru 1 1/2" and slip-on flanges 6" and over.

STM. – GCDND.
C.W. –

	NOMINAL PIPE SIZE	¼	⅜	1	1¼	2	3	4	6	8	10	12	14	16	18	20	24	Over 24
PIPE	PIPE: SCH OR WEIGHT; MATERIAL ASTM SPECIFICATION	Sch 80;carbon steel A106 Gr B				Sch 40; CS A587; BRW			A53 Type S Grade B				Sch 20; CS			Sch 10; carbon steel		
	NIPPLES: SCHEDULE AND SPEC	Sch 80;CS, A106 Gr B																
FITTINGS	FITTINGS: RATING; MATERIAL SPECIFICATION; DIMENSIONS	3001b;ductile iron, thrd A445; B16.3				Sch 40;CS; BW A234 Gr WPB;B16.9				Sch 20;CS	BW		Sch 10;CS	BW				
	STUB ENDS: SCHEDULE; TYPE SPECIFICATION																	
	COUPLINGS: RATING; MATERIAL ASTM SPECIFICATION	3000lLFCS, thrd A181 Gr I																
	OUTLETS: RATING; MATERIAL ASTM SPECIFICATION	Std wt;forged CS, thrd A105 Gr I				Std wt; forged CS, buttwelded A105 Gr I												
	USE THESE RUN SIZES	DO not use				Use as shown in Table IB or for thermowell connections												
	BRANCH CONSTRUCTION	THREADED TEES: FULL, YY, REDUCED				USE TABLE 1A BRANCH CONSTRUCTION UNLESS DESIGN PRESSURE EXCEEDS ALLOWABLE PRESSURE SHOWN. FOR ANY SUCH BRANCHES USE FULL STRENGTH CONSTRUCTION TABLE 1B. TO, TC, S, R, WT, WO												
PAINT JOINTS	UNIONS: RATING; MATERIAL ASTM SPECIFICATION	3000lb;MI, thrd A197; all iron trim																
	FLANGES: RATING; MATERIAL ASTM SPEC; USAS DIMENSIONS FACING					150lb;forged CS, thrd A181 Gr I; B16.5 1/16" raised face				150lb;forged CS, slip-on A181 Gr I;B16.5 1/16" raised face								
	BOLTING: MATERIAL AND SPEC	A307 Gr B heavy hex bolts with heavy hex nuts																
	GASKETS: MATERIAL AND DIM	1/8" thick compressed asbestos, graphited, flat ring; Garlock 7011 (typical)																
WELD	ELECTRODES: BARE COATED	A559 Class E60S-2 A233 E60 series																
MISC CONN	PRESSURE – CONNECTION – VALVE	P1 1/2" BL107		3/4"BL107		P5												
	VENT – CONNECTION – VALVE	V1				V21; 3/4" BA4												
	DRAIN – CONNECTION – VALVE	D17 1/2" BA4				D21	1" BA4			1 1/2" BA4			2" BA4					
	TEMPERATURE – TW CONNECTION	T1, T25				5,25	T11, T25		T11, T29, T33									
VALVES	GATE	BA4 2001b thrd (500 F max)				FA42 150lb flg RF (750 F max) (30" max size)												
	GLOBE	BB4/BL4F 2001b thrd (500 F max)				FH42/FL42 150lb flg RF (750 F max)												
	CHECK: SWING (VERTICAL OR HOR USE)	BC3 2001b thrd (500 F max)				FC41 150lb flg RF (750 F max)												
	CHECK: LIFT (HORIZONTAL USE)	DC4 2001b thrd (500 F max)																
	PLUG	DE1 150lb thrd (350 F max)				DE41 150lb flg RF (350 F max)												
	BALL	BF3 3001b thrd (350 F max)				DF43 150lb flg RF (400 F max)												

4. SERVICE RESTRICTIONS: See Figure 1 page 2 for pressure-temperature limits. See also the fluid directory for service temperature and other limits applicable to specific fluids.
4.1 Water: Water service is restricted to the area to the left of the steam vapor pressure curve in Figure 1.
4.2 Steam and Condensate: Steam is limited to 100 psig max saturated or superheated to not over 500 F. Condensate should be limited to 100 psig max.

5. DESIGN AND CONSTRUCTION FEATURES:
5.1 Bends: Five diameter bends are preferred for change of direction where space permits. Bends are limited to 4" pipe size. Flexibility for bending must be verified by the Project Engineer on each project. Bends and fitting required must be shown on each drawing.
5.2 Flanges: Use weld neck flanges adjacent to buttweld fittings only.
5.3 Vents: Vents are not required on air lines.
5.4 Pipe Layout and Design: See P1.2 Std 2.
5.5 Steam Mains: All branches take-off top of steam main. Drip pockets with steam traps shall be provided every 1000 feet and at the bottom of risers.
5.6 Thread Lubricant: For threaded piping joints use Teflon thread sealing and lubricating compound. Do not backweld Teflon lubricated joints. For bolt threads use "Molykote Type U" or equal.
* The details for these connections are found in P6.5.

Volume: P4.2 STDS 6, 8, & 10: Pipe and Fitting; P3.1 STDS F1, F11, & F4

Monsanto
ANSARDS

TENTATIVE

PIPING MANUAL
PIPING SYSTEM SPECIFICATIONS
150 LB STEEL CLASS C GENERAL SERVICE
Socketweld (1½") & Buttweld (24") — Socketweld & Flanged Valves — 350 F

MAN. SECT PART: P2.2 STD F2C4
ISSUE 3A | DATE 9/70
PAGE 1 OF
MODIFICATIONS: See Para. 4.

SECT. 02II-03
MCS
W.W.

1. APPLICATION: This specification is intended for use in Class C fluid services. Fluids must be non-corrosive to steel.
1.1 Service Ranges: See Figure 1, page 2. Typical ratings are 275 psig at -20 to 100 F and 195 psig at 350 F.

1.2 Temperature Limitations: This system is limited to 350 F by limitations on Teflon seated ball valves.

2. PIPING COMPONENTS

CONSTRUCTION	F2C4	Socketweld fitting and valves, slip-on flanges				Buttweld fittings, flanged steel valves and slip-on flanges.										
	F2C4L	Socketweld fitting and valves, slip-on flanges				SW ftg, flgd, stl vlv mach-lape & SO flg.		Buttweld fittings, flanged steel valves and slip-on flanges.								
NOMINAL PIPE SIZE		1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24
PIPE	F2C4	Carbon steel, A106 Gr B				C.S., A53, TPS, Gr B			Carbon steel, A53, Tp S, Gr B				Carbon steel, A53, TpS, GrB				
	F2C4L	Carbon steel, A106 Gr B				CS, A587, ERW (note 1)			Carbon steel, A53 Tp S, Gr B				Carbon steel, A53, TpS, GrB				
		Schedule 40				Schedule 40			Schedule 20				Schedule 10				
NIPPLES		CS A106 Gr B Sch 40															
FITTINGS		Carbon steel, A181 Gr I 3000lb. socketweld, B16.11				Carbon steel, A234, Gr WPB Std. Wt buttweld, B16.9			Carbon steel, A234 Gr WPB Sch. 20, buttweld, B16.9				Carbon steel A234 Gr WPB Sch 10, buttweld, B16.9				
COUPLINGS		Carbon steel, A181 Gr I 3000 lb, socketweld															
UNIONS		Carbon steel, A105 Gr II 300 lb, socketweld															
OUTLETS		Carbon steel, A105 Gr II Std. Wt, Socketweld				Carbon steel, A105 Gr II Standard weight, buttweld, bore to match pipe											
BRANCH CONSTRUCTION		Use socketweld tees as per Table 1B				Use unreinforced stub-in branch connections unless design pressure exceeds Table 1A. When design pressure exceeds allowable (Table 1A) use Table 1B.											
STUBENDS	F2C4L					[illegible] per ¶ P2.1.9TD5											
FLANGES		Carbon steel, A181 Gr I 150 lb, slip-on (See Note 2 & Par 3.2) 1/16" raised face															
BOLTING		Carbon steel, A307 Grade B Heavy hex bolts with heavy hex nuts															
GAS		Compressed asbestos 150 lb, 1/8" flat ring, Garlock 7021 or Equal															
ELECTRODES		Bare: AWS A5.18 Class E60S-2 Coated: AWS A5.1 E60 Series															

PRESSURE CONN*	Detail P2 ¼" FP38	Det.P2 3/4" FP38			Detail P6 Valve: 3/4" FP38											
VENT*	Detail V2				Detail V14 Valve: 3/4" FA33											
DRAIN*	Detail D10 Valve: ¼" FA33				Det.D14 ¼" FA33	Det. D22 Valve: 1" FA37			Detail D22 Valve: 1½" FA37				Detail D22 Valve: 2" FA37			
TW CONNECTION*	Detail T2				Det.T7 Det.T27	Detail T11 Detail T27			Detail T11, T29, T33							
NOMINAL PIPE SIZE	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24
GATE VALVE	FA37 600 lb socketweld (750 F max)				FA42 150 lb flanged RF (750 F max)											
GLOBE ANGLE VALVE	FB37/FL37 600 lb socketweld (750 F max)				FB42/FL42 150 bl flanged, RF (750 F max)											
SWING CHECK VALVE (VERT OR HOR USE)	FC37 600 lb socketweld (750 F max)				FC41 150 lb flanged, RF (750 F max)											
LIFT CHECK VALVE (HOR USE)	FC37 600 lb socketweld (750 F max)															
BALL VALVE	FF33 300 lb socketweld (350 F max)				DF43 150 lb flanged, RF (400 F max)											
PLUG VALVE					DF41 150 lb flanged (350 F max)											

NOTE 1. If A587 ERW pipe is not available Procurement may substitute A106 MFT.
2. Use plate flanges (per P3.1 STD 120 and 121) as back up flanges for machine flares.

3. DESIGN AND CONSTRUCTION FEATURES
3.1 Bends: Five diameter bends are preferred for change of direction where space permits. Field weld bends are limited to 4" maximum size. Bends and miters required must be shown on each drawing.
3.2 Flanges: Use weld neck flanges adjacent to buttweld fittings only.
3.3 Thread Lubricant: For bolt threads use "Molykote Type [illegible]" or equal.

4. MODIFICATIONS
[illegible] when "Surface [illegible]" [illegible] the pipe material in 2" to 4" size is A587 ERW with [illegible] or pipe lapped end back up flanges. All other components same as F2C4.

MONS 095559

* THE DETAILS FOR THESE CONNECTIONS ARE FOUND IN P6.8.

SOURCE CBD 0519; P4.1 STD 8 & 10; P3.1 STD F26, F11 & F41; P2.2 STD F2C4 Issue 2, F2C5 Issue 2.

SECT 2211-03

Monsanto STANDARDS

TENTATIVE

PIPING MANUAL
PIPING SYSTEM SPECIFICATIONS

150LB STEEL CLASS C GENERAL SERVICE
Buttweld—Flanged Steel Valves 350F

MAN. SECT PART	
P2. 2 STD P2C6	
ISSUE 1	DATE 10/69
PAGE 1	OF 3

This standard has been adopted to the requirements of the Material Control System. It has been judged suitable for general use by a select review panel. It will be maintained for compliance review at an early date.

1. APPLICATION: This specification is intended for use in Class C fluid services.
1.1 Service Range: See Figure 1 & Table I.
1.2 Use Limitations: System is limited by the Teflon valve components to 350 F.

AIR/GLOR UNLOADING

2. CONSTRUCTION: Flanged valves, buttweld fittings, all sizes.

3. PIPING COMPONENTS:

	NOMINAL PIPE SIZE	½	¾	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	Over 24
PIPE	PIPE: SCH OR WEIGHT; MATERIAL	Sch 40; carbon steel									Sch 20; CS		Sch 10; carbon steel					
	ASTM SPECIFICATION	A106 Gr B				A53 tp S,Gr B												
	NIPPLES: SCHEDULE AND SPEC	Sch 80; CS,A106 Gr B																
FITTINGS	FITTINGS: RATING, MATERIAL SPECIFICATION, DIMENSIONS	Sch 40; carbon steel buttwelding									Sch 20; BW		Sch 10; CS, BW					
		A234 Gr WPB; B16.9																
	STUBENDS: SCHEDULE, TYPE SPECIFICATION																	
	COUPLINGS: RATING, MATERIAL ASTM SPECIFICATION																	
	OUTLETS: RATING, MATERIAL ASTM SPECIFICATION	Std wt; forged carbon steel, buttwelding A105 Gr II																
	USE THESE RUN SIZES	No Mch Use				Use as shown in Table 10 or for thermowell connections												
	BRANCH CONSTRUCTION																	
MAINT JOINTS	UNIONS: RATING, MATERIAL ASTM SPECIFICATION	Use flanges																
	FLANGES: RATING, MATERIAL ASTM SPEC, USAS DIMENSIONS FACING	~~150lb, forged carbon steel, slip-on or weld-neck~~ (use WN adjacent to BW fittings only) A181 Gr I; B16.5 (bore WN to match pipe) 1/16" Raised Face																
	BOLTING: MATERIAL AND SPEC	A307 Gr B heavy hex bolts w/ heavy hex nuts																
	GASKETS: MATERIAL AND DIM	1/8" thick compressed asbestos, graphited, flat ring; Garlock 7021 (typical)																
WELD	ELECTRODES: BARE COATED	A559 Class B60S-2 A233 Class B60 series																
SPEC CONN*	PRESSURE – CONNECTION – VALVE	Det P12 ½" FA44	¾" FA44			Det P16												
	VENT –	Det V4				Det V24 3/4" FA44 valve												
	DRAIN – CONNECTION – VALVE	Det D20 ½" FA44				Det D24 1" FA44							1½" FA44			2" FA44		
	TEMPERATURE – TW CONNECTION	Det T4			8,28	12,28	T12, T32, T36											

	NOMINAL SIZE	½	¾	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	Over 24
VALVES	GATE	FA44 150 lb flg RF (750 F max)						FA42 150lb flg RF (750 F max) (30" max size)										
	GLOBE	FA44 150lb flg RF (750 F max)						FA42/FA43 150lb flg RF (750 F max)										
	CHECK: SWING (VERTICAL OR HOR USE)	FC41 150lb flg RF (750 F max)																
	CHECK: LIFT (HORIZONTAL USE)																	
	BALL:	DF41 150lb flg RF (400 F max)																
	PLUG:	DR41 150lb flg RF (350 F max)																

4. SERVICE RESTRICTIONS: See Figure 1 page 2 for pressure-temperature limits. See also the fluid directory for service temperature and other limits applicable to specific fluids.

5. DESIGN AND CONSTRUCTION FEATURES:
5.1 Bends: ~~Standard wrought pipe bends are preferred for changes of direction where space permits. Bends are limited to~~ [illegible] mfg. Facilities for bending must be verified by the Project Engineer on each project. Bends and fitting required must be shown on each drawing.
5.2 Thread Lubricant: Use "Molykote Type U" lubricant or equal for bolt threads.
5.3 Stress Analysis: A stress analysis is required for all lines operating at 350F or above or for any temperature where the configuration suggests overstress.
5.4 Construction: See P3.2.

* The details for these connections are found in P6.5.

MONS 095560

SOURCE CRA 0519; valves P4.2 STD 10; Pipe & Fittings P3.1 STD P41

SECT. 02II-03

Monsanto STANDARDS

TENTATIVE

PIPING MANUAL

PIPING SYSTEM SPECIFICATIONS

300 LB STEEL CLASS C GENERAL SERVICE

Threaded & Buttweld – Threaded & Flanged Valves – 500 F

MAN. SECT PART	P2.2 STD F3C11	
ISSUE	1	DATE 1/70
PAGE	1	OF 2

This standard has been adapted to the requirements of ASME B31.1 Power Piping Code. It has been judged suitable for Code application by the Chemical Engineering Standards Committee. It has been reviewed by the Code Committee's review panel. It will be submitted for Code approval review at an early date.

1. APPLICATION: This specification is intended for use in Class C fluid services (see P2.1 STD 1). Fluids must be non-corrosive to steel.
   1.1 Service Ranges: See Figure 1 & Table I.
   1.2 Use Limitations: System is limited by flanged joint to 500 F.

2. CONSTRUCTION: Threaded fittings, flanges and valves thru 1 1/2" size. Buttweld fittings, flanged valves and slip-on flanges sizes 2" & larger.

Sag. SYM. -SM

3. PIPING COMPONENTS:

	NOMINAL PIPE SIZE	½	¾	1	1¼	2	3	4	6	8	10	12	14	16	18	20	24	Over 24
PIPE	PIPE: SCH OR WEIGHT; MATERIAL ASTM SPECIFICATION	Sch 80; carbon steel A106 Gr B				Sch 40; carbon steel												
	NIPPLES: SCHEDULE AND SPEC	Sch 80; carbon steel																
FITTINGS	FITTINGS: RATING, MATERIAL SPECIFICATION, DIMENSIONS STUBENDS: SCHEDULE, TYPE SPECIFICATION	3000lb; forged CS ASTM A181Gr I; USAS B16.11				Sch 40; carbon steel, buttwelding ASTM A234 Gr WPB; USAS B16.9												
	COUPLINGS: RATING; MATERIAL ASTM SPECIFICATION	3000lb; forged CS A181 Gr I; USAS B16.11																
	OUTLETS: RATING, MATERIAL ASTM SPECIFICATION	Re; forged carbon steel A105 Gr II				Std wt; forged carbon steel												
	USE THESE RUN SIZES	Do not use				Use as shown in Table IB or thermowell detail												
	BRANCH CONSTRUCTION	Use threaded tee as per Table IB.				Use unreinforced stub-in branch connections unless design pressure exceeds allowable pressure shown (psig @ -20 F to 100 F) in Table IA. If design temperature is higher than 100 F, allowable pressures will be reduced by the appropriate correction factor, figure 1. When design pressure exceeds allowable pressure, use construction methods in Table IB.												
MAJOR JOINTS	UNIONS: RATING; MATERIAL ASTM SPECIFICATION	3000lb; forged CS ASTM A105																
	FLANGES: RATING, MATERIAL ASTM SPEC; USAS DIMENSIONS FACING	300lb; forged CS, thrd A181 Gr I; B16.5 raised face				300lb; forged carbon steel, slip-on A181 Gr I; B16.5 raised face												(use NN w/ same bore as fittings adjacent to BW fittings only)
	BOLTING: MATERIAL AND SPEC	heavy hex steel bolts w/ heavy hex nuts; ASTM A307 Gr B																
	GASKETS: MATERIAL AND D M	1/8" thick compressed asbestos flat ring; 300lb RF dim; JM76, Garlock 7021 typical																
FIELD	ELECTRODES: BARE COATED	ASTM A559 Cl E60S-2 ASTM A233 Cl E60 series																
MISC CONN*	PRESSURE – CONNECTION – VALVE	P1 1/2" FP3		3/4" FP3		P5												
	VENT –	V1				V21, 3/4" FA7												
	DRAIN – CONNECTION – VALVE	D17 1/2" FA7				D21 1" FA7		1 1/2" FA7		2" FA7								
	TEMPERATURE – TW CONNECTION	T1, T25				5.25 T11, T25		T11, T29, T33										
VALVES	GATE	FA7 600lb, thrd (750 F max)				FA52 300lb flg, RF (750 F max) (30" max size)												
	GLOBE/Angle	FA7/FJ7 600lb, thrd (750 F max)				FB52/FL52 300lb flg, RF (750 F max)												
	CHECK: SWING (VERTICAL OR HOR USE)	FC6 600lb, thrd (750 F max)				FC51 300lb flg, RF (750 F max)												
	CHECK: LIFT (HORIZONTAL USE)	FJ7 600lb, thrd (750 F max)																

4. SERVICE RESTRICTIONS: See Figure 1 page 2 for pressure-temperature limits. See also the fluid directory for service temperature and other limits applicable to specific fluids.

5. DESIGN AND CONSTRUCTION FEATURES:
   5.1 Bends: ~~Fabricated or bends are prefabricated for changes of direction of pipe runs. Undercutting is not permitted.~~ Facilities for bending must be verified by the Project Engineer on each project. Bends and fitting required must be shown on each drawing.
   5.2 Thread Lubricant: Use "Molykote Type U" lubricant or equal for bolt threads. Use TFE thrd compd for piping joints.
   5.3 Stress Analysis: A stress analysis is required for all lines operating at 350F or above or for any temperature where the configuration suggests overstress.
   5.4 Construction: See P1.2.

MONS 095561

* The details for these connections are found in P6.5.

SECT. 0211-03

Monsanto

CBA 2415
PIPING SYSTEM SPECIFICATIONS

125 LB POLYPROPYLENE LINED CLASS D PROJECT SPECIFICATION

Flanged (8")—Flanged Valves-225 F

PSP QP1M101		
ISSUE 1	DATE 10/70	
PAGE 1	OF 2	

MODIFICATIONS: None

1. APPLICATION: This specification is intended for use in Class D services.
1.1 Service Range: See Figure 1, page 2. Typical rating for flanged lined valves is 150 psig at 225F.

1.2 Temperature Range: System is limited to 225 F by the polypropylene lining.

2. PIPING COMPONENTS:

CONSTRUCTION	Flanged fittings, valves, and pipe spools - all sizes. All items lined with polypropylene. May be field flared.							
NOMINAL PIPE SIZE	1	1½	2	3	4	6	8	
PIPE	carbon steel, A587 ERW Polypropylene lined per ASTM D-2146 Type 1 (Note 1,2)					CS,A53, Tp S, Grade A or B PP lined, ASTM D-2146 Type I (Note 1,2)		
	Schedule 40							
NIPPLES	Schedule 40							
FITTINGS	Ductile iron, A445 150 lb, polypropylene lined per D-2146 type I (Note 2)							
COUPLINGS								
UNIONS								
OUTLETS								
BRANCH CONSTRUCTION	Use flanged tee with reducer.							
STUBENDS	formed on pipe flares M Co P6.1 STD 3							
FLANGES	carbon steel: plate flanges M Co. P3.1 STD 120							
BOLTING	carbon steel, A306 Grade B							
GASKETS	heavy hex bolts with heavy hex nuts							
ELECTRODES								
PRESSURE CONN *	Use tee with QPE40 valve							
VENT *	Use tee with QPE40 valve							
DRAIN *	Use tee with QPE40 valve							
TW CONNECTION *	Use tee							
NOMINAL PIPE SIZE	1	1½	2	3	4	6	8	
GATE VALVE								
GLOBE/ANGLE VALVE								
SWING CHECK VALVE (VERT OR HOR USE)								
LIFT CHECK VALVE (HOR USE)	QPC42 (horz), QPC41 (vert) 125 lb, flanged (225 F max)							
DIAPHRAGM	QPG41 150 lb, flanged (225 F max)							
PLUG	QPE40 125 lb, flanged (225 F max)							

NOTE 1. All pipe and fitting linings shall have a wall thickness of not less than .050" and flare face thickness shall not be less than .040".
2. Use standard field fabricating techniques, including use of cutting, threading, heating and forming tools as shown in vendor literature.

3. DESIGN AND CONSTRUCTION FEATURES:
3.1 Thread lubricant: Use "Molykote Type U" lubricant or equal on bolt threads.

MONS 095562

ELECTRICAL DESIGN BASIS FOR THE ELECTRICAL FACILITIES WITHIN THE PROJECT BATTERY LIMITS

PROJECT: Aroclor Waste Disposal
DIVISION: Organic
PLANT: W. G. Krummrich
PLANT LOCATION: Sauget, Illinois

Central Engineering Department
Monsanto Company
800 N. Lindbergh
St. Louis, Missouri 63166

CEA No.
2415
Aroclor
Waste
Disposal

WGK
Plant

PROJECT DESIGN MANUAL

Central
Engineering
Department

Monsanto

MONS 095383

CEA No. 2415

AROCLOR WASTE DISPOSAL

W. G. Krummrich Plant

PROJECT DESIGN MANUAL

Monsanto

Central Engineering Department

MONS 095384

EIC 6226

CENTRAL ENGINEERING DEPARTMENT
MONSANTO COMPANY
ST. LOUIS, MO.

PROJECT DESIGN MANUAL
CEA NO. 2415

AROCLOR WASTE DISPOSAL AT WGK PLANT SAUGET, ILLINOIS

COPY NO. 2 DATE 7/12/71

DISTRIBUTION:

1. Project Manager
2. CED Central Files
3. Manufacturing Representative

RETURN TO:
CENTRAL FILES
CENTRAL ENGINEERING DEPT.
"F" BUILDING

DO NOT REMOVE ANY
MATERIAL FROM THIS FILE.

ISSUED BY: N. B. Wolk
N. B. Wolk
Project Manager

COMPANY CONFIDENTIAL

This document is the property of Monsanto Company and the recipient is responsible for its safekeeping and disposition. It contains Confidential Information which must not be reproduced, revealed to unauthorized persons or sent outside the Company without proper authorization.

CEA 2415

PROJECT DESIGN MANUAL

TABLE OF CONTENTS

SECTION 1 - PROCESS DESIGN

0101-00 - PROJECT SCOPE SUMMARY
0102-00 - PROCESS DESCRIPTION
0103-00 - FLOW DIAGRAMS
-03 - Engineering Flow Diagrams
0104-00 - EQUIPMENT INFORMATION SUMMARY
0105-00 - EQUIPMENT ARRANGEMENTS
0106-00 - PLOT PLANS
0108-00 - UTILITIES
-02 - Utilities Summary

SECTION 2 - ENGINEERING DESIGN

0201-00 - EQUIPMENT - General
-01 - Master Equipment Numbering List
0201-00 - INDIVIDUAL EQUIPMENT ITEMS
-01 - Performance Data Sheet
-02 - Specification
-03 - Test and Inspection Data
-04 - Performance Curves
0202-00 - INSTRUMENTS - General
-01 - Instrument Design Basis
-03 - Instrument Specifications
-05 - Control Schematics
0203-00 - SET AND TEST EQUIPMENT
- Refractory Installation
0211-00 - PIPELINES
-03 - Pipeline Specifications - System
-04 - Pipeline Specifications - Materials
-05 - Pipeline Specifications - Construction
0213-00 - ELECTRICAL
-01 - Electrical Design Basis
0215-00 - SEWERS, DRAINS, PLUMBING
-02 - Layout Drawing

SECTION 3 - REFERENCE

0301-00 - DRAWING INDEX
0302-00 - PURCHASE ORDER INDICES
-01 - Equipment No./P.O. No./Vendor
-02 - P.O. No./Category/Equipment No./Vendor

MONS 095386

I. PROJECT SCOPE SUMMARY

A. Title

Aroclor Waste Disposal, Organic Division, W. G. Krummrich Plant, Sauget, Illinois, CEA 2415. Expected Cost $430 M. Expected Completion date May 1, 1971.

B. Objectives

The objectives of this project are to:

1. Thermally decompose essentially all the highly chlorinated used liquid Aroclors and Montar fed to the incineration system to harmless by-products.

2. Limit the non-decomposed PCB's from the incineration system entering the plant sewer to 0.012 lbs./hr. or 0.29 lbs./day.

3. Provide for possible future incineration of other plant wastes.

4. Complete these facilities by May 1, 1971 or sooner.

C. Project Tone

The primary objective of this project is to achieve the highest possible level of decomposition of the Aroclors and Montar fed to the incineration system. The allowable contribution of PCB's from the incineration system to the total plant sewer stream has been set at ppb (0.012 lbs./hr. or 0.29 lbs./day).

Since this project is part of the "Monsanto Action Plan" to control PCB's, it is desirable to meet or better the expected completion date of May 1, 1971.

Low capital cost and low operating costs are required for this non-earnings project.

D. Design Capacity

The design capacity is 10 $\overline{M}$ lbs./yr. of waste Aroclors and Montars.

E. Project Status

Engineering can proceed with definitive design when approval is granted.

F. Description of Facilities

The project will include facilities to:

1. Unload drums, tank cars and tank trucks of used Aroclors returned by customers.

2. Store the waste Aroclor and Aroclor-Montar mixture in three existing 20,000-gallon steel storage tanks.

3. Receive Montar from the Aroclor Department and transport it back to the three waste Aroclor storage tanks.

4. Incinerate waste Aroclor-Montar liquid and scrub the flue gas with water. The incinerator-scrubber system includes: incinerator, quench pot, venturi scrubber, packed column, demister pad, stack, air blower, flame safeguard, temperature controls, and water flow controls.

5. Adsorb non-decomposed PCB's from the scrubber liquor and dissolved PCB's in the overflow water from the Aroclor-water sump with a carbon tower.

CEA 2415

AROCLOR WASTE DISPOSAL

I. PROCESS DESCRIPTION

Polychlorinated Biphenyls are decomposed by heat in the oxidizer 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 to get through the oxidizer 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 about 2% strength.

The hot combustion products leaving the oxidizer are cooled from oxidizer temperatures (2800°F maximum) to approximately 180°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 demister pad and into the atmosphere.

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

II. —— PROCESS STUDIES

Independent calculations were made by W. L. Bolles of CED who verified the efficiency claimed by John Zink Company for the packed scrubber.

Two series of destruction tests on various PCBs were conducted by John Zink Company at their facility in Tulsa, Oklahoma. These tests showed the PCBs could be successfully decomposed to the aforementioned combustion products to a degree required to meet the WGK plant goal of 10 ppb maximum. PCBs in the total plant waste stream. These test results were the basis of the Zink design of the full scale unit. A residence time in the oxidizer of approximately 3 seconds was shown to be required.

R. A. Entrup conducted laboratory tests on the mixing of the Montar residues in heated Aroclor 1242. He concluded that mixing takes place quite easily and we should have no problems with the proposed collection system. (Pumping a hot Montar stream into a partially filled tank trailer of hot Aroclor 1242.)

III. DESCRIPTION OF FACILITIES

1. Unloading Facilities

a. Tank Car

Returned tank cars will be unloaded at one of the existing phenol unloading docks (Dock No. 1) on Track No. 7 at the southwest corner of the building BB-T. A new unloading pump (Item 1-110) 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 1-116, 1-117 and 1-118) through a common 3" transfer line (1-110-2) which also serves the unloading dock sump pump (Item 1-125), the Aroclor sump pump (Item 1-121) and the drum unloading sump pump (Item 1-119). Care should be exercised when pumping to see that all valves from these other sources are closed.

b. Tank Truck

Return tank trucks of Aroclor 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 1-111) 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 deposited by straddle carrier in the same area, west of the storage tanks as is used to unload tank trucks. They will be sampled for solvent content and viscosity and then picked up one at a time by fork lift with attachment (Item 1-134) and deposited on the south end of the drum conveyor (Item 1-107). 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 1-128) can be attached.

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

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 chain-operated dumper is then used to tilt the drum to discharge 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 1-120) actuated by level switch LS-120-1 pumps Aroclor spills and/or water to the 10,000 gallon Aroclor-water sump (Item 1-124) at the west side of the phenol pressure evaporation area.

b. Aroclor Water Sump

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-1a1-1, the water layer is pumped to the sewer manually using Water Sump Pump (Item 1-122).

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.

c. Unloading Dock Sump

The unloading dock sump pump (Item 1-125) 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 Aroclor 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 Aroclors which may contain contaminants such as mineral oil, solvents, etc. As these drums are dumped into the sump, pump (Item 1-119) actuated by level switch LS-119-1, pumps the Aroclor into one of the storage tanks.

3. Montar Collection System

Still residue, called "MONTAR" is collected in Dept. 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 Aroclor from one of the storage tanks in the incinerator area, using tank truck unloading pump (Item 1-111). The trailer is then transported to Dept. 246 and parked in a designated area north of the still. Two connections, a Montar feed line and a fume collection line, are made at the top of the trailer. The hot "Montar" at approximately 300°C is pumped from the still, using the existing still circulating pump, 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 1-111).

The ability of the Aroclor to dilute and disperse the "Montar" has been verified in the laboratory by R. A. Entrup.

NOTE: THE NORTH STORAGE TANK (ITEM 1-117) WILL BE USED EXCLUSIVELY FOR MONTAR.

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 1-116, 1-117 and 1-118. The north tank, Item 1-117, will be reserved 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. 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 lime solids from the Montar suspended. Each tank is also provided with a local level indicator (LI-116-2, LI-117-2 and LI-118-2).

Since the returned 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 will be provided by portable trailers which will 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 "sticking".

5. Waste Feed System

Waste Aroclors are fed to the incinerator by a MOYNO positive displacement pump (Item 1-104). Normal pump discharge pressure at full feed rate (1250 lb./hour) will be approximately 80-100 psig. A pressure relief valve PSV-104-1 set at 150 psig relieves back to the

storage tanks if the feed to the incinerator is dead headed. Item 1-104 can pump from either the middle (Item 1-117) or the north (Item 1-118) storage tank. The feed rate is governed by a variable speed drive. Maximum rate is approximately 3 GPM. Actual rates for various speed settings should be determined by timing and weighing samples collected at the pump discharge with the main discharge valve closed. Drain valve opening can be regulated to provide a back pressure equivalent to normal operating back pressure.

6. Incinerator-Scrubber System

The incinerator system consists of the combustion air blower (Item 1-150), quench column (Item 1-141), oxidizer (Item 1-102), quench pot (Item 152), venturi scrubber (Item 1-153), scrubber circulating pump (Item 1-106), packed scrubber (Item 1-154) and mist eliminator (Item 1-155).

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

The 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 oxidizer 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 packed scrubber sump. The scrubber circulating pump pulls solution from the line between quench pot and 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 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.

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 1-112) supplies the required pressure. In addition, city water from the break tank (Item 1-126) is pumped by (Items 1-127 or 1-132) to a weir at the top of the contactor tube (8 GPM) which cools the tube walls and two quench nozzles in the oxidizer (5 GPM). (This quench water is used only when burning Montar.) In addition, this city water supply is also an emergency back up for the well water to the contactor tube. If well water flow falls below a preset point, the oxidizer furnace is shut down and city water flows to the contactor tube to protect the polyester lining in the quench and scrubber systems.

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 quench nozzles in the oxidizer. 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 for use in cooling the nozzles when burning Aroclors.

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 60 psig to approximately 35 psig by pressure reducing valve PRV-102-3. It is fed to the oxidizer through the normal FIA approved series of safety shut-off and double block and bleed valving. (See drawing D4). 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 oxidizer. Gas flow is controlled by temperature controller TRC-15 to maintain the desired oxidizer temperature.

Back-up fuel oil, for use when natural gas is interrupted, is contained in storage tank (Item 1-114) located northeast of the incinerator area, just north of the Interim PNA department. Pumps (Items 1-115 or 1-123) deliver fuel oil to the oxidizer, 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

100 psig steam is supplied to the waste Aroclor burner and the fuel oil burner for use as a fuel atomizer.

10. Other Required Utilities

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

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 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 1-133), 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. Oxidizer Sight Ports (On east side and north end of oxidizer) - Purge air should flow continuously whenever oxidizer is in operation.

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

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

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

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

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, may require water. (The vendor will be consulted.)

13. Flame Safeguard System

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

14. Interlocks and Alarms

Motor Interlocks

1-150 - Incinerator Air Blower

The following conditions must be satisfied before starting Item 1-150.

a. Water flow to contactor tube (FS-38).

b. Water flow to venturi (FS-37)

c. Water flow to weir (FS-127-2)

d. Power on at incinerator panel

Loss of any of the above will stop the blower.

1-104 - Incinerator Feed Pump

The following conditions must be satisfied before starting Item 1-104.

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. To close valve depress "waste stop" pushbutton. Loss of any of the above will stop 1-104.

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

1-106 - Packed column circulating pump.

1-111 - Tank truck unloading pump.

1-112 - Well water booster pump.

1-118 - Storage tank agitator (stop pushbutton at motor, start-stop pushbutton on tank near grade).

1-116 - Storage tank agitator.

1-117 - Storage tank agitator.

1-122 - Water sump pump.

1-127 and 1-132 - City Water Break Tank Pumps.

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

1-110 - 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.

1-119 - 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.

1-120 - Incinerator Floor Drain

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

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.

Alarms

The following conditions will sound alarm on burner control panel.

a. Flame failure (Honeywell safeguard).

b. Low level quench pot PS-12.

c. High level quench pot PS-11.

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).

INTERLOCKS INCINERATOR

Item Number	NAME	FUNCTION
PS-6	High Gas Pressure	Complete Shutdown (when using gas only)
PS-7	Low Gas Pressure	Complete Shutdown (when using gas only)
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
FS-38	Low Contractor Water Flow	Complete Shutdown, Opens SV-64, Stops Blower
FS-37	Low Venturi Water Flow	Complete Shutdown 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 Pilot Only	Complete Shutdown
LSO-65 LSO-73	Gas Valve Limit Switches	Start Low Fire Timer (Gas)
LSO-67 LSO-68	Oil Valve Limit Switches	Start Low Fire Timer (Oil)

IV. OPERATING INSTRUCTIONS

1. Pre-Startup Checkout

Before feeding waste liquid to the oxidizer, the unit must be brought up to operating temperature using auxiliary fuel (natural gas or fuel oil). The auxiliary fuel is also required to maintain operating temperature when burning waste.

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 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, $\frac{73}{3/4"}$ at the burner is closed. Other main gas manual valves are open.
6. Fuel oil manual valve $\frac{68}{1/2"}$ at the burner is closed. Also atomizing steam manual valve $\frac{70}{1/2"}$ at burner is closed. All other fuel oil and atomizing steam manual valves are open.
7. Waste liquid manual valve $\frac{74}{1"}$ at the burner is closed. Also atomizing steam manual valve $\frac{74}{1"}$ at burner is closed. Manual valves at the incinerator feed pump (Item 1-104) suction and discharge should be open. Atomizing steam supply valving should be open.
8. Manual reset safety valves, SV-65 on the main gas; SV-67 on the fuel oil are closed.
9. Fuel gas, fuel oil, atomizing steam and instrument air supplies are available at the required pressures:

   Fuel gas - 30 psig
   Fuel oil - 80 psig (minimum)
   Atomizing Steam - 100 psig (minimum)

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

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

(TRC-15)	Oxidizer Hi Temp.	3000°F when burning Aroclor 2200°F when burning Montar
	Oxidizer Low Temp.	- 1600°F
(TS-4 & TS-5)	Quench Pot Hi Temp.	- 220°F
(PSL-7)	Low Fuel Gas Pressure	- 7 psig
(PSH-6)	Hi Fuel Gas Pressure	- 35 psig
(PS-8)	Low Fuel Oil Pressure	- 75 psig
(PSL-9)	Low Atomizing Steam Pressure	- 90 psig
(FS-10)	Low Combustion Air Flow	- By John Zink
(FS-38)	Low Well Water Flow to Contactor Tube	- 50 GPM
(FS-37)	Low Recycle Flow to Venturi	- 50 GPM
(FS-127-2)	Low City Water Flow to Contactor Wier	- 7 GPM

2. Oxidizer Heatup Procedures

When the oxidizer is brought on-stream for the first time a 40-hour heatup period is required in order to cure the refractory properly and prevent damage. (See Page 4A of the attached Appendices).

Subsequent heatups after the oxidizer has been shut down and allowed to cool require a 16-hour heatup period. (See Page 4B of the attached Appendi es). Page 4B also describes the heatup procedure when restarting the oxidizer after a short shutdown before the refractory has completely cooled.

3. Normal Operation

Startup

1. Open discharge valve at well water booster pump (Item 1-112) and start pump. Other well water valves should have been previously arranged for proper flow to the contactor tube sprays and the scrubber water distributor.

   Adjust flow through rotameter FI-87 for 60 GPM. (This can be slightly higher, but not lower.)

2. 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.

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

4. Start city water pump. Open discharge valve at city water pump (Items 1-127 or 1-132). Other valves should have been previously arranged for proper flow to the contactor tube weir and the oxidizer quench nozzles if preparing to burn Montar. (When burning straight Aroclors, water flow to the quench nozzles should be shut off and steam flow initiated to protect the nozzles.)

5. After liquid levels have been established in the quench pot and packed scrubber, start the scrubber circulating pump (Item 1-106) valves should have been previously arranged for proper flow.

   Quench pot level is maintained by level control LS-92. Packed scrubber sump level is maintained by a trap leg in the outlet piping.

6. Start combustion air blower. The butterfly valve in the blower discharge line should have been preset to provide a flow rate to maintain approximately 25% excess air to the oxidizer. Since the oxidizer will normally operate at design rate (1250 lb. waste/hr.) the combustion air flow setting will remain constant once it has been set. In order to be certain a fuel rich mixture is avoided at all times air flow should be sufficient to cover maximum auxiliary fuel rate. A combustion gas analysis can be made, once in operation, to check percentage excess air.

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

8. Turn the TRC switch on the control panel to "ON", push RED button on TRC until position meter reads 0% (This is percent opening of the main fuel gas control valve) - Check Leeds and Northrup TRC instruction booklet for details.

9. If all shutdown conditions described in Paragraph 11 of the Pre-Startup Checkout are satisfied, startup may proceed.

10. 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.

11. Allow a minimum of 10 seconds for the "Flame Scanner" to warm up, then Open The Manual Pilot Gas Valve At The Burner.

    a. Firing on Natural Gas

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

        13. Depress the "Ignition" pushbutton.

        14. If the pilot flame is established within 15 seconds, the GREEN "Pilot Proved" light is lit and the RED "Flame Failure" light goes out. Release the "Ignition" button immediately when the GREEN light comes on. If depressed more than 15 seconds, the purge cycle will have to be repeated.

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

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

        17. Also open the manual valve in the main gas line at the burner. When both of these valves are open the Low Fire Timer starts.

18. When the Low Fire Timer times out, Latch "Open" low fire manual reset solenoid SV-60 on the air output line.

19. With the TRC on manual slowly bring oxidizer temperature up to 300°F by depressing the YELLOW button on the TRC. Adjust the set point indicator until it aligns with the indicator point.

20. Switch the TRC to "Automatic". The set point should now be advanced in accordance with the appropriate Oxidizer Heatup Procedure as described in Pages A- and A- of the Appendix.

21. When the temperature reaches the operating point (2000°F for burning "Montar", 2800°F for burning Aroclors) the feeding of waste material can begin.

NOTES:

a) Somewhat lower temperatures may be adequate. This will be determined during initial operation.

b) 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 2800°F, the sensor is the Leeds and Northrup Rayotube.

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) Before advancing the TRC set point beyond 2000°F, the thermocouple which is located in the north end of the oxidizer must be physically removed since it would be damaged by the higher temperatures. Turn on purge air at thermocouple well before removing to prevent hot gases escaping.

d) The oxidizer temperature must be above 1600°F for waste material feed to flow.

22. 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 100 psig.

23. 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.

24. Start waste pump.

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

b. Firing on Fuel Oil

First eleven (11) steps are the same as when starting up on natural gas.

12. Align fuel oil valves at storage tank (Item 1-114) and pumps (Items 1-115 or 1-123) for pumping to the oxidizer. Manual shut off valve at the burner should be closed.

13. TURN GAS-OIL-GAS & OIL selector switch to OIL. The AMBER "Fuel Oil Ready" light will come on. Oil pressure and atomizing steam pressure must be OK before switching or purge will reset.

14. Repeat steps 13 and 14 for "FIRING ON NATURAL GAS", to light and prove the pilot.

15. When the Flame Scanner picks up the pilot flame the AMBER "Fuel Oil Ready" light comes on.

16. Start fuel oil pump. Then open manual valve at the burner admitting atomizing steam to the fuel oil burner. Pressure on the gage should be 100 psig. Steam must be on to satisfy startup conditions.

17. Manually latch OPEN the Manual Reset Fuel Oil Valve (SV-67).

18. Open the manual fuel oil valve at the burner. This activates the Low Fire Timer (2-TR).

19. Repeat steps 19 thru 24 for "FIRING ON NATURAL GAS". Manually latch "OPEN" Instrument Air manual reset fuel oil solenoid SV-61 on the air output line from the TRC. This makes oil available to the burner.

20. Combustion air must be manually adjusted to insure proper air-fuel ratio. The regulating butterfly valve should be set wide open initially to assure excess air then adjusted in operation from exhaust gas analyses.

4. Switching Auxiliary Fuels With Oxidizer in Operation

There are several ways to accomplish this. Method No. 1 (This is the easiest method and presents no danger of losing temperature control of the oxidizer.

Switch From Natural Gas To Fuel Oil

1. Stop waste flow to burner by depressing WASTE STOP button.

2. Open the manual valve at the burner admitting atomizing steam. Set pressure at 100 psig.

3. Turn GAS-OIL-COMBINATION selector switch to COMBINATION position.

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. Manually latch OPEN the Manual Reset Fuel Oil Valve (SV-67) and open the manual fuel oil valve at the burner. This activates Low Fire Timer (2-TR).

6. When the timer times out the fuel oil starts feed to the burner. The oxidizer is now burning both Gas and Oil.

7. Turn 3-WAY selector switch to "OIL". The AMBER "Fuel Oil Ready" light will come on, and natural gas flow will shut off. The oxidizer is now operating on OIL only.

8. Reestablish waste flow by depressing the WASTE START button.

9. Close manual valve in natural gas line at the burner.

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. Manually latch OPEN the main gas Manual Reset Valve SV-65. Also open the manual valve in the main gas line at the burner. When both these valves are open, the Low Fire Timer starts.

4. When the timer times out, latch "Open" low fire manual reset solenoid SV-60 starting gas flow to burner. The oxidizer is now on both GAS and OIL.

5. Turn 3-WAY selector switch to GAS. The fuel oil will shut off. The oxidizer is now operating on GAS ONLY.

6. Close manual fuel oil valve at the burner.

7. Close manual atomizing steam valve at the burner.

8. Shut off fuel oil pump.

Method No. 2 The switch can also be made from Gas to Fuel Oil or Fuel Oil to Gas without using the (COMBINATION) position. However, there will be a period where there would be no auxiliary fuel flow, which could result in a loss of temperature control if the operator delayed too long in making the switch.

5. Normal Shutdown Procedure

   a. For Extended Downtime

      1. Shut off flow of waste liquid to the oxidizer by depressing "WASTE STOP" pushbutton on control panel which closes valve FCV-80 in waste feed line.

      2. Close manual waste shut off valve at burner.

      3. The waste feed pump stops automatically when FCV-80 closes.

      4. Reduce atomizing steam flow to the waste burner (allow small flow to keep gun cool).

5. Decrease oxidizer temperature gradually to 1000°F over a 2-hour period by periodically lowering the TRC set point.

6. Hold at 1000°F for 30 minutes.

7. Close the fuel gas (or fuel oil) manual shutoff valve at the burner.

8. Close the manual atomizing steam valve at the burner if firing on fuel oil.

9. Cut back on combustion air flow by throttling butterfly valve to lowest position. Keep blower running until the oxidizer temperature drops to 500°F. Then shut blower down.

10. Shut down fuel oil pump if running on fuel oil.

11. Shut off well water and city water to the system, and shut down water pumps. Drain trapped piping legs in winter.

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

5. Normal Shutdown Procedure

b. When Preparing For Short Term Downtime

1. Shut off flow of waste liquid same as for extended shutdown.

2. Close manual waste shutoff valve at burner.

3. Decrease oxidizer temperature to 1000°F in 2 hours as for extended shutdown.

4. Allow unit to operate at 600°F on auxiliary fuel until ready to resume feeding waste liquid, if expected shutdown is 24 hours or more. Operate at 1000°F if expected shutdown is less than 24 hours.

6. Resuming Operations After Short Term Shutdown

1. Advance TRC set point as follows:

500°F to 1000°F - 30 minutes
1000°F to 1200°F -
1200°F to 1400°F - 60 minutes
1400°F to 1600°F - 60 minutes

If operating temperature required is about 2000°F allow an additional 60 minutes for each 200°F increment.

2. Open manual atomizing steam valve to the waste gun at the burner.

3. Depress the "Waste Start" pushbutton on the panel. Also start waste feed pump.

4. Slowly open manual waste valve at the burner. The oxidizer is now back on stream.

7. Emergency Shutdown

To shut down and render the unit safe in any emergency situation such as a minor explosion, runaway oxidizer temperature condition, etc., cut electrical power to the unit by,

1. Turn off "Master Power Switch" on control panel. On loss of power all controls go to a fail safe condition as follows:

   Main Gas - Close and vent

   Fuel Oil - Close

   Pilot Gas - Close and vent

   Waste Liquid - Close and pump stops

   Combustion Air Blower - Stops

   Quench Pot Level Control Valve - Closes

   Water Supply - Fire Water Starts.

   If prevented from reaching control panel throwing the disconnect at will accomplish the same results.

2. Close manual shut off valves on natural gas, fuel oil and waste liquid. The waste feed pump will stop automatically when waste feed is shut off.

V. SAFETY

Aroclors have very low vapor pressures and do not constitute a fire or explosion hazard.

Some of the returned Aroclors will be contaminated with solvents. The following precautions have been taken:

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 will be blanketed 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.

Main well water and back-up city water quench and 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 both well water and city water pumps.

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.

MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION
Krummrich and Anniston
FINISHED PRODUCT
SPECIFICATION

PROJECT CODE	82863
DEPT. OR JOB	MCK 246 Ann. 2
USE	Sales
SALES CODE	*See Below

APPENDIX 4
Issued [illegible]
[illegible]

SECT. 0102-00

PRODUCT (Trade Name) Montars 1 and 2 TYPE

PRODUCT (Chemical Name) Polychlorinated Polyphenyls TYPE

CHEMICAL FORMULA

Mixture

SUPERSEDES SPECS OF 6-15-61

SAMPLE FOR ANALYSIS 2 x 16 oz. [illegible] Bottles

UNRESTRICTED INFORMATION

Routine Tests	Specification	Anniston Method No.	MCK
Appearance	Black Solid	14-17-52	11321

General Information

Physical Properties (Typical Values)	Montar 1	Montar 2
Softening Point (ASTM E-28-51T)	54-160°C	70-170°C
Acidity	Slightly Basic	Slightly Basi
Chlorine Content	36-42%	44-48%
CaO	5-15%	5-15%
Fe	0.5-1.0%	0.5-1.0%
Benzene Insoluble	- - - -	12.5%
Flash Point	500-620°F	- - - -

RESTRICTED INFORMATION

Montars 1 and 2 are the still residues from distillation of Aroclors 1242 and 1248 respectively. Composition of these Montars is not controlled, being entirely dependent on conditions required to make acceptable distilled product.

Sales Code Nos.

Montar 1 6405 - 001 - 04 - 03/09
Montar 2 6405 - 002 - 04 - 03/09

MONS 095412

MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION
Krummrich and Anniston
FINISHED PRODUCT SPECIFICATION

PRODUCT CODE	DEPT. OR JOB
S2868	WGK 246 Ann.27

Issued JUL 15 1964
W. G. Krummrich Plant
By [illegible]

SECT. 0102-00

USE: Sales

SALES CODE: *See Below

PRODUCT (Trade Name): Montars 3 and 4 — TYPE:

PRODUCT (Chemical Name): Polychlorinated Polyphenyls — TYPE:

CHEMICAL FORMULA: Mixture

OIL WT.:

UPDATED SPECS OF: 6-15-61

SAMPLE FOR ANALYSIS: 2 x 16 oz. W. M. Bottles

UNRESTRICTED INFORMATION

Routine Tests	Specification	Anniston Method No.	WGK
Appearance	Black Solid	14-17-52	1132
General Information			

Physical Properties (Typical Values)	1254 Montar 3	1260 Montar 4
Softening Point (Method ASTM E28-51T)	86-168°C	92-206°C
Acidity	Slightly Basic	Slightly Basic
Chlorine Content	50-52%	54-56%
CaO	5-10%	5-10%
Fe	0.3-0.6%	0.5-1.0%

RESTRICTED INFORMATION

Montars 3 and 4 are the still residues from distillation of Aroclors 1254 and 1260 respectively. Composition of these Montars is not controlled, being entirely dependent on conditions required to make acceptable distilled product.

*Sales Code Nos.

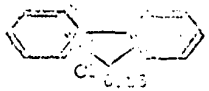
Montar 3 6405 - 003 - 04 - 03/09
Montar 4 6405 - 004 - 04 - 03/09

MONS 095413

SECT. 0102-00

ROCLOR 1260

STRUCTURAL FORMULA



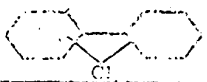
MONS 095414

PHYSICAL CONSTANTS DATA

SECT. 0102-00

SUBSTANCE: AROCLOR 1242

STRUCTURAL FORMULA:



COMPILED BY	DATE
A. M. Elsenbaumer	6-25-57

Formula	$C_{12}H_5Cl_5$	
Molecular Weight	257.9 A.S.T.M.	
Boiling Point	Decomposes at 325°C.	A.S.T.M. D 1120-54
Boiling Point, Micro Range	325 - 360°C	"
Boiling Point, 3 mm.	155 - 165°C	
Boiling Point, 1 mm.		
Boiling Point, 760 mm.		
Color, Visual	Water-white liquid	
Odor		
Specific Gravity, 25/25°C.	1.382	"
Specific Gravity, 25/15.5°C.	1.382 - 1.392	Specification MIL-C-19663
Refractive Index, 25°C.	1.64	A.S.T.M. D 1218-52T
Coefficient of Expansion, 25-55°C.	0.00068 cc/cc/°C.	"
Solubility, 25°C., H2O	0.05 - 0.2 %	Specification MIL-C-19663
Infra Red Spectrum (Reference)		
Ultra Violet Spectrum (Reference)		
Viscosity, 210°F.	3 cs. SUS	M. B. 05-1
Viscosity, 100°F.	32-38 SUS	"
Refractive Index, Dyne/cm. @ 25°C.	38	A.S.T.M. Designation D 1331-56
Pour Point	-20°C.	M. B. 05-1
Coefficient of Expansion @ 0°C.	0.00068 cc/cc	"
Coefficient of Expansion @ 20°C.	0.00070 cc/cc	"
Flash Point (Pensky) c.o.c.	180°C	"
Fire Point c.o.c.	None	"
Vapor Pressure		
Vapor Density		
Heat of Formation		
Heat Capacity (cal/gm/°C)		
Critical Temperature		
Critical Pressure		
Surface Tension, dyn/cm.	38	Calculated
Dielectric Constant @ 60 C.	6.45	M. B. 05-1
Dielectric Strength		
Power Factor		
Specific Heat @ 100°C.	0.353	"

Contacts

Pour Point	-24°C. ASTM	
Thermal Conductivity, cal/cm²/cm/°C/sec	2.5 x 10⁻⁴ @ 25°C.	M. B. 05-1
Dielectric Constant, 60°C.	6.45	M. B. 05-1
Dielectric Strength	350 Volts	M. B. 05-1

MONS 095415

Toxicity (Reference)	Chemical Medical Dept.	M. B. 05-1

APPENDIX I

SECT. 0102-00

PHYSICAL CHARACTERISTICS DATA

HYDRATED LIME (Calcium Hydroxide)

Mississippi Lime Company

St. L. C.

MONS 095416

APPENDIX 4A

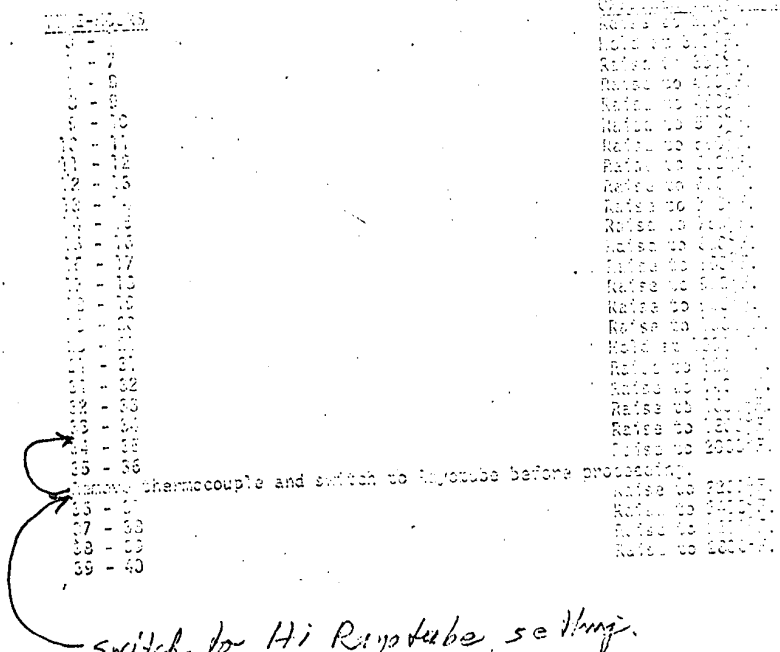
SECTION 0102-06

[illegible]

The Thermal Oxidizer should be heated up according to the following time-temperature schedule, after a minimum of one day of air curing.

[illegible]: The preceding page on [illegible] and [illegible] [illegible] should be read thoroughly before proceeding with cure out [illegible] all [illegible] (Except the 2 oxidizer [illegible] water [illegible]) should be at full design rates to prevent fiberglass damage.

TIME-HOURS	[illegible]
[illegible] - [illegible]	Raise to [illegible]
[illegible] - 7	Hold at [illegible]
[illegible] - 8	Raise to [illegible]
[illegible] - 9	Raise to [illegible]
[illegible] - 10	Raise to [illegible]
[illegible] - 11	Raise to [illegible]
[illegible] - 12	Raise to [illegible]
[illegible] - 13	Raise to [illegible]
[illegible] - [illegible]	Raise to [illegible]
[illegible] - [illegible]	Raise to [illegible]
[illegible] - [illegible]	Raise to [illegible]
[illegible] - 17	Raise to [illegible]
[illegible] - [illegible]	Raise to [illegible]
[illegible] - [illegible]	Raise to [illegible]
[illegible] - [illegible]	Raise to [illegible]
[illegible] - [illegible]	Raise to [illegible]
[illegible] - [illegible]	Hold at [illegible]
[illegible] - 31	Raise to [illegible]
31 - 32	Raise to [illegible]
32 - 33	Raise to [illegible]
33 - 34	Raise to [illegible]
34 - 35	Raise to 2000°F.
35 - 36	Raise to 2200°F.
Remove thermocouple and switch to Raytube before proceeding.	
36 - [illegible]	Raise to [illegible]
37 - 38	Raise to [illegible]
38 - 39	Raise to [illegible]
39 - 40	Raise to 2000°F.



switch to Hi Raytube setting.

APPENDIX 4B

SECT. 0102-00

[illegible]

[illegible]	[illegible]
[illegible]	Raise to [illegible]°F.
[illegible]	Raise at [illegible]°F.
[illegible]	Raise to [illegible]°F.
[illegible]	Raise to [illegible]°F.
[illegible]	Raise to [illegible]°F.
[illegible]	Raise to [illegible]°F.
[illegible]	Raise to [illegible]°F.
[illegible]	Raise to [illegible]°F.
[illegible]	Raise to [illegible]°F.
[illegible]	Raise to [illegible]°F.
[illegible]	Raise to [illegible]°F.
Remove thermocouple and switch to Rayotube before proceeding	
12 - 13	Raise to [illegible]°F.
13 - [illegible]	Raise to [illegible]°F.
[illegible] - 15	Raise to [illegible]°F.
15 - 16	Raise to [illegible]°F.

HOT STARTUP AFTER TEMPORARY SHUTDOWN

Over a period of 30 minutes, gradually increase the temperature to [illegible]°F. Hold this temperature for 1 hour. Gradually increase to 1200°F. over a one hour period. Gradually increase to [illegible]°F. over a one hour period. Gradually increase to 1[illegible]°F. Over a one hour period. Gradually increase to [illegible] over a one hour period. Remove thermocouple and switch to Rayotube before proceeding. Gradually increase to 2200°F. over a one hour period. Gradually increase 2[illegible]°F. over a one hour period. Gradually increase to 2500°F. over a one hour period. Gradually increase to [illegible]°F. over a one hour period.

SECT. 0102-00

John Zink Pollution Research

A Division of JOHN ZINK Company

PHONE 918 RI 7-1371

4401 SOUTH PEORIA • TULSA, OKLAHOMA 74105

March 14, 1970

AIRMAIL

Monsanto Company
800 North Lindbergh Blvd.
St. Louis, Missouri 63166

Attention: Mr. Art Pier, Central Engineering

Gentlemen:

Enclosed you will find a table of the data that resulted from the tests that we ran for you on March 10. We managed to complete all nine of the tests that you asked for, finishing about 9 o'clock that night.

The Aroclor 1260 burned very nicely, but it did require a bit more fuel than the other two wastes in order to burn with a nice stable vortex. We also had no trouble at all pumping and handling the Aroclor 1260 once we had the pipes and gun parts hot.

The residence times we ended up with are in a very good range for comparison with analytical results. I feel these results will give us a good idea of what we need in the way of residence time in a commercial size unit in order to assure complete destruction of the waste material. I feel that the tests were quite sucessful and I hope you find the results useful.

If you have any questions about the tests or any future questions about the commercial size equipment involved, please feel free to call on us.

Yours truly,

JOHN ZINK COMPANY

A. Kim Reyburn

A. Kim Reyburn

AKR:slc
Enclosure

MONS 095419

Results of Thermal Oxidizer Tests Conducted for Monsanto on March 10, 1970

	AROCLOR 1242			INERTEEN PPO			AROCLOR 1260		
	1600° F	1800° F	2000° F	1600° F	1800° F	2000° F	1600°F	1800° F	2000° F
Waste Rate (cpm)	0.94	1.00	0.89	1.03	1.03	0.84	0.85	0.85	0.92
Fired Fuel Rate (Btu/Hour)	0.51mm	0.62mm	0.97mm	1.95mm	2.15mm	2.4mm	3.4mm	4.0mm	4.3mm
Quench Water Rate (gpm)	2.3	1.8	____	2.5	1.8	0.15	2.6	1.9	____
Stack Gas									
Combustibles (vol. %)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Excess O_2 (vol. %)	3.8	4.0	4.0	4.2	4.2	4.5	4.0	2.5	3.0
Gun Type	R	R	R	R	R	R	EA865	EA865	EA865
Residence Time (sec.)									
First Point	0.64	0.57	0.67	0.58	0.56	0.76	0.52	0.51	0.51
Second Point	1.71	1.52	1.78	1.56	1.48	2.04	1.40	1.35	1.36
Third Point	2.61	2.32	2.71	2.37	2.26	3.10	2.13	2.06	2.07
Pressures (psig)									
Fuel	<1	<1	<1	<1	<1	<1	1.5	2.5	3.5
Waste	90	85	85	100	95	85	97	100	95
Steam	96	92	91	110	104	94	125	124	124
Pressure (in. w. c.)									
Combustion Air	8.5	8.7	9.2	8.7	8.9	8.9	11.3	11.3	11.3

Equipment: Horizontal Oxidizer with HI-10 Burner

Personnel:

Monsanto
- Art Pier, Central Engineering
- Jeff Waldheser, Central Engineering
- Scott Tucker, Organic Chemicals Research
- Bill Papageorge, Manager, Environmental Control

John Zink Co.
- A. Kim Reyburn, Pollution Control
- Gene McGill, Pollution Control
- Sam Napier, Test Furnace

MONS 095420

SEGT 0102-00

APR 10 1970

SECT. 0102-00

Test Material	Temperature °F	Sampling Point	Resonance time (sec.)	Sample Size m^3	g/m^3 HCL	mg/m^3 Cl_2	Estimated mg/m^3 PCB *	mg/m^3 Total Cl Chlorine	
Aroclor 1242	1600	1	0.64	0.027	27.4	11.1	NC	—	
		2	1.71	0.026	51.5	34.2	0.08	—	
		3	2.61	0.023	62.6	7.8	0.19	—	
	1800	1	0.57	0.028	40.4	13.9	0.06	—	
		2	1.52	0.025	62.8	10.8	0.11	—	
		3	2.52	0.023	61.7	17.4	0.11	—	
	2000	1	0.67	0.027	48.9	34.8	0.16	1.36	
		2	1.78	0.035	50.0	24.6	0.10	1.81	
		3	2.71	0.031	35.2	5.2	1.47	6.02	
Silvereen PPO (Aroclor 1260)	1600	1	0.58	0.025	60.8	24.4	1.13	—	NC - not calc'd
		2	1.56	0.026	34.6	73.1	0.32	—	interferences
		3	2.37	0.026	47.3	11.5	4.94	—	* estimated
	1800	1	0.56	0.025	53.6	42.8	0.09	—	because of
		2	1.48	0.026	101.9	71.2	0.07	—	[illegible]
		3	2.26	0.025	67.6	16.0	5.52	—	[illegible]
	2000	1	0.76	0.025	86.8	72.0	0.06	>0.43	no greater than
		2	2.04	0.025	100.0	11.2	0.05	12.93	
		3	3.10	0.025	85.6	36.4	2.80	13.67	
Aroclor 1260	1600	1	0.52	0.025	43.6	7.6	2.20	—	
		2	1.40	0.026	75.4	30.4	7.06	—	
		3	2.13	0.025	52.8	61.6	5.20	—	
	1800	1	0.51	0.026	72.3	60.8	0.14	—	
		2	1.35	0.025	100.0	76.0	0.08	—	
		3	2.06	0.025	58.7	27.0	2.40	—	
	2000	1	0.51	0.030	88.5	105.0	0.22	0.93	
		2	1.36	0.026	80.0	99.6	0.22	5.83	
		3	2.07	0.025	68.8	67.6	7.60	11.34	

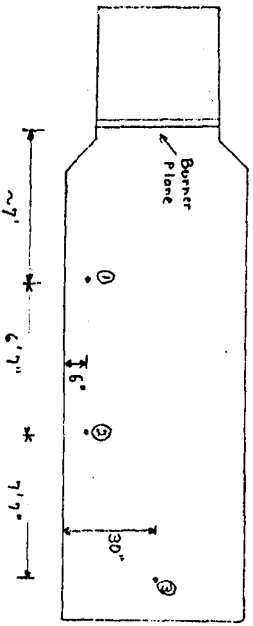
MONS 095421

CENTRAL ENGINEERING DEPARTMENT

PRD/DEPT. _____
PLANT _____ DIVISION _____

EQUIP. NO. _____
CEA NO. _____ AREA NO. _____
BY _____ SHEET ____ OF ____

TOP VIEW



MONS 095422

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

March 16, 1970
File 1142

John Zink Company
P. O. Box 7388
Tulsa, Oklahoma 74105

Attention: Mr. Gene McGill

Gentlemen:

The following pages will report our sampling during the 9 oxidation tests using 3 Monsanto materials, on March 10, 1970.

The sampling was done following instructions given in our discussion with Mr. Art Pier and Mr. Jeff Waldbeser on March 9, 1970, and with Mr. Scott Tucker and Mr. Bill Papageorge during the test oxidations on March 10, 1970.

The liquid samples obtained were packaged in oil absorbent material and styrene beeds. The boxes were crated and sent to Mr. E. S. Tucker, Monsanto Company, St. Louis, Mo. on Friday March 13, 1970 by motor freight.

Six of the gas samples were analyzed. The remaining gas samples will be destroyed unless you request otherwise.

We enjoy serving you.

Yours truly,

Clair C. Wilson

Clair C. Wilson

CCW:jw

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

File 1142
March 10, 1970

EQUIPMENT

Three quartz sampling tubes, 3/4 inches outside diameter by 6 feet long were made and turned down 4 inches into a 28 x 15 Ground Glass ball joint. This jointed onto the inlet tube of the pyrex gas scrubbing absorber. This absorbing bottle was kept in a water bath.

The gas was drawn through tygon tubing into the second gas absorption tube; through a gas sampling tube and metered with a dry test meter. Laboratory vacuum pumps were used to draw the gas through the sampling train.

PROCEDURE

Two of the quartz sampling tubes were inserted to the centerline of the thermo oxidizer. The third tube was inserted until its tip was even with the centerline of the exhaust stack. The sampling tube was connected to the primary absorber which had been filled with 175 ml of 2 N Sodium Hydroxide solution. This was then connected to the second scrubber which had been filled with sufficient AR Grade Toluene to cover the sintered glass tube. The gas sample tube was connected in and the vacuum pump started.

Approximately 1 cubic foot of gas sample was drawn through the train in 8 minutes. The gas sample tube and train disassembled.

The caustic solution in the primary absorber was poured into a glass bottle and the absorber rinsed three times with distilled water into the glass bottle. The absorber was then rinsed with toluene and this rinse put into a second glass bottle. The toluene solution in the second absorber was poured into the second-glass bottle. The absorber was rinsed twice with toluene into this second bottle.

The quartz sampling tube was rinsed with water and poured into the caustic sample. The quartz tube was next rinsed with toluene and this poured into the toluene sample.

SECT. 0102-00 ,

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

File 1142
March 10, 1970

Monsanto Company

On the first run, the quartz tube could not be put in the second sampling point. A stainless steel tube 1/2 inch outside diameter was used, and this sample taken after the other two samples had been taken. The stainless steel tube was deformed by the heat and was approximately 8 inches below the centerline. The quartz tube at the first point also was deformed by the heat. It was broken by its forced removal through the sampling port. On succeeding runs, the quartz sampling tubes were inserted until the tips were 24 inches from the thermo oxidizer center line.

A stronger cuastic, 2 N was used after the first two runs. The washing of the sample tube was done after the third run. The caustic scrubbers were washed with toluene after the fourth run.

Three materials were oxidized at three different temperatures. Gas in the oxidizer was sampled at three different points. Twenty-seven (27) samples of each; caustic, toluene, and gas were taken, a total of 81.

The toluene samples were put in a polyethylene bag. This was packed into an oil absorbent material. The caustic samples were put in a polyethylene bag and packed in styrene beeds.

Three of the gas samples, runs 2, 5 and 8, at sampling point 2 were analyzed and are reported. These are only indicative of conditions as the water vapor and some of the carbon dioxide have been deleted from the sample.

The chloride content of three other gas samples were measured to check the efficacy of the scrubbing train. No chlorides (less than 10 ppm.) were detected in these samples.

The metered gas volumes were corrected for temperature and pressure to standard cubic feet at 60°F. and 14.7 psia. This was multiplied by 1.196 and reported as gram mols of gas.

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto
Material: Aroclor 1242
Burn Temp. °F. 2000

File No. 1142
Date: March 10, 1970
Barometer in. Hg. 29.38
Ambient Temp. °F. 46.

RUN NO. 1

Sampling Point	1	2*	3
Inches from center line	0**	0**	8
Inches from stack center plane			0
Scrubber solution, milliliters			
First: AR Sodium Hydroxide 1 N.	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	1.052	1.294	1.365
Temperature °F.	51	64	49
Vacuum millimeters Hg.	30	64	125
Absolute Pressure mm.Hg.	716	726	621
Gas Metered, Gram Mols	1.123	1.481	1.294

* Made about 10 minutes after other samples were taken using a stainless steel probe
** Deformed by heat

Sect. 0102-00,

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto — File No. 1142

Material: Aroclor 1242 — Date: March 10, 1970

Barometer in. Hg. 29.38

Burn Temp. °F. 1800 — Ambient Temp. °F. 46.

RUN NO. 2

Sampling Point	1	2	3
Inches from center line	24	24	8
Inches from stack center plane			0
Scrubber solution, milliliters			
First: AR Sodium Hydroxide 1 N.	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.010	0.000
Final Reading Cu. Ft.	1.093	1.002	1.102
Temperature °F.	53	62	53
Vacuum millimeters Hg.	30	52	130
Absolute Pressure mm.Hg.	716	694	616
Gas Metered, Gram Mols	1.171	1.069	0.968

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto — File No. 1142

Material: Aroclor 1242 — Date: March 10, 1970

Barometer in. Hg. 29.34

Burn Temp. °F. 1600 — Ambient Temp. °F. 50

RUN NO. 3

Sampling Point	1	2	3
Inches from center line	24	24	8
Inches from stack center plane			0
Scrubber solution, milliliters			
First: AR Sodium Hydroxide 2 N.	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	1.100	1.015	1.099
Temperature °F.	52	58	52
Vacuum millimeters Hg.	52	52	135
Absolute Pressure mm.Hg.	693	693	610
Gas Metered, Gram Mols	1.139	1.096	0.957

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto
Material: Inerteen PPO
Burn Temp. °F. 2000

File No. 1142
Date: March 10, 1970
Barometer in. Hg. 29.34
Ambient Temp. °F. 48.

RUN NO. 4

Sampling Point	1	2	3
Inches from center line	24	24	8
Inches from stack center plane			0
rubber solution, milliliters			
First: AR Sodium Hydroxide 2 N.	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	0.998	0.991	1.092
Temperature °F.	53	62	53
Vacuum millimeters Hg.	42	62	138
Absolute Pressure mm. Hg.	703	683	607
Gas Metered, Gram Mols	1.050	1.063	1.042

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto
File No. 1142

Material: Inerteen PPO
Date: March 10, 1970

Barometer in. Hg. 29.36

Burn Temp. °F. 1800
Ambient Temp. °F. 46.

RUN NO. 5

Sampling Point	1	2	3
Inches from center line	24	24	8
Inches from stack center plane			0
Scrubber solution, milliliters			
First: AR Sodium Hydroxide 2 N.	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	1.000	1.005	1.084
Temperature °F.	51	61	53
Vacuum millimeters Hg.	42	51	138
Absolute Pressure mm. Hg.	704	695	608
Gas Metered, Gram Mols	1.050	1.095	1.036

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto File No. 1142

Material: Inerteen PPO Date: March 10, 1970

Barometer in. Hg. 29.36

Burn Temp. °F. 1600 Ambient Temp. °F. 46

RUN NO. 6

Sampling Point	1	2	3
Inches from center line	24	24	8
Inches from stack center plane			0
Scrubber solution, milliliters			
First: AR Sodium Hydroxide 2 N.	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	1.006	0.992	1.085
Temperature °F.	50	60	53
Vacuum millimeters Hg.	35	48	140
Absolute Pressure mm. Hg.	711	698	606
Gas Metered, Gram Mols	1.064	1.083	1.033

SECT. 0102-00,

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto File No. 1142

Material: Aroclor 1260 Date: March 10, 1970

Barometer in. Hg. 29.36

Burn Temp. °F. 2000 Ambient Temp. °G. 46

RUN NO. 7

Sampling Point	1	2	3
Inches from Center line	24	24	8
Inches from stack center plane			0
Scrubber solution, milliliters			
First: AR Sodium Hydroxide 2 N.	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	0.792	0.992	1.112
Temperature °F.	48	59	52
Vacuum millimeters Hg.	33	52	142
Absolute Pressure mm. Hg.	713	694	604
Gas Metered, Gram Mols	0.837	1.075	1.053

SECT. 0102-001

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto — File No. 1142

Material: Aroclor 1260 — Date: March 10, 1970

Barometer in. Hg. 29.38

Burn Temp. °F. 1800 — Ambient Temp. °F. 46

RUN NO. 8

Sampling Point	1	2	3
Inches from Center line	24	24	8
Inches from stack center plane			0
Scrubber solution, milliliters			
First: AR Sodium Hydroxide 2 N.	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	1.000	1.000	1.110
Temperature °F.	48	62	52
Vacuum millimeters Hg.	33	51	140
Absolute Pressure mm. Hg.	713	695	606
Gas Metered, Gram Mols	1.057	1.092	0.950

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto

Material: Aroclor 1260

Burn Temp. °F. 1600

File No. 1142

Date: March 10, 1970

Barometer in. Hg. 29.40

Ambient Temp. °F. 45

RUN NO. 9

Sampling Point	1	2	3
Inches from center line	24	24	8
Inches from stack center plane			0
Scrubber solution, milliliters			
First: AR Sodium Hydroxide 2N	175	175	175
Second: AR Toluene Malenkrodt	50	135	50
Meter Number	3	1	4
Calibration Factor	0.965	0.995	1.013
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	0.999	0.995	1.107
Temperature °F.	48	59	52
Vacuum millimeters Hg.	35	51	144
Absolute Pressure mm. Hg.	712	688	603
Gas Metered, Gram Mols	1.054	1.069	1.046

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Monsanto Company

File 1142
March 10, 1970

GAS ANALYSIS

Component	Sampling Point 2 Run No. 2 Mol. %	Sampling Point 2 Run No. 5 Mol. %	Sampling Point 2 Run No. 8 Mol. %
Hydrogen	0.00	0.00	0.00
Carbon Monoxide	0.00	0.00	0.00
Carbon Dioxide	5.79	6.91	4.45
Oxygen	4.22	4.36	3.56
Nitrogen	89.99	88.73	91.99
Totals	100.00	100.00	100.00

SECT. 0102-00

John Zink Pollution Research
A Division of JOHN ZINK Company
4401 SOUTH PEORIA • TULSA, OKLAHOMA 74105
PHONE 918 RI 7-1271

June 5, 1970

AIRMAIL

Monsanto Company
800 North Lindbergh Blvd.
St. Louis, Missouri 63166

Attention: Mr. Jeff Waldbeser,
Central Engineering

Gentlemen:

Enclosed you will find a table of the data resulting from the test conducted by John Zink on May 19, 1970. The particulate analysis from Wilson-Wright Laboratories is enclosed along with a data summary sheet of the information taken by John Zink Company.

General Discussion

The Aroclor 1260 burned well. We were able to reach the three desired temperatures of 2000° F, 2400° F, and 2800° F. The latter temperature was taken with an optical pyrometer as the range of our thermocouple went only to 2400° F. The Aroclor 1260 fed well at an estimated temperature of 180° F to 200° F.

The particulate reading for the Montars on the first run showed an abnormally high value as the filter plugged during the sampling run and was not noticed until after the run was completed. The other two readings of particulate showed good agreement. As you can see from the test data, we were unable to reach 2800° F with Montars. We feel this was due to the high calcium content in the Montars. We would like to discuss with you further the possibility of a "pyroburner" unit, (rotary kiln or like equipment) to remove the calcium product in the Montars. The residence times seem to agree well with our predictions. It was necessary to estimate the molecular weight of the Montars for theorectical combustion calculations.

When you have had a chance to look over the data and if you have further questions, please do not hesitate to contact us. We hope to discuss a complete thermal oxidation system for both these wastes with you at your early convience.

Thank you for the opportunity to serve you with John Zink equipment.

Yours truly,

MONS 095436

JOHN ZINK COMPANY

Chad Cantrell

RESULTS OF THERMAL OXIDIZER TEST

CONDUCTED FOR MONSANTO ON MAY 19, 1970 AT

JOHN ZINK COMPANY, TULSA OKLAHOMA

	Aroclor 1260 - Calc MW = 369.34			Montars: Calc. MW = 334.08		
	2000°F	2400°F	2800° F	2000° F	2400° F	2400° F
Waste Rate (gpm)	1.16	1.05	0.884	0.981	0.785	1.178
Fired Fuel (mm Btu/Hr.)	2.92	2.44	6.65	3.40	4.75	3.60
Quench Water Rate (gpm)	1.51	0	0	1.30	0	0
Stack Gas						
Combustibles (Vol.%)	0	0	0	0	0	0
Excess O_2 (Vol.%)	3.0	3.0	2.5	3.5	3.5	3.5
Excess Air (Vol.%)	15	15	12	17	17	12
Residence Time (Sec.) @ Sample Point						
1	~~1.94~~	~~2.16~~	~~1.36~~	~~2.06~~	~~1.98~~	~~1.69~~
2	1.73	1.92	1.21	1.83	1.76	1.51
3	1.14	1.27	0.80	1.03	1.16	0.99
Pressure (psig)						
Fuel	1.5	1.0	2.0	1.0	5.0	1.0
Waste	100	102	95	95	90	105
Steam	125	125	130	130	135	130
Quench Water	35	0	0	25	0	0
Pressure (in WC) Combustion Air	10.0	9.4	9.8	10.8	10.2	16.8
Time	1353	1120	1435	1700	1555	1735
Gun Type	EA	EA	EA	EA	EA	EA

Equipment: Horizontal Thermal Oxidizer with HI-10 Burner

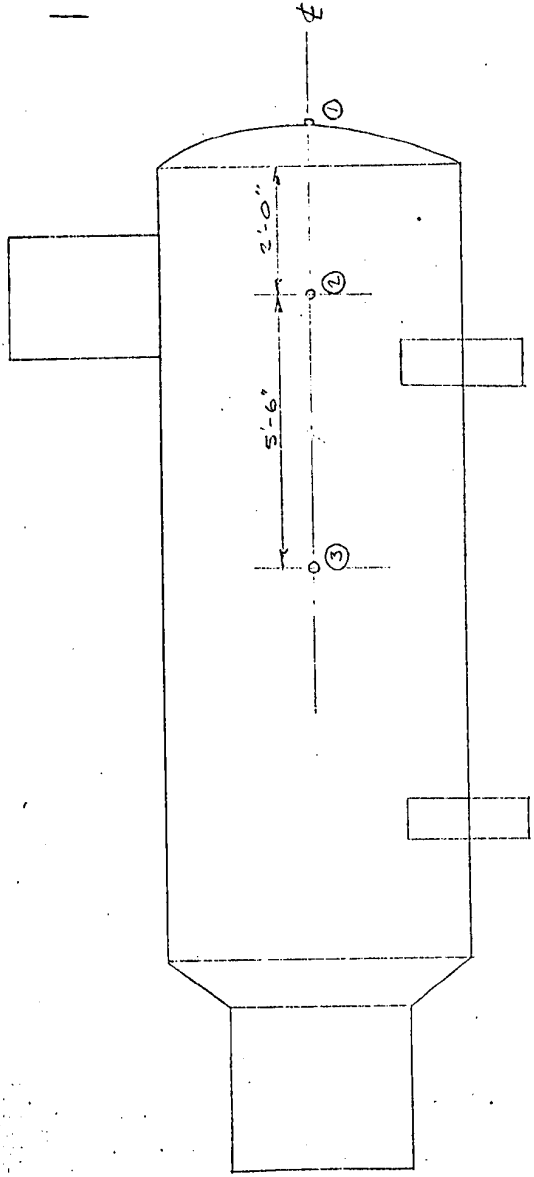
Personnel:
Monsanto — Jeff Waldbeser - Central Engineering
John Zink — Cliff Cantrell - Pollution Control
Gene McGill - Pollution Control
Sam Napier - Test Furnace

*estimated from optical pyrometer

MONS 095437

SECT. 0102-00

SECT. 0102-00



SAMPLE POINT LOCATION

MONSANTO TEST 5/19/70

5/19/70 CJC

MONS 095438

6-11-70

For 1260:

2000: $5.12 \frac{\text{moles}}{\text{min}} \frac{60 \text{ min}}{\text{hr}} \frac{1250}{946} = 409 \text{ moles/hr}$

2800: $6.57 \frac{\text{moles}}{\text{min}} \frac{60 \text{ min}}{\text{hr}} \frac{1250}{946} = 688 \text{ moles/hr}$

2000: $409 \frac{\text{moles}}{\text{hr}} \frac{379 \text{ ft}^3}{\text{mole}} \frac{.029 \text{ mg}}{\text{m}^3} \frac{\text{m}^3}{35.315 \text{ ft}^3} = 3.91 \text{ mg/hr} = .00086 \text{ lb/hr}$

2800: $688 \frac{\text{moles}}{\text{hr}} \frac{379 \text{ ft}^3}{\text{mole}} \frac{.038 \text{ mg}}{\text{m}^3} \frac{\text{m}^3}{35.315 \text{ ft}^3} = 281 \text{ mg/hr} = .00062 \text{ lb/hr}$

2000: $.00086 \text{ lb/hr} \frac{\text{sec}}{45000 \text{ ft}^3} \frac{\text{hr}}{3600 \text{ sec}} \frac{\text{ft}^3}{62.4 \text{ lb}} = .0000086 \text{ ppb in river}$

2800: $.00062 = .0000062 \text{ ppb in river}$

2000: $.00086 \text{ lb/hr} \frac{\text{day}}{1200 \text{ gal}} \frac{7.48 \text{ gal}}{\text{ft}^3} \frac{24 \text{ hr}}{\text{day}} \frac{\text{ft}^3}{62.4} = .206 \text{ ppb in sewer}$

2800: $.00062 = .149 \text{ ppb in sewer}$

2000: $.00086 \frac{\text{lb}}{\text{hr}} \frac{\text{hr}}{409 \text{ moles}} \frac{\text{moles}}{367.75 \text{ lb}} = .0057 \text{ ppm in flue gas}$

2200: $.00062 \frac{\text{lb}}{\text{hr}} \frac{\text{hr}}{688 \text{ moles}} \frac{\text{mole}}{367.5 \text{ lb}} = .0024 \text{ ppm in flue gas}$

2000: $.00086 \frac{\text{lb}}{\text{hr}} \frac{\text{min}}{100 \text{ gal}} \frac{\text{hr}}{60 \text{ min}} \frac{7.48 \text{ gal}}{\text{ft}^3} \frac{\text{ft}^3}{62.4 \text{ lb}} = .0162 \text{ ppm in scrubber liquor}$

2800: $.00062 = .0124 \text{ ppm in scrubber liquor}$

MONS 095439

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

June 1, 1970
File 1206

John Zink Company
P. O. Box 7388
Tulsa, Okla. 74105

Attention: Mr. Gene McGill

Gentlemen:

The following pages report the data measured during sampling from your Horizontal Thermo-Oxidizer on May 19, 1970. Two Monsanto materials, Aroclor 1260 and Montar were burned at three different temperatures.

Samples were taken at three points in the oxidizer, and the particulate matter in the stack was measured and sampled. The sampling was done following instructions given during the tests by Mr. Jeff Waldbeser.

The particulate matter results were reported to your Mr. Cantrell by phone May 25, 1970. The samples were packaged and shipped to Monsanto in St. Louis, Mo. attention Mr. Scott Tucker May 28, 1970.

We enjoy serving you.

Yours truly,

Clair C. Wilson

Clair C. Wilson

CCW:jw

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

June 1, 1970
File 1206

John Zink Company
Thermo-Oxidizer Tests
Monsanto - May 19, 1970

PROCEDURE

Samples of the burning material in the horizontal oxidizer were pulled through two (2) sintered glass gas dispersion absorbers with a vacuum pump, and the gas volume discharged from the pump was metered. The solution in the first scrubber was approximately one (1) normal sodium hydroxide and the second AR Grade Toluene.

Three (3) samples of the burning material were taken from the horizontal oxidizer at each burn temperature. The first sample, No. 1 was pulled vertical to the gas flow about 1 foot from the center of the oxidizer The second sample was pulled vertical to the gas flow approximately 1 foot from the centerline of the oxidizer and on the center plane of the stack. The third sample was pulled almost directly from the flow of the gas, 8 inches from the center line of the oxidizer and on the centerplane of the stack.

On the Montar burns, a sample of the stack gas was pulled through a quartz tube and through a 5 micron teflon filter held at 250°F. to prevent condensation of water. The rate and amount of gas pulled through the filter was metered.

On Tuesday morning, May 19, 1970 the horizontal thermo-oxidizer was fired and brought up to temperature. The aroclor was started burning and after the temperature was stabilized, at 2400°F., samples of the burning material were taken. Before all three samples had been taken, a nozzle on the injector plugged. Re-sampling was scheduled but only one point could be sampled as the quartz sample tubes were broken.

The sampling tubes were repaired and after lunch, the aroclor burn was started. After the burn temperaure stabilized at 2000°F., three samples of the burning material was taken.

The thermo-oxidizer was heated to 2800°F. and after the aroclor burn stabilized at this temperature, three samples of the burning material were taken.

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

June 1, 1970
File 1206

John Zink Company
Thermo-Oxidizer Tests
Monsanto - May 19, 1970

PROCEDURE - continued

The Montar was fed into the thermo-oxidizer and after the temperature stabilized at 2400°F. a sample of the particulate matter in the stack was taken. Approximately one cubic foot of gas was pulled through the filter. Examination indicated a possible leak in the filter. A second sample of the particulate matter was taken. After one tenth (0.1) cubic feet of gas was pulled through the meter, the filter plugged. Three samples of the burning material were taken.

Montar burning temperatures of 2000°F. was stabilized and approximately 1 cubic foot of stack gas was pulled through the filter in three minutes. Three samples of the burning material in the oxidizer were taken.

Burning conditions were adjusted to obtain maximum temperature with the Montar. After the temperature stabilized at 2400°F., approximately 1 cubic foot of stack gas was pulled through the filter in 3 minutes. Three samples of the burning material in the thermo-oxidizer were taken.

The data measured during sampling are on the following pages.

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto

Material: Aroclor 1260

File No. 1207

Date May 19, 1970

Barometer in. Hg 29.62

Burn Temp. °F. 2400

Ambient Temp. °F. 83

Run 1

Sampling Point	1	2	3
Sampler	Quarts	Ceramic	Quartz
Inches from center line	12	12	12
Inches from stack center plane		0	0
Scrubber solution, milliters			
First: 1 N. Sodium Hydroxide	150	150	150
Second: Toluene AR Grade	200	200	200
Meter Number	1	3	4
Time	10:40	10:40	10:40
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	0.759	0.963	1.005
Time	10:50	10:50	10:43
Temperature °F.	124	122	104
Cu. Ft. @ 60°F. 760 MM	0.669	0.849	0.917
Gram Mols	0.800	1.015	1.096

SECTION 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto	File No. 1206
Material: Aroclor 1260	Date May 19, 1970
	Barometer in. Hg. 29.62
Burn Temp. °F. 2400	Ambient Temp. °F. 85
Run 1	
Sampling Point	1
Sampler	Ceramic
Inches from center line	12
Incher from stack center plane	1
Scrubber solution, milliters	
First: 1 N. Sodium Hydroxide	150
Second: Toluene AR Grade	200
Meter Number	1
Time	11:30
Initial Reading Cu. Ft.	0.812
Final Reading Cu. Ft.	1.811
Time	11:33
Temperature °F.	125
Cu. Ft. @ 60°F. 760 mm	0.880
Gram Mols	1.052

MONS 095444

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto
Material: Aroclor 1260
Burn Temp. °F. 2000

File No. 1206
Date May 19, 1970
Barometer in. Hg. 29.56
Ambient Temp. °F. 91

Run 2

Sampling Point	1	2	3
Sampler	Quartz	Ceramic	Quartz
Inches from center line	12	12	12
Inches from stack center plane		0	0
Scrubber solution, milliters			
First: 1 N. Sodium Hydroxide	150	150	150
Second: Toluene AR Grade	200	200	200
Meter Number	1	3	4
Time	2:20	2:20	2:20
Initial Reading Cu. Ft.	0.000	0.000	0.000
Final Reading Cu. Ft.	1.005	0.603	1.000
Temperature °F.	130	130	112
Cu. Ft. @ 60°F. 760 MM	0.875	0.525	0.898
Gram Mols	1.046	0.628	1.073

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto
File No. 1206

Material: Aroclor 1260
Date May 19, 1970

Barometer in. Hg. 29.54

Burn Temp. °F. 2800
Ambient Temp. °F. 93

Run 3

Sampling Point	1	2	3
Sampler	Quartz	Ceramic	Quzrtz
Inches from center line	12	12	8
Inches from stack center plane		0	0
Scrubber solution, milliters			
First: 1 N. Sodium Hydroxide	150	150	150
Second: Toluene AR Grade	200	200	200
Meter Number	1	3	4
Time	2:40	2:40	2:40
Initial Reading Cu. Ft.	9.992	0.058	0.000
Final Reading Cu. Ft.	10.988	1.061	1.004
Temperature °F.	125	125	114
Cu. Ft. @ 60°F. 760 MM	0.873	0.880	0.898
Gram Mols	1.043	1.052	1.073

SECT 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto

Material: Montar

Burn Temp. °F. 2400

File No. 1206

Date May 19, 1970

Barometer in. Hg. 29.50

Ambient Temp. °F. 93

Run 4

Sampling Point	1	2	3
Sampler	Quartz	Ceramic	Quartz
Inches from center line	12	12	8
Inches from stack center plane		0	0
Scrubber solution, milliliters			
First: 1 N. Sodium Hydroxide	150	150	150
Second: Toluene AR Grade	200	200	200
Meter Number	1	3	4
Time	4:15	4:15	4:15
Initial Reading Cu. Ft.	0.000	0.057	1.005
Final Reading Cu. Ft.	1.000	1.000	2.012
Temperature °F.	117	120	118
Cu. Ft. @ 60°F. 760 MM	0.893	0.834	0.894
Gram Mols	1.068	0.997	1.068

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto — File No. 1206

Material: Montar — Date May 19, 1970

Barometer in. Hg. 29.50

Burn Temp. °F. 2000 — Ambient Temp. °F. 93

Run 5

Sampling Point	1	2	3
Sampler	Quartz	Ceramic	Quartz
Inches from center line	12	12	8
Inches from stack center plane		0	0
Scrubber solution, milliters			
First: 1 N. Sodium Hydroxide	150	150	150
Second: Toluene AR Grade	200	200	200
Meter Number	1	3	4
Time	5:05	5:05	5:05
Initial Reading Cu. Ft.	0.000	0.000	1.032
Final Reading Cu. Ft.	1.000	1.000	2.038
Temperature °F.	112	117	118
Cu. Ft. @ 60°F. 760 MM	0.894	0.889	0.897
Gram Mols	1.071	1.062	1.072

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

Company: Monsanto

Material Montar

Burn Temp. °F. 2400

File No. 1206

Date May 19, 1970

Barometer in. Hg. 29.50

Ambient Temp. °F. 93

Run 6

Sampling Point	1	2	3
Sampler	Quartz	Ceramic	Quartz
Inches from center line	12	12	8
Inches from stack center plane		0	0
Scrubber solution, milliters			
First: 1 N. Sodium Hydroxide	150	150	150
Second: Toluene AR Grade	200	200	200
Meter Number	1	3	4
Time	5:25	5:25	5:25
Initial Reading Cu. Ft.	0.000	0.000	1.100
Final Reading Cu. Ft.	1.007	1.013	2.041
Temperature °F.	115	119	115
Cu. Ft. @ 60°F. 760 MM	0.898	0.897	0.839
Gram Mols	1.073	1.072	1.003

SECT. 0102-00

WILSON-WRIGHT, INC. PETROLEUM LABORATORIES

BOX 2526 TULSA, OKLA. 74101 918 LU 4-6060 7 W. HASKELL

JOHN ZINK COMPANY

THERMO-OXIDIZER

File 1206

Monsanto - Montar Burns
May 19, 1970

Run No.	4	5	6
Burn Temp. °F.	2400	2000	2400
Cu. Ft. Sampled	0.1033	0.8923	0.8476
Rate Cu.Ft./Min.	0.091	0.297	0.356
Sampling Tip Velocity Ft./Min.			
Gas at 60°F.	312.	970.	1170.
Gas at Run Temp.	1752.	4700.	6570.
Particulate Loading			
Grams per Cu. Ft.	0.291	0.1114	0.1436
Grains per 100 Cu. Ft.	~~0.045~~ 450	~~0.0172~~ 172	~~0.0222~~ 222

MONS 095450

THERMAL OXIDATION OF AR[illegible]OR 1260 AND MONTAR 3

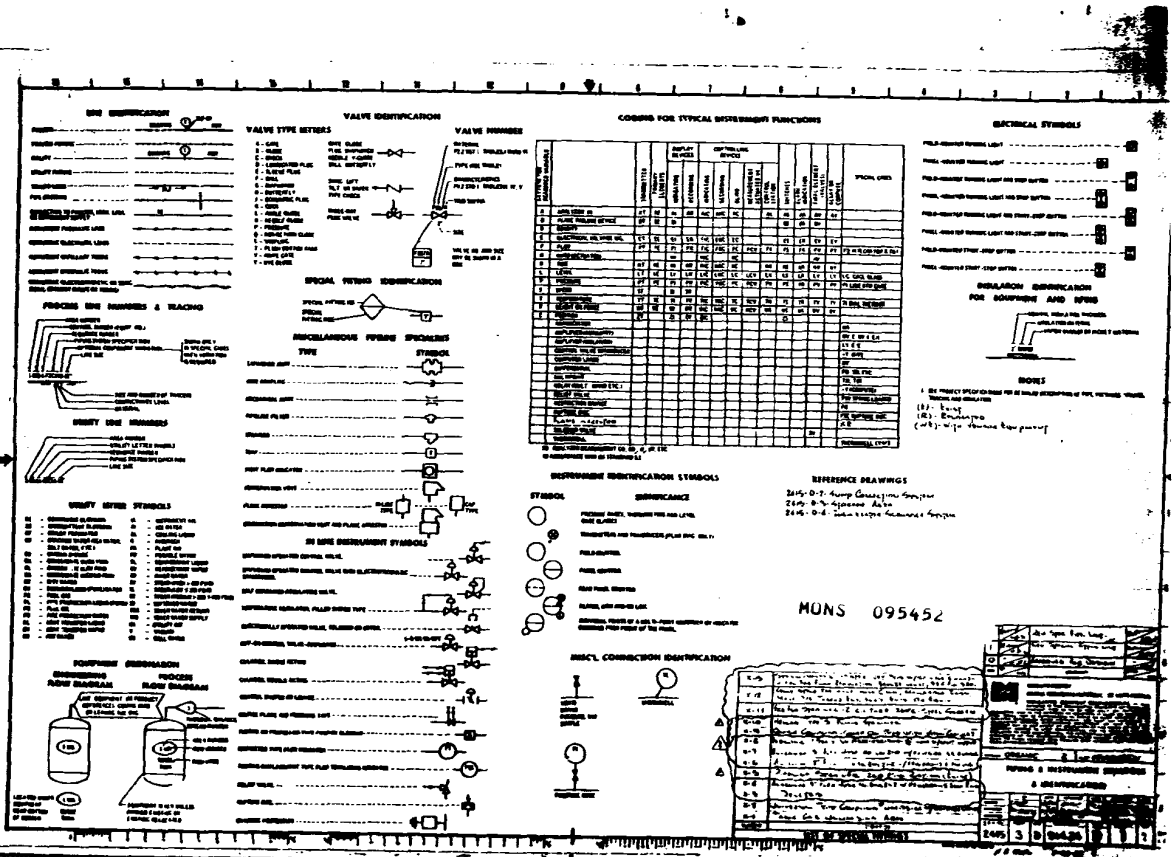
Material	Temp. °F	Run Sample Pt.	m^3 Sample Size	HCL g/m^3	Cl_2 mg/m^3	Total Org. Chlorine mg/m^3	Estimated PCB's mg/m^3
Aroclor 1260	2400	1-1	0.019	104.2	23.2	11.2	0.084
		1-2	0.024	92.9	14.6	1.5	0.045
		1-3	0.026	97.3	296.8	4.8	0.105
		1-1*	0.025	84.4	29.6	5.3	0.042
Aroclor 1260	2000	2-1	0.025	77.2	65.6	30.4	0.060
		2-2	0.015	84.0	78.7	ND	0.089
		2-3	0.025	69.2	61.2	3.6	0.048
Aroclor 1260	2800	3-1	0.025	51.6	155.6	98.8	0.038
		3-2	0.025	61.6	26.4	3.2	0.015
		3-3	0.025	68.8	47.6	1.4	0.032
Montar 3	2400	4-1	0.025	18.8	63.2	ND	0.017
		4-2	0.024	38.3	28.3	ND	0.020
		4-3	0.025	27.6	53.2	5.0	0.031
Montar 3	2000	5-1	0.025	76.4	18.8	22.4	0.033
		5-2	0.025	55.6	32.8	23.2	0.015
		5-3	0.025	84.8	26.4	3.2	0.029
Montar 3	2400	6-1	0.025	58.0	278.0	7.1	0.024
		6-2	0.025	52.4	38.4	94.0	0.002
		6-3	0.024	61.3	69.2	3.7	0.016

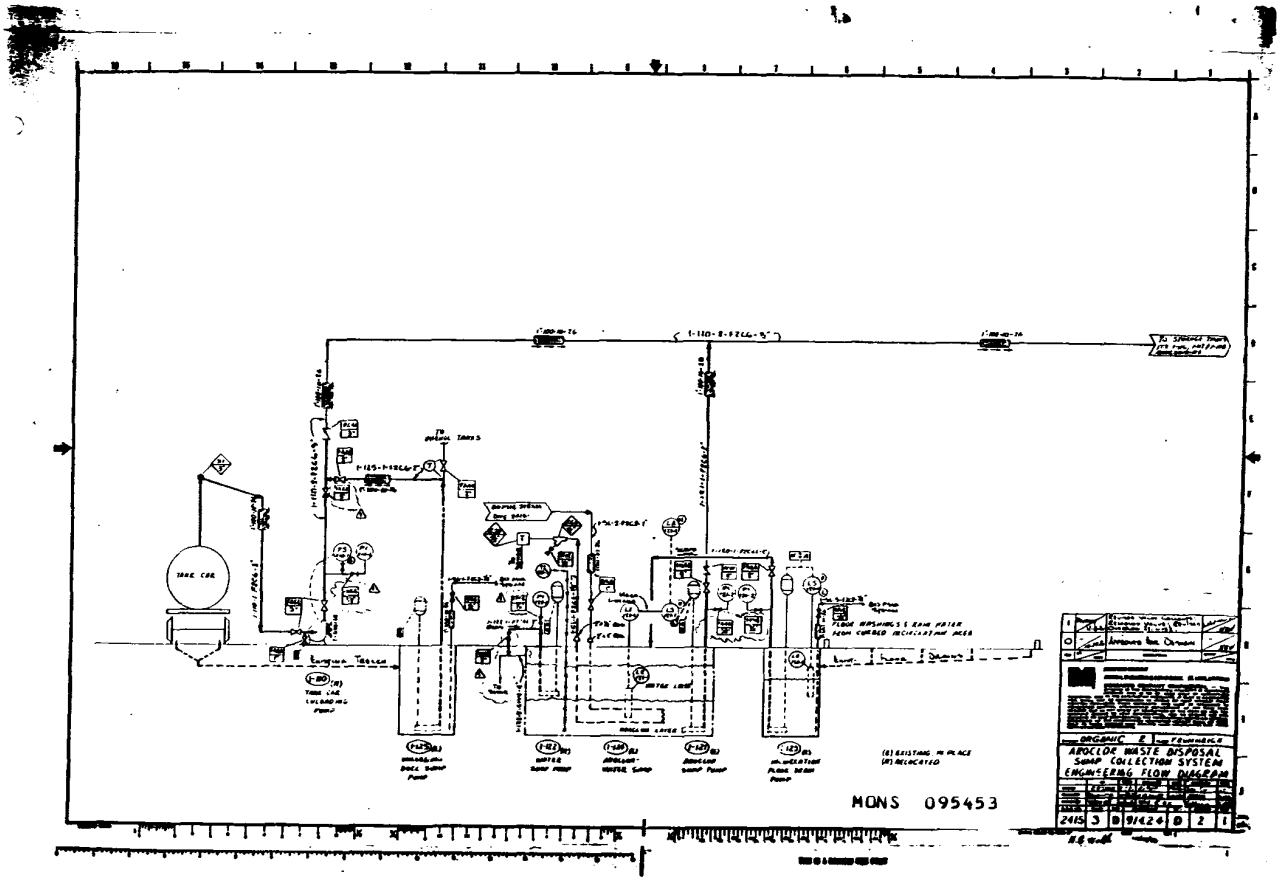
*Repeat Sample

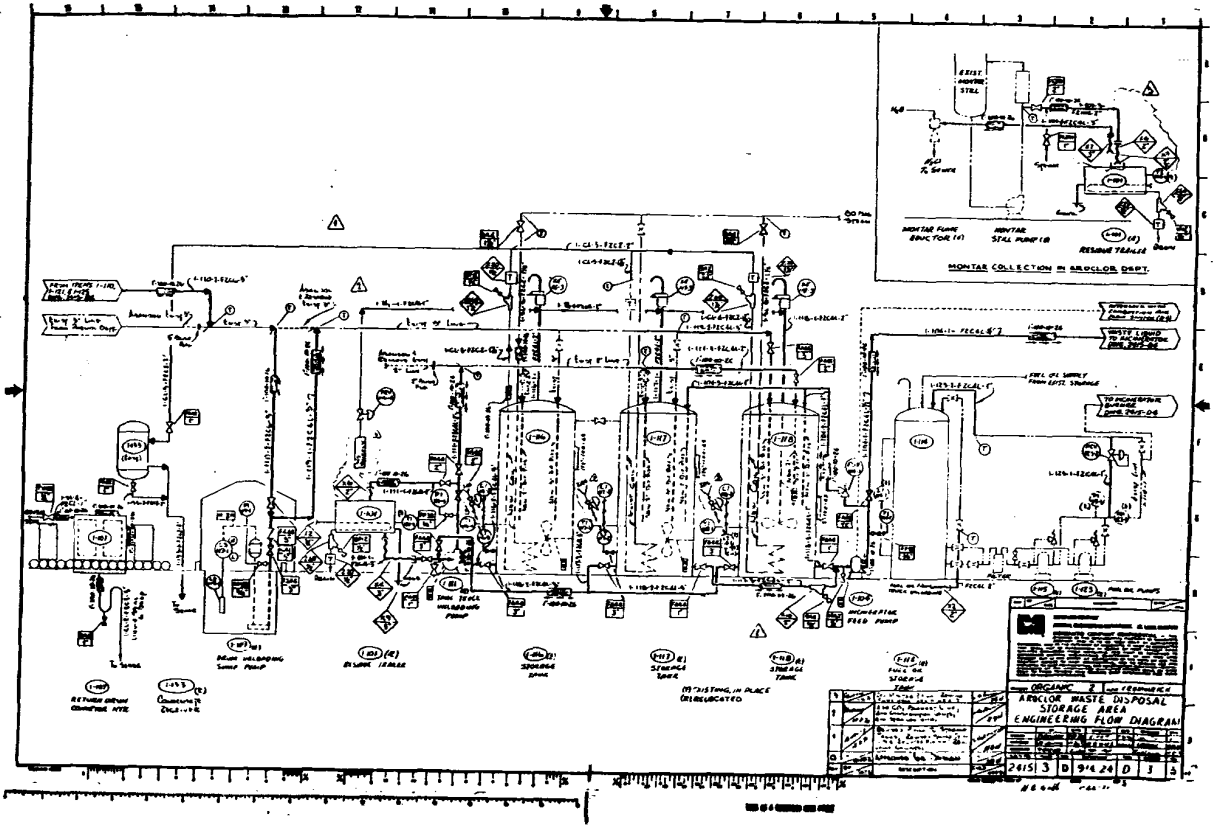
ND - None detectable above normal blank

MONS 095451

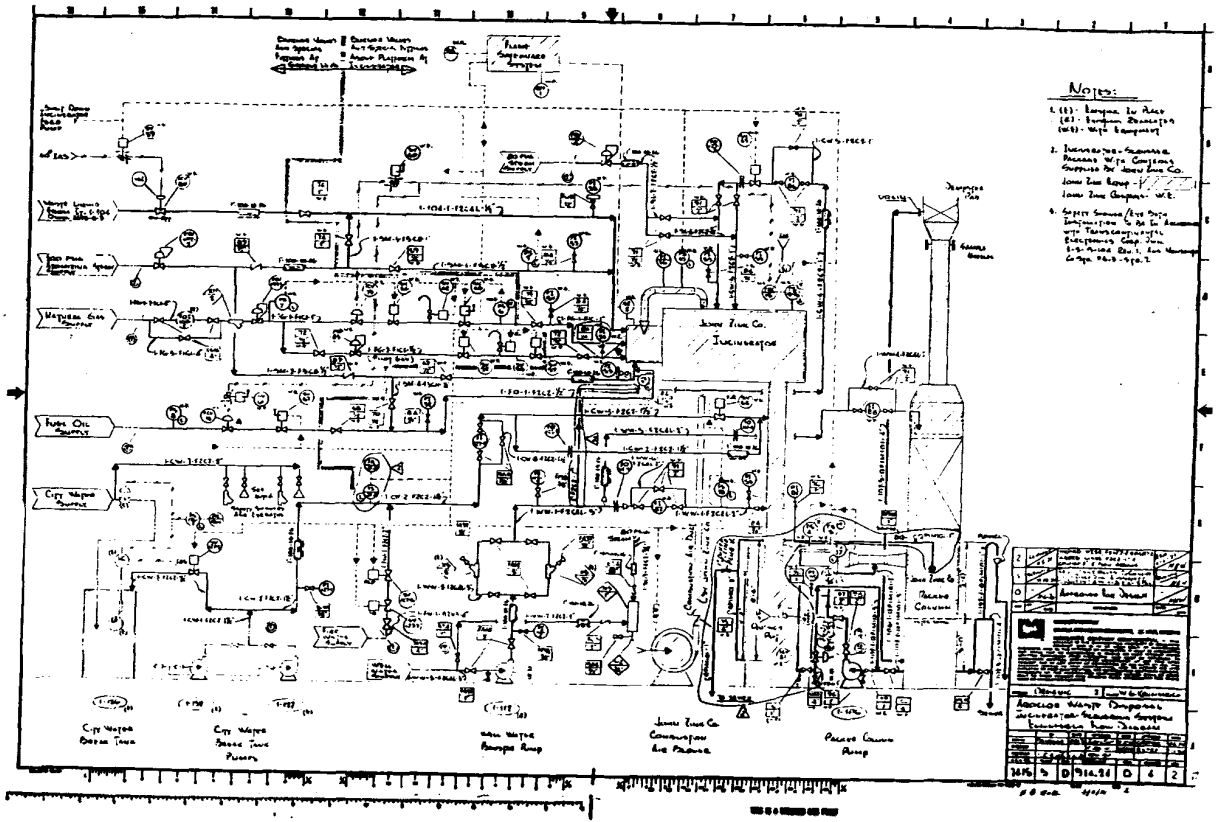
SECT. 0102-00


LINE IDENTIFICATION
VALVE IDENTIFICATION
VALVE TYPE LETTERS
VALVE MARKER
CODING FOR TYPICAL INSTRUMENT FUNCTIONS
ELECTRICAL SYMBOLS
PROCESS LINE NUMBERS & TRACING
UTILITY LINE NUMBERS
SPECIAL PIPING IDENTIFICATION
MISCELLANEOUS PIPING SYMBOLS
TYPE
SYMBOL
UTILITY LINES SYMBOLS
INSULATION IDENTIFICATION FOR EQUIPMENT AND LINES
NOTES
EQUIPMENT IDENTIFICATION
PROCESS FLOW DIAGRAM
INSTRUMENT IDENTIFICATION SYMBOLS
SYMBOL
SIGNIFICANCE
REFERENCE DRAWINGS
MISC'L CONNECTION IDENTIFICATION
MONS 095452


MONS 095453
ORGANIC
ARCOLOR WASTE DISPOSAL
SUMP COLLECTION SYSTEM
ENGINEERING FLOW DIAGRAM
2415 3 D 91424 D 2 1


MONTAR COLLECTION IN AROCLOR DEPT.
ORGANIC
AROCLOR WASTE DISPOSAL
STORAGE AREA
ENGINEERING FLOW DIAGRAM
2415 3 D 9-14-24 D 1 5

MONS 009454


Notes:
Jenny Zink Co.
Incinerator
Fuel Oil Supply
City Water Supply
City Water Bottom Tank
City Water Bottom Tank Pumps
Jenny Zink Co. Combustion Air Blower
Packer Column Pump
Packer Column
Aerocline Waste Disposal
Incinerator-Scrubber System
Engineering Flow Diagram
D
914.24
D
4
2

MONS 095455

APPENDIX A

[illegible] ENGINEERING DEPARTMENT — EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CEA NO.	AREA	P
N.BW	2415	01	1 OF 6
APPROVED BY	INITIAL ISSUE	REV. NO.	REV. ISSUED
	8/5/70		

[illegible] AROCLOR WASTE DISPOSAL

[illegible] ENT [illegible] CATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	** OPERATING WEIGHT (POUNDS)	REMARKS	[illegible]	[illegible]
[illegible]-101	RESIDUE TANK TRAILER	1	4000 GAL.	CARBON STEEL		INSULATED WITH HEATING COIL	E	
01-102	INCINERATOR-SCRUBBER SYSTEM INCLUDES INCINERATOR, QUENCH POT, VENTURI, PACKED COLUMN, STACK, AIR BLOWER, CONTROLS & SAFEGUARD SYSTEM.	1	BURN 1250 LB/HR OF AROCLOR OR MONTAR	VARIOUS		TO BE PURCHASED AS A PACKAGE	N	
01-103	CANCELLED	1	[illegible]	[illegible]		[illegible]	[illegible]	
01-104	INCINERATOR FEED PUMP	1	(1-5) GPM	TOOL STEEL ROTOR VITON A STATOR		MOYNO TYPE CDF	N	
01-104-001	MOTOR	1	3/4 HP				N	
~~01-105~~	~~QUENCHER PUMP~~	~~1~~	~~(35-40) GPM~~	~~EPOXY~~		CANCELLED	N	
~~[illegible]-105-001~~	~~MOTOR~~	~~1~~	~~5 HP~~				N	

MONS 095456

SECT. 0104

& SOURCE: N = NEW E = EXISTING R = TO BE RELOCATED

** ESTIMATED WEIGHT FILLED WITH NORMAL CONTENTS OR TEST MATERIAL, WHICHEVER IS HEAVIER

APPENDIX A

CENTRAL ENGINEERING DEPARTMENT — EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CE A NO	AREA	SHEET
NBW	2415	01	2 OF 6
APPROVED BY	INITIAL ISSUE	REV NO	REV ISSUED
	8/5/70		

PROJECT NAME: AROCLOR WASTE DISPOSAL

CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	OPERATING WEIGHT (POUNDS) **	REMARKS	SOURCE*	ESTIMATED PRICE ($)
01-106	PACKED COLUMN	1	80 GPM	HASTELLOY "C"		DURCO 2X1-18	N	
	CIRCULATING PUMP							
01-106-001	MOTOR	1	7½ HP 3500 RPM				N	
01-107	DRUM HEATER	1				CUSTOM FABRICATING CO	N	
~~01-108~~	~~COLLECTION TANK~~	~~1~~	~~(60-65) GPM~~	~~DUCTILE IRON~~		CANCELLED	N	
	~~TRANSFER PUMP~~	~~1~~	~~10 HP~~				N	
~~01-108-001~~	~~MOTOR~~							
~~01-109-A~~	~~RESIDUE TRAILER PUMP~~	~~1~~	~~50 GPM~~	~~DUCTILE IRON~~		CANCELLED	E	
~~01-109-B~~	~~MOTOR~~	~~1~~	~~10 HP~~				E	
01-110	TANK CAR UNLOADING PUMP	1	100 GPM	WORTHITE		WORTHINGTON SELF-PRIMING RELOCATE	E	
01-110-001	MOTOR	1	15 HP				N	
01-111	TANK TRUCK UNLOADING PUMP	1	100 GPM	DUCTILE IRON		DURCO A20 RELOCATE	E	
01-111-001	MOTOR	1	20 HP				E	

CE-884

* SOURCE: N=NEW E=EXISTING R=TO BE RELOCATED

** ESTIMATED WEIGHT FILLED WITH NORMAL CONTENTS OR TEST MATERIAL, WHICHEVER IS HEAVIER

MONS 095457

SECT. 0104-00

APPENDIX A

ENTRAL ENGINEERING DEPARTMENT EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CEA NO	AREA	F
NBW	2415	01	3 OF 6
APPROVED BY	INITIAL ISSUE	REV NO	REV ISSUED
	8/5/70		

PROJECT NAME: AROCLOR WASTE DISPOSAL

CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	OPERATING WEIGHT (POUNDS)	REMARKS	* CODE	ESTIMATED PRICE ($)
01-112	WELL WATER BOOSTER PUMP	1	(125-150) GPM	ALLOY 20.		DURCO A-70 RELOCATE	E	
01-112-001	MOTOR	1	75 HP			"	E	
~~1-113~~	~~COLLECTION TANK~~	~~1~~	~~320 GAL.~~	~~CARBON STEEL~~		CANCELLED	E	
1-114	FUEL OIL STORAGE TANK	1	13' O.D. X 20' HIGH	CARBON STEEL		IN PLACE	E	
1-115	FUEL OIL PUMP	1	1¼ X 1¼	CAST IRON		IN PLACE	E	
1-115-001	MOTOR		1.5 HP, 1200 RPM			" "	E	
1-116	STORAGE TANK	1	20,000 GAL.	CARBON STEEL		IN PLACE	E	
1-116-001	AGITATOR	1				" "	E	
1-116-002	MOTOR	1				" "	E	
1-116-003	COIL	1					N	

SECT. 0104-00

MONS 095458

CE-284

N = NEW E = EXISTING R = TO BE RELOCATED

** E... WEIGHT FILLED WITH NORMAL CONTENTS OR TEST MATERIAL, WHICHEVER IS HEAVIER

APPENDIX A

CENTRAL ENGINEERING DEPARTMENT — EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CEA NO	AREA	PAGE
NGW	2415	01	4 OF 6
APPROVED BY	INITIAL ISSUE	REV NO	REV ISSUED
	8/5/70		

PROJECT NAME: AROCLOR WASTE DISPOSAL

CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	** OPERATING WEIGHT (POUNDS)	REMARKS	* SOURCE	ESTIMATED PRICE ($)
1-117	STORAGE TANK	1	20,000 GAL.	CARBON STEEL		IN PLACE	E	
1-117-001	AGITATOR	1				" "	E	
1-117-002	MOTOR	1				" "	E	
1-117-003	COIL	1				" "	E	
1-118	STORAGE TANK	1	20,000 GAL.	CARBON STEEL		IN PLACE	E	
1-118-001	AGITATOR	1				" "	E	
1-118-002	MOTOR	1				" "	E	
1-118-003	COIL	1				" "	E	
1-119	DRUM UNLOADING SUMP PUMP	1	50 GPM	DUCTILE IRON		TABER CZ VERT. IN PLACE	E	
1-119-00	MOTOR	1	7½ HP, 1800 RPM			" "	E	
1-120	INCINERATION FLOOR DRAIN SUMP PUMP	1	100 GPM	304 S.S.		TABER CZ VERT. IN PLACE	E	
1-120-001	MOTOR	1	5 HP, 1800 RPM			" "	E	

MONS 095459

SECT. 0104-00

CE-324

* SOURCE: N = NEW E = EXISTING R = TO BE RELOCATED

** ESTIMATED WEIGHT FILLED WITH NORMAL CONTENTS OR TEST MATERIAL, WHICHEVER IS HEAVIER

APPENDIX A

ENTRAL ENGINEERING DEPARTMENT EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CEA NO.	AREA	PA
W. G. N.	2415	01	5 OF 6
APPROVED BY	INITIAL ISSUE	REV NO.	REV ISSUED
	8/5/70		

PROJECT NAME: AROCLOR WASTE DISPOSAL

CEO EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	** OPERATING WEIGHT (POUNDS)	REMARKS	* SOURCE	ESTIMATED PRICE ($)
1-121	AROCLOR SUMP PUMP	1	50 GPM	DUCTILE IRON		GOULDS MODEL 3171 IN PLACE	E	
-121-001	MOTOR	1	10 HP			" "	E	
1-122	WATER SUMP PUMP	1	100 GPM	DUCTILE IRON		TAGER C2 VERT.	E	
1-122-001	MOTOR	1	5 HP			TEFC RELOCATE	E	
1-123	FUEL OIL PUMP	1	1¼ x 1¼	CAST IRON		IN PLACE	E	
1-123-001	MOTOR	1	1.5 HP, 1200 RPM			" "	E	
1-124	AROCLOR-WATER SUMP	1	10,000 GAL	CONCRETE		IN PLACE	E	
1-125	UNLOADING DOCK SUMP PUMP	1	75 GPM	316 S.S.		IN PLACE	E	
1-125-00	MOTOR	1	7½ HP, 1200 RPM			" "	E	
1-126	CITY WATER BREAK TANK	1		CARBON STEEL		IN PLACE	E	
1-127	CITY WATER BREAK TANK PUMP	1				" "	E	
1-127-00	MOTOR	1				" "	E	

MONS 095460

SECT. 0104-00

CE-224

* SOURCE: N = NEW E = EXISTING R = TO BE RELOCATED

** ESTIMATED WEIGHT FILLED WITH NORMAL CONTENTS OR TEST MATERIAL, WHICHEVER IS HEAVIER

CENTRAL ENGINEERING DEPARTMENT — EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CEA NO	AREA	P.
W.G.N.	2415	01	6 of 6
APPROVED BY	INITIAL ISSUE	REV NO	REV ISSUED
	8/5/70		

PROJECT NAME: AROCLOR WASTE DISPOSAL

CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	** OPERATING WEIGHT (POUNDS)	REMARKS	* SOURCE	ESTIMATED PRICE ($)
1-128	DRUM UNLOADING HOIST	1	½ TON	CARBON STEEL		HAND OPERATED HYDRAULIC	N	
~~1-129~~	~~TANK CAR UNLOADING ARM~~	~~1~~	~~3"~~	~~CARBON STEEL~~		CANCELLED	N	
~~1-130~~	~~VENT BLOWER~~	~~1~~		~~CARBON STEEL~~		CANCELLED RELOCATE	E	
~~1-131~~	~~DRUM WASHER~~	~~1~~				CANCELLED	N	

MONS 095461

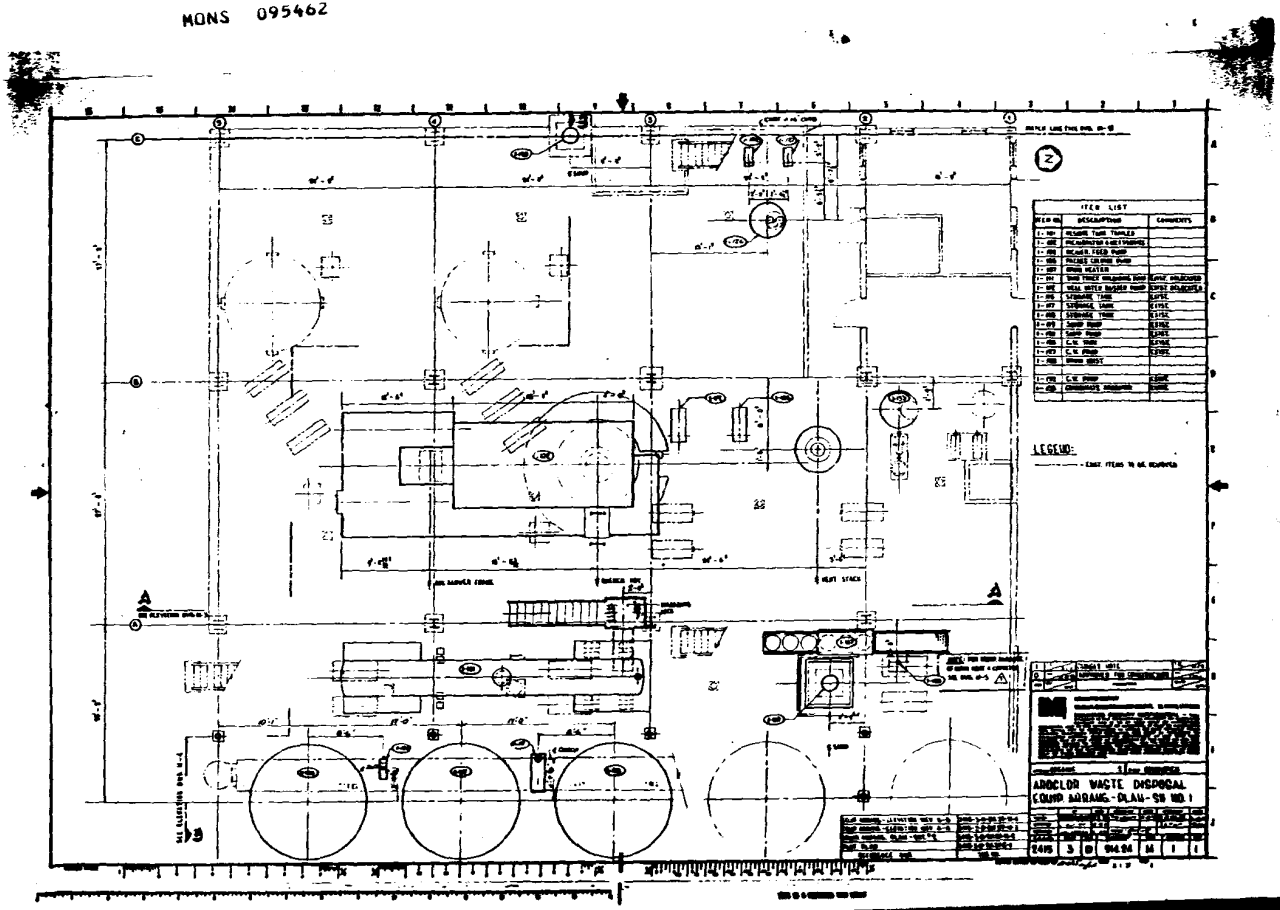
SECT 0104-00

CE-226

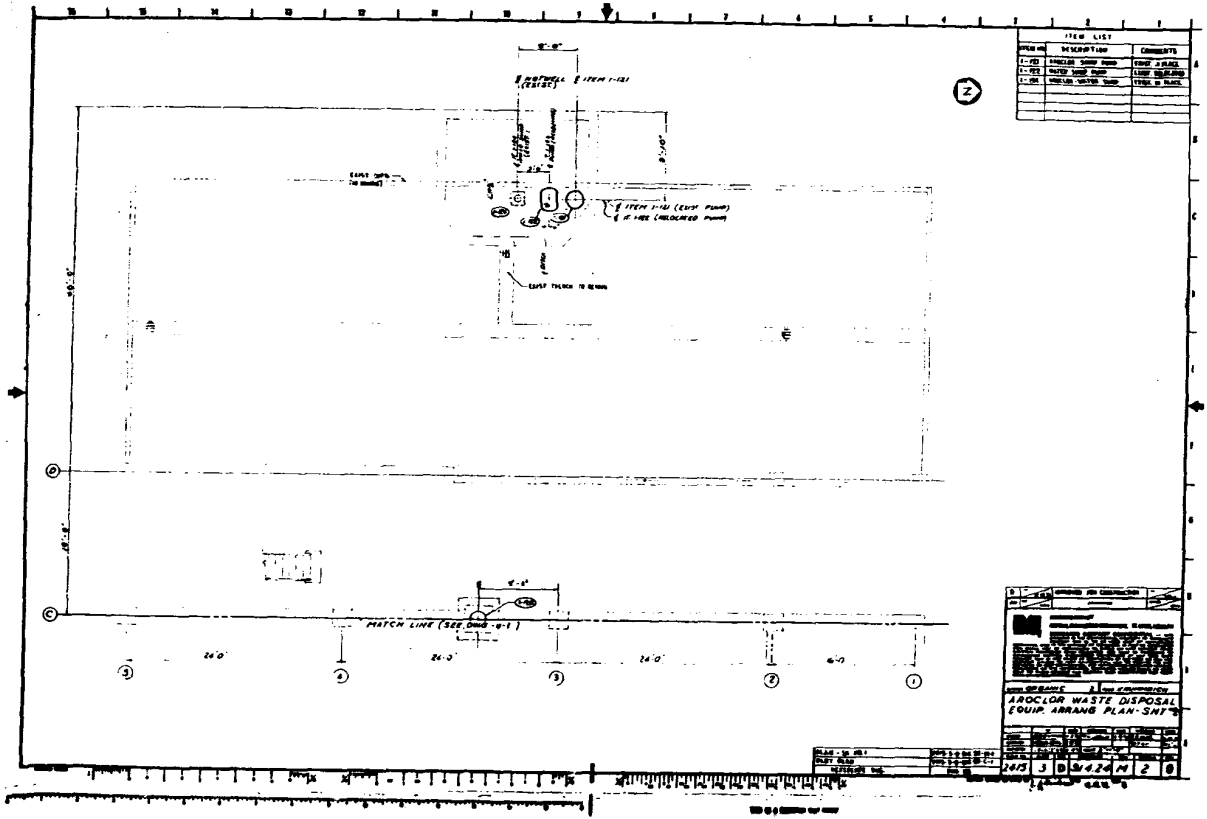
* SOURCE: N=NEW E=EXISTING R=TO BE RELOCATED

** ... OPERATIVE OR TEST MATERIAL, WHICHEVER IS HEAVIER

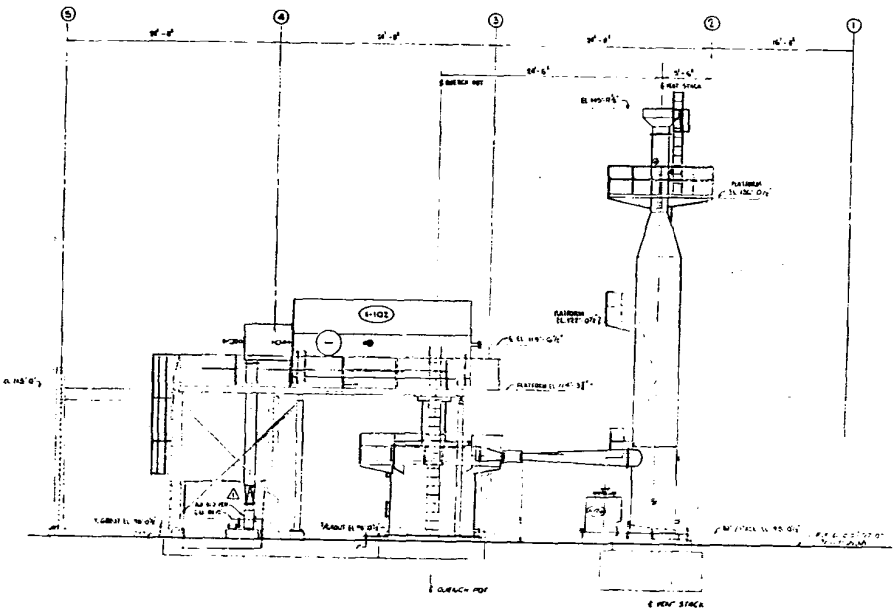
MONS 095462


ITEM LIST
LEGEND:
ARCOLOR WASTE DISPOSAL
EQUIP ARRANG. - PLAN - SH NO 1

MONS 095463


ITEM LIST
DESCRIPTION
COMMENTS
MATCH LINE (SEE DWG -4-1)
24'0"
24'0"
24'0"
6'0"
AROCLOR WASTE DISPOSAL
EQUIP. ARRANG PLAN-SHT 2
2415
3
D
3/4.24
M
2
0

MONS 095464

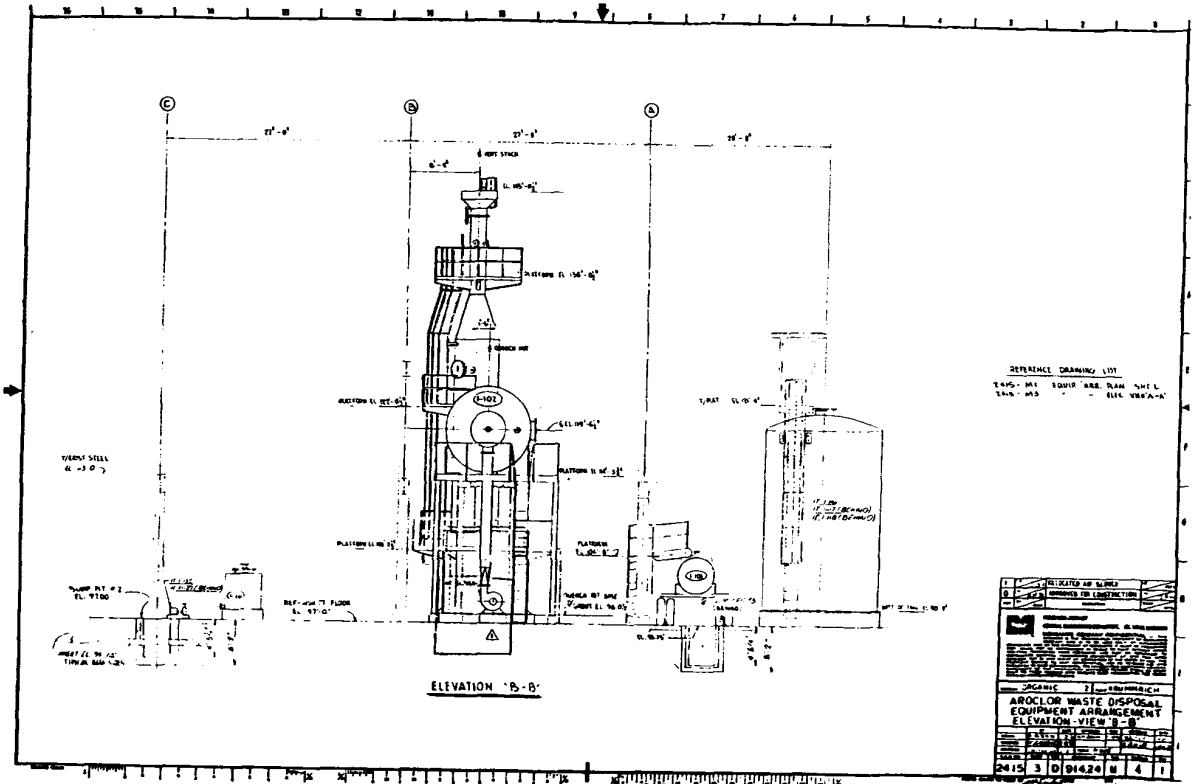


ELEVATION A-A

AROCLOR WASTE DISPOSAL
EQUIP ARRANG.-ELEV-VIEW A-A

2415 | 3 | D | 814.24 | M | 3 | 1

MONS 095465


C
B
A
REFERENCE DRAWING LIST
ELEVATION 'B-B'
AROCLOR WASTE DISPOSAL
EQUIPMENT ARRANGEMENT
ELEVATION-VIEW 'B-B'

1. REFERENCES

Project Scope Report - August 6, 1970
Project Organization and Procedure - September 25, 1970
Master Project Schedule - October 14, 1970
Standard Code of Accounts - September 17, 1970
Process Flow Sheets - October 27, 1970

2. This Electrical Design Basis describes the in battery limits electrical systems (control, grounding, lighting, and power) that will be designed for the Arocolor Waste Disposal Project.

The appropriation for the electrical facilities is as follows:

Code Category	Amount
01 (Motors)	$ 500
04 (Electrical Only)	2,000
10	0
13	29,500
Total Capital for Equipment, Material and Labor	$32,000
80 (Cost Center 45-46)	$ 8,000
90, 92, and 93 (Expense)	2,000

3. GENERAL DESCRIPTION OF THE ELECTRICAL FACILITIES

This project consists of an incinerator from John Zink Company, storage facilities for used aroclor, tank truck and tank car unloading stations, and a drum unloading station. Of the twenty motors required: eight are existing and require no change, two are existing but require rewiring of control circuits, the remaining ten are new or relocated and require power and control wiring. The existing MCC's 8A2, 8C and 8D will be used for the new and relocated motors. Approximately six new light fixtures will be installed for the incinerator and area lighting. John Zink will supply the control panel for the incinerator. The existing lighting panel will be used to supply power to the new lighting and instrumentation.

4. PROJECT RISK

There is no project risk with the proposed electrical installation.

5. ELECTRICAL EQUIPMENT AND MATERIAL REMOVALS

One motor starter and one fusible disconnect will be relocated from MCC 8A1 to MCC 8A2.

6. SCHEDULE

Electrical design and drawing completion - 8 February, 1971
Start construction on project - 8 March, 1971
Startup date on project - 10 May, 1971

7. ELECTRICAL DRAWINGS

This project will require approximately 15 new drawings and revisions to approximately 4 existing drawings. See attached drawing status report.

8. ELECTRICAL PURCHASING

CED will purchase all new motor starters, control stations, light fixtures, motors and cable.

Field construction will purchase all wire, conduit, conduit fittings, lamps, fuses, and motor overloads.

9. CONSTRUCTION AND STARTUP ASSISTANCE PROVIDED OR ARRANGED FOR BY THE DESIGN SECTION

The electrical installation should require minimal assistance. No vendor assistance is anticipated. Assistance will be provided at the request of the project manager.

10. COMPLETION CRITERIA

This project will be considered to be electrically complete when all electrical equipment that was scheduled for modification has been properly modified or relocated and all new electrical equipment has been properly installed and the operation of the new and modified electrical equipment has been demonstrated to be satisfactory to the Project Manager and to the Plant Manager or his designee.

11. ELECTRICAL CODES

All electrical installations will be made in accordance with the latest issue of the National Electrical Code and the National Electrical Safety Code.

12. ELECTRICAL STANDARDS

This project will use those electrical items and materials that are covered by the Monsanto Electrical Standards as applicable to the W. G. Krummrich Plant.

13. HAZARD CLASSIFICATION

The immediate area around the drum unloading sump is classified Class I Division I Group D due to the flammable material returned with the used aroclor. The other areas of the project are non-hazardous.

14. SPECIAL SAFETY CONSIDERATIONS

None.

15. SPECIAL SAFETY CONSIDERATIONS

All conduit and fittings will be plasti-bond due to the HCL fumes and other corrosive chemicals present. All control stations to be corrosion resistant.

16. SPECIAL PROTECTIVE COATINGS AND EQUIPMENT PAINTING

All painted equipment is to have a paint system which is 5 mils thick.

17. POWER SUPPLY REQUIREMENTS AND SOURCE OF POWER

	INSTALLED HP	INSTALLED KVA	ESTIMATED DEMAND
460 Volt 3 phase 60 hertz power for motors	320		250
460 Volt 3 phase 60 hertz power for heaters		0	0
120 Volt 1 phase 60 hertz power for lighting		2	2
120 Volt 1 phase 60 hertz power for instrument		3	3

The loads will be divided among the existing MCC's.

MCC - 8A2	8C	8D
LOAD - 100 HP	190 HP	30

18. EMERGENCY POWER SYSTEMS

None.

19. SPECIAL ELECTRICAL EQUIPMENT

None.

20. WIRING SYSTEMS

All wire will be stranded copper. No conductor smaller than #14 will be installed. Control wire will be #14, lighting conductors will be #12 and above. Type THW 600 Volt insulation is specified.

21. SUPPORTS FOR CONDUIT AND EQUIPMENT MOUNTING

Conduit will be supported from the building steel with trapeze type hangers. Individual control stations will be supported by the conduit. Light fixtures will be clamped to building steel or hand rails.

22. MOTORS

Approximately six new motors will be purchased for this project. All motors shall have TEFC enclosures, Allis-Chalmers type RGZ preferred. Approximately four existing motors will be relocated. See attached list.

23. SPARE PRIME MOVERS

None.

24. MOTOR CONTROL CENTERS

The existing MCC's 8A2, 8C and 8D will be used.

25. INDIVIDUALLY MOUNTED MOTOR STARTERS

None.

26. MOTOR CONTROL CIRCUIT REQUIREMENTS

Motors will have local start-stop (Allen-Bradly type 4X) only. Control voltage will be 120 volts.

27. ELECTRICAL CONTROL PANELS

A combination instrument-electrical control panel will be built for the burner controls. This panel will be supplied by John Zink.

28. CONDUCTOR IDENTIFICATION

All wires will be labeled at all terminal blocks and devices using Brady 500 wire markers with the numbers and/or letters that are indicated on the appropriate electrical drawings.

29. POWER PANELS

None.

30. POWER RECEPTACLES

Two welding receptacles will be provided near the incinerator.

31. POWER FACTOR CORRECTION EQUIPMENT

None.

32. LIGHTING SYSTEMS

Approximately six 175 watt mercury vapor light fixtures will be mounted on or around the incinerator platforms. Approximately four light fixtures will be mounted on the packed column. All lights will be 120 volt 60 hertz and be powered from the existing lighting panel.

43. RAILROAD CAR PULLERS

None.

44. EQUIPMENT NAMEPLATES

Furnished by CED.

45. SKETCHES AND SCHEMATICS

See attached typical motor schematics.

46. INTERLOCKS

See attached motor schematics. The incinerator will shutdown on flame-out, high temperature, low air flow and/or low water flow.

47. OPERATING INSTRUCTIONS

Operating instructions for the incinerator will be supplied by John Zink.

48. FORMS USED WITH DESIGN BASIS

ES 25 - Power and Motor Summary.

CE-101 - Drawing Status Report.

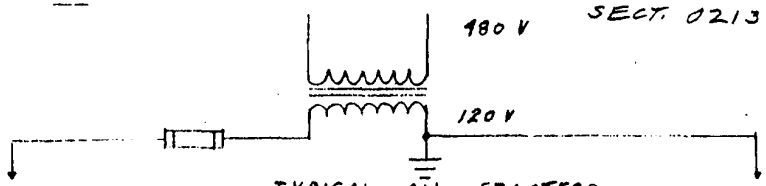
CENTRAL ENGINEERING DEPARTMENT

MOTOR SCHEMATICS

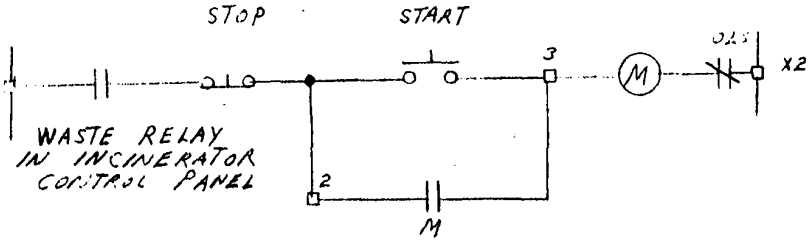
PROJ/DEPT AROCLOR WASTE DISPOSAL
PLANT WGR DIVISION OR

EQUIP. IDENT. NO
CEA NO. 2415 AREA NO. 01
BY K. JOHNSTON
DATE SHEET 1 OF

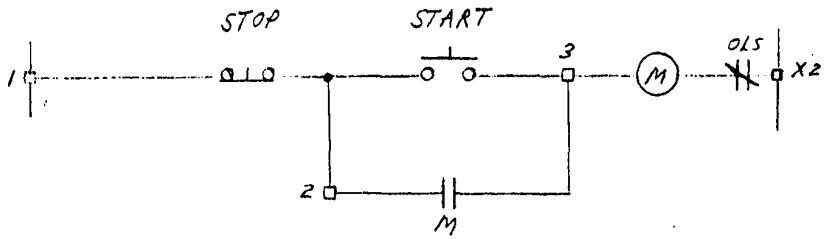
SECT. 0213-01



TYPICAL ALL STARTERS



01-104-001 INCINERATOR FEED PUMP



01-111-001 TANK TRUCK UNLOADING PUMP

01-112-001 WELL WATER BOOSTER PUMP

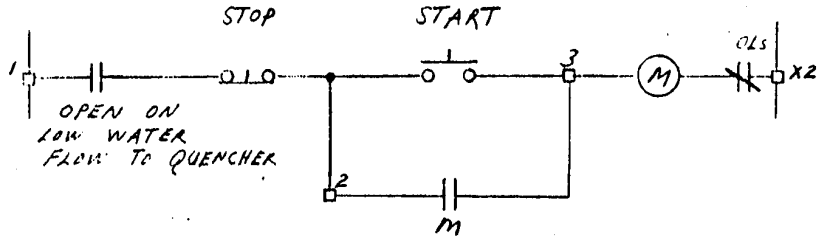
01-130-001 VENT BLOWER

01-122-001 WATER SUMP PUMP

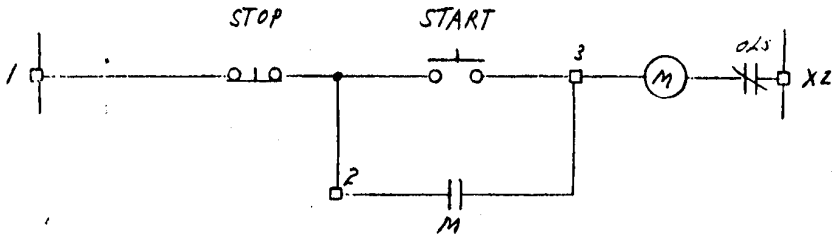
MONS 095569

ES-7

SECT. 0213-01



01-102-001 INCINERATOR AIR BLOWER



01-106-001 PACKED COLUMN CIRC. PUMP

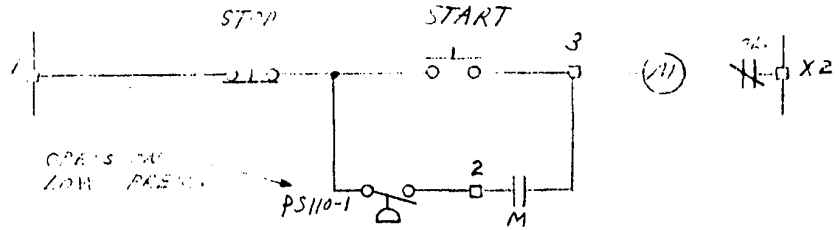
CENTRAL ENGINEERING DEPARTMENT

MOTOR SCHEMATICS

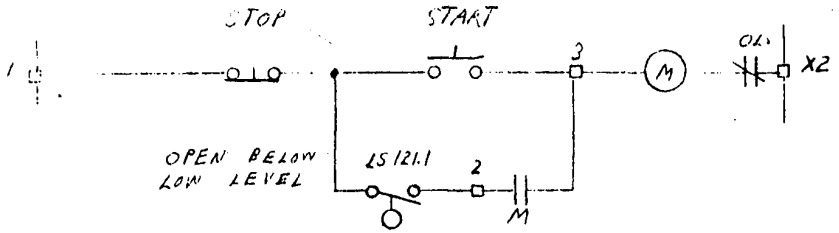
PROJ/DEPT AROCLOR WASTE DISPOSAL
PLANT W.G.R. DIVISION OR

EQUIP. IDENT. NO
CEA NO. 2415 AREA NO. 01
BY R. JOHNSTON
DATE SHEET 3 OF

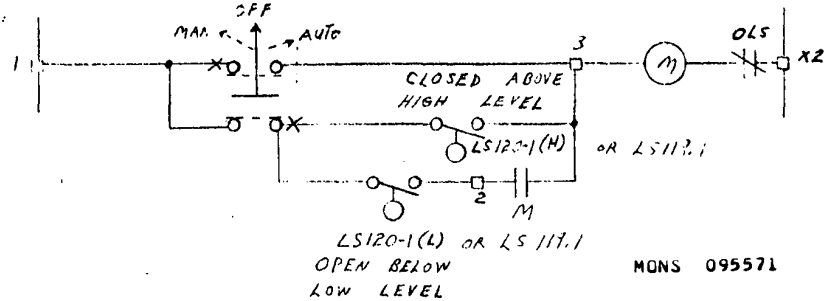
SECT. 0213-01



01-110-001 TANK CAR UNLOADING PUMP



01-121-001 AROCLOR SUMP PUMP



MONS 095571

01-120-001 INCINERATION FLOOR DRAIN
01-119-001 DRUM UNLOADING SUMP PUMP

THIS SUMMARY INCLUDES MOTORS, POWER EQUIPMENT AND CONTROL DEVICES FOR MOTORS AND POWER EQUIPMENT FOR THE PROCESS AND/OR THE SUPPORTING FACILITIES.

INSTRUMENTS AND CONTROL DEVICES FOR PROCESS CONTROL ARE IN THE INSTRUMENT INDEX.

REVISIONS
BY
BY
BY
BY

DWG. NO. 2313 AREA NO. 01
BY K. JOHNSTON
DATE SHEET 1 OF 2

ELECTRICAL POWER AND CONTROL SUMMARY
PROJECT AROCLOR WASTE DISPOSAL
DIV. ORE. PLANT W.G.K.

EQUIPMENT DESCRIPTION		MOTOR OR LOAD DATA				STARTER DATA				CONTROL DEVICES		REMARKS
EQUIPMENT NUMBER / DIAGRAMMATIC SYMBOL	FUNCTION IDENTIFICATION NAMEPLATE	HP or KW SYN RPM	FL AMPS WIRE SIZE	FRAME NO. TYPE ENCL.	VENDOR NUMBER PHYSICAL DIMENSION MOTOR OR LOAD LOCATION	STARTER SIZE MCC COMPT. NO.	SW. DISC. PUSH BUTTONS FU AMP RATING	OL HTR. CAT. NO. CONTROL TRANS VA	EXTRA AUX CONTACTS SPECIAL FEATURES NO NC	MANUAL	AUTOMATIC AUTO DEVICES WHICH CONTROL THE MOTOR OR EQUIPMENT	SPECIAL ITEMS SUCH AS SPECIAL WIRING OF STARTER, MOTOR OR EQUIPMENT, ALSO ITEMS REQUIRED BY STARTER AND MISCELLANEOUS DEVICES
EQUIPMENT NUMBER / DIAGRAMMATIC SYMBOL	NP. NO.					SIZE	SW	OL HTR	NO NC			
OF-102-001	INCINERATOR AIR BLOWER	100				5	100			(1)	LOW FLOW WATER STOPS BLOWER	
						COMPT. NO. 8C-2FK	FU	TRANSF VA				
EF-104-001	INCINERATOR FEED PUMP	3				SIZE 1	SW 30	OL HTR	NO NC	(1)	INCINERATOR SHUTDOWN STOPS PUMP	
		1800				COMPT. NO. 8A2-2K1	FU	TRANSF VA				
						SIZE 1	SW 30	OL HTR	NO NC	⬡		
						COMPT. NO.	FU	TRANSF VA				
EJ-126-001	PACKED COLUMN CIRCULATING PUMP	15				SIZE 2	SW 60	OL HTR	NO NC	(1)	NONE	
		3600				COMPT. NO. 8A2-2K2	FU	TRANSF VA				
EH-128-001	DRUM HOIST					SIZE 1	SW 30	OL HTR	NO NC	⬡		REVERSING !
						COMPT. NO.	FU	TRANSF VA				
						SIZE	SW	OL HTR	NO NC	⬡		
						COMPT. NO.	FU	TRANSF VA				
OF-110-001	TANK CAR UNLOADING PUMP	15				SIZE 2	SW 60	OL HTR	NO NC	(1)	LOW PRESSURE PS 110-1 STOPS PUMP	
		1800				COMPT. NO. 8A2-3K2	FU	TRANSF VA				
OF-111-001	TANK TRUCK UNLOADING PUMP	15	19.5	284U		SIZE 2	SW 60	OL HTR	NO NC	(1)	NONE	
		1800				COMPT. NO. 8A2-4K2	FU	TRANSF VA				
OF-112-001	WELL WATER BOOSTER PUMP	75	95	365TS		SIZE 3	SW 100	OL HTR	NO NC	(1)	NONE	
		3600				COMPT. NO. 8C-1FK	FU	TRANSF VA				
OF-116-003	E STORAGE TANK AGITATOR (209)	10	13.7	256U		SIZE 1	SW 30	OL HTR	NO NC	(1)		NO CHANGE REQUIRED
		1800				COMPT. NO. 8A2-1K2	FU	TRANSF VA				
OF-117-003	E STORAGE TANK AGITATOR (206)	10	13.7	256U		SIZE 1	SW 30	OL HTR	NO NC	(1)		NO CHANGE REQUIRED
		1800				COMPT. NO. 8A2-1K3	FU	TRANSF VA				
OF-118-003	E STORAGE TANK AGITATOR (210)	15				SIZE 2	SW 60	OL HTR	NO NC	(1)		REPLACE START-STOP PB
		1800				COMPT. NO. 8A2-4K3	FU	TRANSF VA				
OF-119-001	DRUM UNLOADING SUMP PUMP	5 1/2				SIZE 1	SW 30	OL HTR	NO NC	(2)	LEVEL SWITCH LS 119-1 STARTS AND STOPS PUMP IN AUTO POSITION	
		1800				COMPT. NO. 8A2-3F1	FU	TRANSF 50				

MONS 095572

GENERAL SPECIFICATIONS UNLESS OTHERWISE NOTED

1. ALL MOTORS AND POWER EQUIPMENT ARE FOR 460 VOLT, 3-PHASE, 60 HERTZ OPERATION.
2. ALL MOTORS ARE NEMA DESIGN B, HORIZONTAL, SQUIRREL CAGE INDUCTION.
3. STARTERS ARE COMBINATION, FULL VOLTAGE, NON-REVERSING, 3 POLE WITH FUSIBLE DISTECH AND FUSE TRON FUSES.
4. EACH STARTER HAS 2 OVERLOAD RELAYS.
5. EACH CONTROL POWER TRANSFORMER HAS A 115 VOLT SECONDARY, THE X1 TERMINAL IS FUSED AND THE X2 TERMINAL IS GROUNDED.
6. THE TABULATED CONTROL DEVICES ARE EXTERNAL TO THE STARTER.

MCC VENDOR & PO NO.

SPECIAL NOTES
(1) - START-STOP PB. AT MOTOR
(2) - HAN-OFF-AUTO SS. AT MOTOR

SEE DWG. 2313-EV

Monsanto
C O M P A N Y

THIS SUMMARY INCLUDES MOTORS, POWER EQUIPMENT AND CONTROL DEVICES FOR MOTORS, AND POWER EQUIPMENT FOR THE PROCESS AND/OR THE SUPPORTING FACILITIES.

INSTRUMENTS AND CONTROL DEVICES FOR PROCESS CONTROL ARE IN THE INSTRUMENT INDEX.

REVISIONS
Δ ____ BY ____
Δ ____ BY ____
Δ ____ BY ____
Δ ____ BY ____

DWG. NO. ____
CRA NO. 2915 AREA NO. 01
BY K. JOHNSTON
DATE ____ SHEET 1 OF 2

ELECTRICAL POWER AND CONTROL SUMMARY
PROJECT AROCLOR WASTE DISPOSAL
DIV. ORG PLANT WEK

EQUIPMENT DESCRIPTION: Equipment Number / Function Identification Nameplate	MOTOR OR LOAD DATA: HP or KW / Syn RPM	FL Amps / Wire Size	Frame No. / Type Encl.	Vendor and/or Purch. Order / Motor or Load Location	STARTER DATA: Starter Size / Compt. No.	SW. Amp Rating / FU Amp Rating	OL Htr. Cat. No. / Control Trans VA	Extra Aux Contacts / Special Features	CONTROL DEVICES: Manual	Automatic (Auto Devices Switch Control the Motor or Equipment)	REMARKS (Special Items Involved in Electrical Motor Starter Switch, Etc. Special Equipment, Relay Trains with Elaborate Starting and Interlock Effect)
EQ. NO. 01-120-001	HP. NO. 5				SIZE 1	SW 30	OL HTR	NO NC	(2)	LEVEL SWITCH LS 120.1 STARTS AND STOPS PUMP IN AUTO POSITION	
SEE DWG NO. INCINERATION SUMP PUMP (217)	Syn RPM 1800				COMPT. NO. BA2-2F1	FU	TRANSF VA				
EQ. NO. 01-121-001	HP. NO. 5-10				SIZE 1	SW 30	OL HTR	NO NC	(1)	LOW LEVEL LS 121.1 STOPS PUMP	
SEE DWG NO. AROCLOR SUMP PUMP (625)	Syn RPM 1800				COMPT. NO. BD-1RD	FU	TRANSF VA				
EQ. NO. 01-122-001	HP. NO. 5	6.5	215 P		SIZE 1	SW 30	OL HTR	NO NC	(1)	NONE	
SEE DWG NO. WATER SUMP PUMP (518)	Syn RPM 1800				COMPT. NO. BD-2RD	FU	TRANSF VA				
EQ. NO. 01-123-001	HP. NO. E 7.5				SIZE 1	SW	OL HTR	NO NC	(2)		EXISTING FIELD MOUNTED STARTER - NO CHANGE
SEE DWG NO. UNLOADING DOCK SUMP PUMP	Syn RPM 1800				COMPT. NO. [illegible]	FU	TRANSF VA				
EQ. NO. 01-127-001	HP. NO. E 15		256U		SIZE 2	SW	OL HTR	NO NC	(1)		NO CHANGE REQUIRED
SEE DWG NO. CITY WATER BREAK TANK PUMP	Syn RPM 3600				COMPT. NO. BC-1FE	FU	TRANSF VA				
EQ. NO. 01-130-001	HP. NO. 2				SIZE 1	SW 30	OL HTR	NO NC	(1)	NONE	
SEE DWG NO. VENT BLOWER	Syn RPM				COMPT. NO. BA2-E1F	FU	TRANSF VA				
EQ. NO. 01-132-001	HP. NO. E 15		256U		SIZE 2	SW	OL HTR	NO NC	(1)		NO CHANGE REQUIRED
SEE DWG NO. CITY WATER BREAK TANK PUMP	Syn RPM 3600				COMPT. NO. BD-1RH	FU	TRANSF VA				
EQ. NO. 01-115-001	HP. NO. E 2				SIZE [illegible]	SW	OL HTR	NO NC	(1)		EXISTING FIELD MOUNTED STARTER - NO CHANGE
SEE DWG NO. FUEL OIL PUMP	Syn RPM 1200				COMPT. NO. [illegible]	FU	TRANSF VA				
EQ. NO. 01-123-001	HP. NO. E 2				SIZE 1	SW	OL HTR	NO NC	(1)		EXISTING FIELD MOUNTED STARTER - NO CHANGE
SEE DWG NO. FUEL OIL PUMP	Syn RPM 1200				COMPT. NO. [illegible]	FU	TRANSF VA				
EQ. NO.	HP. NO.				SIZE	SW	OL HTR	NO NC	⬡		
SEE DWG NO.					COMPT. NO.	FU	TRANSF VA				
EQ. NO.	HP. NO.				SIZE	SW	OL HTR	NO NC			
SEE DWG NO.					COMPT. NO.	FU	TRANSF VA				
EQ. NO.	HP. NO.				SIZE	SW	OL HTR	NO NC	⬡		
SEE DWG NO.					COMPT. NO.	FU	TRANSF VA				
EQ. NO.	HP. NO.				SIZE	SW	OL HTR	NO NC	⬡		
SEE DWG NO.					COMPT. NO.	FU	TRANSF VA				

SECT. 0213-01

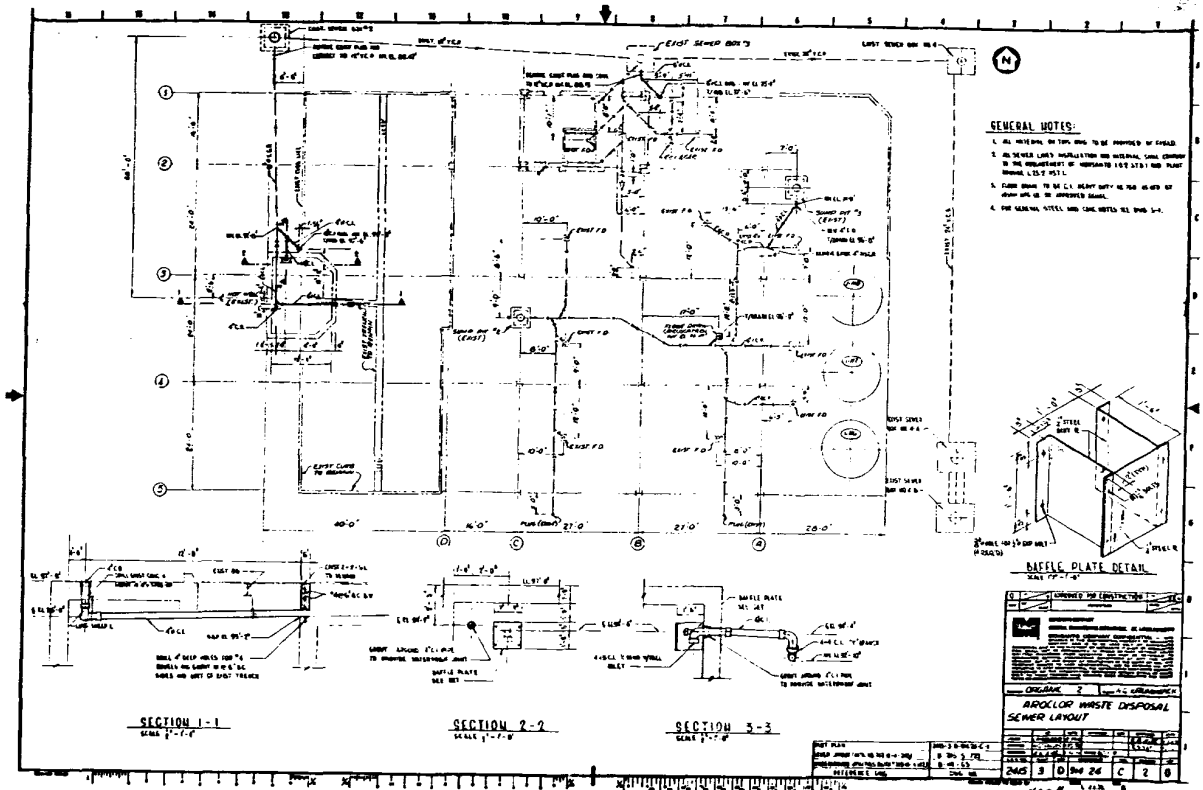
MONS 095573

GENERAL SPECIFICATIONS UNLESS OTHERWISE NOTED

1. ALL MOTORS AND POWER EQUIPMENT ARE FOR 460 VOLT, 3 PHASE, 60 HERTZ OPERATION.
2. ALL MOTORS ARE NEMA DESIGN B, HORIZONTAL, SQUIRREL CAGE INDUCTION.
3. STARTERS ARE COMBINATION, FULL VOLTAGE, NON-REVERSING, 1-HOLE WITH FUSIBLE SWITCH AND FUSETRON FUSES.
4. EACH STARTER HAS ____ OVERLOAD RELAYS.
5. EACH CONTROL POWER TRANSFORMER HAS A 115 VOLT SECONDARY. THE X1 TERMINAL IS FUSED AND THE X2 TERMINAL IS GROUNDED.
6. THE TABULATED CONTROL DEVICES ARE EXTERNAL TO THE STARTER.

MCC VENDOR & PO NO. ____
SPECIAL NOTES

MONS 095574


GENERAL NOTES:
1. ALL WATERMAIN, DUCTILE IRON PIPE TO BE MANUFACTURED BY CANADA
2. ALL SEWER LINES INSTALLATION AND MATERIAL SHALL CONFORM TO THE REQUIREMENT OF MUNICIPAL SPECIFICATIONS
3. FLOOR DRAINS TO BE C.I. HEAVY DUTY W. TRAP AS PER DRAWING APPROVED BY THE APPROVED ENGINEER.
4. FOR GENERAL, STEEL AND CIVIL NOTES SEE DWG. S-1.
EAST SEWER MH 'A'
EAST SEWER MH 'B'
EAST SEWER MH 'C'
EAST SEWER MH 'D'
EAST SEWER MH 'E'
EAST SEWER MH 'F'
EAST SEWER MH 'G'
EAST SEWER MH 'H'
EAST SEWER MH 'I'
EAST SEWER MH 'J'
EAST SEWER MH 'K'
EAST SEWER MH 'L'
EAST SEWER MH 'M'
EAST SEWER MH 'N'
EAST SEWER MH 'O'
EAST SEWER MH 'P'
EAST SEWER MH 'Q'
EAST SEWER MH 'R'
EAST SEWER MH 'S'
EAST SEWER MH 'T'
EAST SEWER MH 'U'
EAST SEWER MH 'V'
EAST SEWER MH 'W'
EAST SEWER MH 'X'
EAST SEWER MH 'Y'
EAST SEWER MH 'Z'
EAST SEWER MH 'AA'
EAST SEWER MH 'BB'
EAST SEWER MH 'CC'
EAST SEWER MH 'DD'
EAST SEWER MH 'EE'
EAST SEWER MH 'FF'
EAST SEWER MH 'GG'
EAST SEWER MH 'HH'
EAST SEWER MH 'II'
EAST SEWER MH 'JJ'
EAST SEWER MH 'KK'
EAST SEWER MH 'LL'
EAST SEWER MH 'MM'
EAST SEWER MH 'NN'
EAST SEWER MH 'OO'
EAST SEWER MH 'PP'
EAST SEWER MH 'QQ'
EAST SEWER MH 'RR'
EAST SEWER MH 'SS'
EAST SEWER MH 'TT'
EAST SEWER MH 'UU'
EAST SEWER MH 'VV'
EAST SEWER MH 'WW'
EAST SEWER MH 'XX'
EAST SEWER MH 'YY'
EAST SEWER MH 'ZZ'
BAFFLE PLATE DETAIL
SECTION 1-1
SECTION 2-2
SECTION 3-3
ARROLOR WASTE DISPOSAL
SEWER LAYOUT

MONSANTO CENTRAL ENGINEERING DEPARTMENT
DRAWING SCHEDULE AND FORECAST SHEET

DATE / /

PROJECT TITLE A[illegible] PLANT NO. ENGINEER K. JOHNSON

PLANT NAME [illegible] DEPARTMENT NO. SHEET 1 OF 2

EA PROJECT NO. 4115 AREA NO. 01 DESIGN CATEGORY NO. E

DRAWING NO.	REV NO	DRAWING TITLE	DRAWN BY	SCHEDULE DATES START	SCHEDULE DATES RELEASE	CHECKED	APPROVED	RELEASED	REVISED 1	2	3	4
E1		STA[illegible]										
E2		[illegible] DRAWING										
E3		MOTOR CONTAOL SCHEDULE SH#1 AREA 700$ 800 D-295-E801										
E4		MOTOR CONTROL SCHEDULE SH#2 AREA 700$ 800 D-295-E802										
E5		SINGLE LINE DIAGRAM D-295-E803										
E6		SCHEMATIC & ONE LINE HIGH PRESS. NABs 1092-3-810.10-E205										
E7		MOTOR SCHEMATICS										
E8		[illegible]										
E9		MCC ROOM LAYOUT										
E10		[illegible]										
E11		[illegible]										
E12		[illegible]										

MONS 095575

SECT 0213-01

MONSANTO CENTRAL ENGINEERING DEPARTMENT
DRAWING SCHEDULE AND FORECAST SHEET

DATE / /

PROJECT TITLE AROCLOR WASTE DISPOSAL PLANT NO. _____ ENGINEER K. JOHNSTON

PLANT NAME WGK DEPARTMENT NO. _____ SHEET 2 OF 2

CEA PROJECT NO. 2415 AREA NO. 01 DESIGN CATEGORY NO. E

DRAWING NO.	REV NO	DRAWING TITLE	DRAWN BY	SCHEDULE DATES START	SCHEDULE DATES RELEASE	CHECKED	APPROVED	RELEASED	REVISED 1	REVISED 2	REVISED 3	REVISED 4
E13		CONDUIT DETAILS										
E14		INTERCONNECTION SH1										
E15		INTERCONNECTION SH2										
EV16		INCINERATOR SCHEMATICS JOHN ZINK SHEET 1										
EV17		INCINERATOR SCHEMATICS JOHN ZINK SHEET 2										
E18		INTERCONNECTION SH 3										

MONS 095576

SECT. 0213-01

MONSANTO CENTRAL ENGINEERING DEPARTMENT

Drawing Status Report

ISSUE DATE 3.1.71

SHEET NO. 1 OF 1

EA PROJECT NO. 2415 PROJECT TITLE Aroclor Waste Disposal

ENGINEER D. Dreslin

LANT NAME W.G. Krummrich PLANT NO. 3 DEPT. CODE 914.24

DRAFTING ROOM F3E/R. Estep

REA NO. AREA TITLE

SQUAD General / E. Henson

DRAWING NO.	DRAWING TITLE	SCHEDULED START	SCHEDULED COMPLETE	ACTUAL START	ACTUAL COMPLETE	APPROV-ED	SCHED-ULED ISSUE	ACTUAL ISSUE	REV. NO.	T
1-1	Equip. Arrang.- Plan- Sh. No. 1	11/2/70	12/7/70	11/2/70 I.R.	12/17/70	12/17/70	12/21/70	12/21/70	1	3/1
1-2	Equip Arrang- Plan- Sh. No. 2	11/2/70	12/7/70	11/2/70 B.B.	12/17/70	12/17/70	12/21/70	12/21/70	0	2/4
1-3	Equip. Arrang.- Elevation A-A	11/2/70	12/7/70	11/4/70 A.A.	12/17/70	12/18/70	12/21/70	12/21/70	1	3/1
1-4	Equip. Arrang.- Elevation B-B	11/2/70	12/7/70	11/4/70 A.A.	12/17/70	12/18/70	12/21/70	12/21/70	1	3/1
1-5	Equip. Arrang.- Drum Hoist & Conveyor	11/2/70	12/7/70	1/14/71 A.A.	1/22/71	2/4/71	12/21/70	2/4/71	0	2/4
1-6	Condensate Receiver Modification	11/2/70	12/7/70	12/22/70 T.C.	1/19/71	1/19/71	12/21/70	1/19/71	0	1/19
M-7	Storage Tank Modification Lt. 1-116, 1-117 & 1-118	11/2/70	12/7/70	11/18/70 T.C.	11/30/70	12/1/70	12/21/70	12/2/70	0	[illegible]
M-8	Details - Storage Tank Modification Lt. 1-116, 1-117 & 1-118	11/2/70	12/7/70	11/20/70 T.C.	11/30/70	12/1/70	12/21/70	12/2/70	0	[illegible] 1
M-9	Equip. Arrange.- Loading Platform	11/2/70	12/7/70	12/7/70 T.C.	1/7/71	1/22/71	12/21/70	2/4/71	0	2/4
M-10	Details for Lt.-1-107	11/2/70	12/7/70	1/22/71 A.A.	1/22/71	2/4/71	12/21/70	2/4/71	0	2/4
M-11	Details for Lt. 1-107	11/2/70	12/7/70	1/20/71 A.A.	1/22/71	2/4/71	12/21/70	2/4/71	0	2/4

MONS 095577

PD-499 REV. 6-70

SECT. 0301-00

MONSANTO CENTRAL ENGINEERING DEPARTMENT

Drawing Status Report

ISSUE DATE 3.1.71.

SHEET NO. 1 OF 1

AREA PROJECT NO. 2415 PROJECT TITLE Aroclor Waste Disposal

PLANT NAME Krummrich PLANT NO. 3 DEPT. CODE 914.24

ENGINEER D. Adkins

DRAFTING ROOM F3E/R. Estep

AREA NO. AREA TITLE

SQUAD General/E. Henson

DRAWING NO.	DRAWING TITLE	SCHEDULED START	SCHEDULED COMPLETE	ACTUAL START	ACTUAL COMPLETE	APPROVED	SCHEDULED ISSUE	ACTUAL ISSUE	REV. NO.	T
S-1	General Notes	11/2/70	12/7/70	12/1/70 T.C.	12/2/70	12/17/70	12/21/70	12/17/70	0	12/17
S-2	Foundation Plan	11/2/70	12/7/70	11/5/70 B.S.	12/11/70	12/17/70	12/21/70	12/17/70	2	2/19
S-3	Foundation Details	11/2/70	12/7/70	11/12/70 B.B.	12/11/70	12/17/70	12/21/70	12/17/70	1	2/3
S-4	Loading Platform & Det.	11/2/70	12/7/70	12/29/70 B.S.	1/14/71	1/18/71	12/21/70	1/18/71	0	1/13
S-5	Vent Stack Base Support	11/2/70	12/7/70	11/16/70 B.B.	12/17/70	12/17/70	12/21/70	12/17/70	0	12/17
S-6	Paving Plan & Fnd. Det.	11/2/70	12/7/70	1/29/71 I.R.	1/29/71	2/2/71	12/21/71	2/2/71	1	2/10
S-7	Shelter Shed for Drum Dumping	11/2/70	12/7/70	1/15/71 HENSEN	1/19/71	1/20/71	12/21/70	1/20/71	1	2/3
S-8	Pipe Supports - Plan & Det.	11/2/70	12/7/70	12/7/70 B.G.	1/14/70	1/18/71	12/21/70	1/18/71	1	1/20
S-9	Unloading Dock - Plan & Sec.	11/2/70	12/7/70	12/29/70 I.R.	1/7/70	1/18/71	12/21/70	1/18/71	0	1/13

MONS 095578

SECT. 0301-00

MONSANTO CENTRAL ENGINEERING DEPARTMEN

Drawing Status Report

ISSUE DATE 3-1-71

SHEET NO. 1 OF 2

CEA PROJECT NO. 2415 PROJECT TITLE WASTE INCINERATION

ENGINEER C. LEPPER

PLANT NAME KRUMMRICH PLANT NO. 03 DEPT. CODE 914.24

DRAFTING ROOM F-3-E (ESTED)

AREA NO. 02 AREA TITLE

SQUAD EST (MORRIS)

DRAWING NO.	DRAWING TITLE	SCHEDULED START	SCHEDULED COMPLETE	ACTUAL START	ACTUAL COMPLETE	APPROVED	SCHEDULED ISSUE	ACTUAL ISSUE	REV. NO.	T
I 1	STANDARD SHEET	10-19-70	12-7-70	1-5-70 RCK	1-5-71	1-6-71	12-7-70	1-26-71	2	2-17-71
I 2	SCHEMATICS SH. 1	10-19-70		11-9-70 RR	1-5-71	1-6-71		1-26-71	1	✓
I 3	SCHEMATICS SH. 2	10-19-70		11-11-70 RR	1-5-71	1-6-71		1-26-71	2	2-17-71
I 4	SCHEMATICS SH. 3	10-19-70		11-11-70 RR	1-5-71	1-6-71		1-26-71	2	2-17-71
I 5	SPARE									
I 6	SPARE									
I 7	SPARE									
I 8	SPARE									
I 9	SPARE									
I 10	SPARE									
I 11	SPARE									
I 12	SPARE									

MONS 095579

FB-105 REV. 6-70

SECT. 0301-00

MONSANTO CENTRAL ENGINEERING DEPARTMENT

Drawing Status Report

ISSUE DATE 5-1-71

SHEET NO. 2 OF

EA PROJECT NO. 2415 PROJECT TITLE WASTE INCINERATION

ENGINEER C. LEDBETTER

LANT NAME KRUMMRICH PLANT NO. 03 DEPT. CODE 914, 24

DRAFTING ROOM F-3-E (ESTEP)

REA NO. AREA TITLE

SQUAD E & I (MORRIS)

DRAWING NO.	DRAWING TITLE	SCHEDULED START	SCHEDULED COMPLETE	ACTUAL START	ACTUAL COMPLETE	APPROVED	SCHEDULED ISSUE	ACTUAL ISSUE	REV. NO.	T
13	LAYOUT- TUBING SH. 1	10-16-70	12-7-70	11 RR -12-70	1-5-71	1-6-71	12-7-70	1-26-71	1	✓
14	LAYOUT- TUBING SH. 2	10-19-70		12-28-70	1-5-71	1-6-71		1-6-71	0	✓
15	SPARE									
16	SPARE									
17	INSTR. INSTALL. DETAILS SH. 1	10-19-70		11 RR -24-70	1-5-71	1-6-71		1-26-71	1	✓
18	INSTR. INSTALL. DETAILS SH. 2	10-19-70	▼	12-?-70	1-5-71	1-6-71	▼	1-26-71	2	? 12-70

MONS 095580

CE-101 REV. 6-70

SECT. 0301-00

MONSANTO CENTRAL ENGINEERING DEPARTMENT

Drawing Status Report

ISSUE DATE 3-1-71 ○

SHEET NO. 1 OF 1

AREA PROJECT NO. 2415 PROJECT TITLE AROCLOR WASTE DISPOSAL

PLANT NAME KENTUCKY PLANT NO. 08 DEPT. CODE 214.24

ENGINEER K. JOHNSTON

AREA NO. 01 AREA TITLE VIII-03

DRAFTING ROOM E-8-E (OSTER)

SQUAD E&I (MORRIS)

DRAWING NO.	DRAWING TITLE	SCHEDULED START	SCHEDULED COMPLETE	ACTUAL START	ACTUAL COMPLETE	APPROVED	SCHEDULED ISSUE	ACTUAL ISSUE	REV. NO.	T
-1	STANDARD SHEET	10-26-70	12-31-70	12-3-70 COLVIN	12-5-70	1-7-71	12-31-70	1-7-71	0	✓
-2	NOT USED									
-3	MOTOR CONTROL SCHEDULE AREA 700 & 800 (PLANT DWG. D-245-E801) SH. #1	10-26-70	12-31-70	12-7-70 COLVIN	12-31-70	1-7-71		1-7-71	6	✓
-4	MOTOR CONTROL SCHEDULE AREA 700 & 800 (PLANT DWG. D-245-E801) SH. #2	10-26-70	12-31-70	12-7-70 COLVIN	12-31-70	1-7-71		1-7-71	4	✓
-5	SINGLE LINE DIAGRAM (PLANT DWG. D-245-E803)	10-26-70	12-31-70	12-7-70 COLVIN	12-31-70	1-7-71		1-7-71	6	✓
-6	PNEMATIC & SINGLE LINE, HIGH PRESS. AREA (PLANT DWG. D-245-E804)	10-26-70	12-31-70	12-7-70 COLVIN	12-31-70	1-7-71		1-7-71	3	✓
E-7	SCHEMATICS - MOTOR CONTROL SHEET #1	10-26-70	12-31-70	12-2-70 COLVIN	12-31-70	1-7-71		1-7-71	0	✓
E-8	NOT USED									
E-9	NOT USED									
E-10	ELEVATION "A-A" CONDUIT & LIGHTING	10-26-70	12-31-70	12-21-70	1-4-71	1-7-71		1-11-71	1	✓ 1-11-71
E-11	LAYOUT - CONDUIT & LIGHTING SHEET #1	10-26-70	12-31-70	12-7-70 COLVIN	1-4-71	1-7-71		1-11-71	1	✓ 1-11-71
E-12	LAYOUT - CONDUIT & LIGHTING SHEET #2	10-26-70	12-31-70	12-7-70 COLVIN	1-4-71	1-7-71		1-7-71	0	✓

MONS 095581

CE-101 REV. 8-70

SECT. 0341-AA

MONSANTO CENTRAL ENGINEERING DEPARTMENT

Drawing Status Report

ISSUE DATE 3-1-71

SHEET NO. 2 OF 2

EA PROJECT NO. 2415 PROJECT TITLE AROCLOR WASTE DISPOSAL

ENGINEER K. JOHNSON

LANT NAME KRUMMRICH PLANT NO. 03 DEPT. CODE 914-24

DRAFTING ROOM F-3-E (ESTEP)

REA NO. 01 AREA TITLE

SQUAD E&T (MORRIS)

DRAWING NO.	DRAWING TITLE	SCHEDULED START	SCHEDULED COMPLETE	ACTUAL START	ACTUAL COMPLETE	APPROVED	SCHEDULED ISSUE	ACTUAL ISSUE	REV. NO.	T
-13	DETAILS	12-26-70	12-31-70	12-7-70 COLUM	1-4-71	1-7-71	12-31-70	1-7-71	0	✓
-14	INTERCONNECTIONS - MOTORS	12-31-70	12-31-70	12-26-70 COLUM	1-4-71	1-7-71		1-22-71	1	1-22-71
-15	INTERCONNECTIONS - INCINERATOR	10-26-70	12-31-70	12-22-70 COLUM	1-22-71	1-22-71		1-22-71	1	1-27-71
-16	SCHEMATICS - INCINERATOR (JOHN ZINK CO.) SH. #1	12-26-70	12-31-70							
-17	SCHEMATICS - INCINERATOR (JOHN ZINK CO.) SH. #2	10-26-70	12-31-70							

MONS 095582

FB-101 REV. 6-70

SECT 1331-10

CEA 2415

AROCLOR WASTE DISPOSAL

JOHN ZINK COMPANY DRAWING LIST

Drawing No.	Description
CA-DH-421-1	Detail Quench Water Gun
D-DH-1016-1	Terminal Block Arrangement
D-DH-1008-1	"YS" - Pilot Assembly
A-DH-883-1	TRC Section Panel Detail for John Zink Thermal Oxidizer
B-DH-1228-3(Sh. 1)	Schematic Ladder Wiring Diagram
B-DH-1228-3(sh. 2)	Schematic Ladder Wiring and Panel Details
B-DH-1229-1	Schematic Piping Details
B-DH-1230-1(Sh. 1)	John Zink Waste Disposal Assembly
B-DH-1230-3(Sh. 2)	John Zink Waste Disposal Assembly
B-DH-1231-1	Anchor Bolt Plan
B-DH-1232-1	Combustion Air Duct Assembly
B-DH-1233-2	John Zink Thermal Oxidizer
B-DH-1234-2(Sh. 1)	Quench Pot and 360° Platform Detail
B-DH-1234-2(Sh. 2)	John Zink Quench Column
B-DH-1235-2	John Zink Trimmable Venturi Assembly
B-DH-1236-2	Vent Stack
B-DH-1240-2	Oxidizer Platform Details
B-DH-1260-2	Burner Plenum Details
B-DH-1263-3	Hl-14 Burner Details
B-DH-1271-0	Step Off, Rest and 360° Platform Design Drawings
B-DH-1272-0	Platform Fabricated Parts Details
B-DH-1273-0	Caged Ladder Details
B-DH-1336-0	Mist Eliminator
B-DH-1350-1	Center Supprt and Venturi Piping
7W-74466	Buffalo Forge Co. Combustion Air Blower (45-3 "CB" - CW-UB-ARR.#8)

5/3/71

N. B. Walk - 269

CENTRAL ENGINEERING DEPARTMENT – EXPEDITING STATUS REPORT

DATE APR 16 1971 PAGE:

PROJECT NUMBER	PROJECT NAME		PROJECT MANAGER	PHONE
2415	Aroclor Waste Disposal		N. WALK	4-8123
EXPEDITER	PHONE:	PLANT LOCATION	CONSTRUCTION ENGINEER	PHONE:	START UP
R. BARTHOLOMEW	4-6859	W. G. K.	HOYER	812-359	

PURCHASE ORDERS

P.O. NO.	DATE	CAT. NO.	AREA NO.	EQUIPMENT NO.	VENDOR	DESCRIPTION OF ITEM
0001	12/17	013	01	136.333	Duriron Co.	AVS Centrifugal Pump
0002	12/20	013	01	102.030	John Zink Co.	Thermal Incinerator Unit
0003	11/11	023	01		Engineered Prod. Div. Instrument Div. Assoc. Inc.	Indicating Interface Level Switches
0004	12/15	023	01		Assoc. Div. & O'Brien Equip. Co.	Temp. Switch
0005	12/31	023	01		Assoc. Div. & O'Brien Equip Co.	Press Trans & Switches
0006	12/7	023	01		Foxboro	Level Transmitters
0007	12/15	023	01		Asco Valves % Dawson Iron Supply Co	Solenoid Valves
0008	12/3	023	01		Emerson Corp. % Fulton Sales & Eng.	Sump Level Control Switch
0009	12/17	023	01		Varec Inc. % Earl F. Gast Co.	Flame Arrester, Conservation Vent
0010	12/21	023	01		Fisher Controls % Purdie Equip. Co.	Regulating Valves
0011	12/7	023	01		Mc Donnell & Miller % United Conveyance	Flow Switch
0012	12/21	023	01		United Instrument % Purdie Equip. Co.	Restrictive Orifice Plate
0013	12/8	023	01		Resco Mfg. % Industrial Process Equip	Relief Valve
0014	12/11	023	01		Weiner Instruments % Earl F. Gast	Temp. Indicator
0015		013	01	104.030	VOID	Positive Displacement Vane Pump & Driver
0016	12/10	013	01	102.030	Aldrich Pump Co. % G E Heath Co.	Priming Pump
0017	1-5	023	01		Dillingham Safety Stairs % J.I Sales	Safety Stairs
0018	1/4	013	01		Fullgraf Steel Co.	Vent Stack & Equipment Structural Steel
0019	1/7	013	01	114.001 102.031 102.021	Kellis Engineers	(3) Fans 25 HP 15 HP 10 HP
0020	12/23	133	01		[illegible]	Motor Starters

MONS 095544

APPROVAL DRAWINGS

ORIG. FROM.	PRESENT FROM.	CH'G. DATE	DATE REC'D.	DATE RET'D.
11/3			11-5	11-12
12/20	12/20	12/20		11-3
115 Rev.				

CENTRAL ENGINEERING DEPARTMENT – EXPEDITING STATUS REPORT

DATE:

PAGE: 3

PROJECT NUMBER	PROJECT NAME	PROJECT MANAGER	PHONE
2415	AROCLOR WASTE DISPOSAL	N. WOLK	

EXPEDITER	PHONE:	PLANT LOCATION	CONSTRUCTION ENGINEER	PHONE:	START UP
R.P BARTHOLOMEW					

PURCHASE ORDERS							APPROVAL DRAWINGS					EQUIPMENT					
P.O NO.	DATE	CAT NO.	AREA NO	EQUIPMENT NO.	VENDOR	DESCRIPTION OF ITEM	ORIG. PROM.	PRESENT PROM	CH'K. DATE	DATE REC'D.	DATE RET'D.	DATE REQ'D.	ORIG PROM.	PRESENT PROM.	CH'K DATE	DATE SHP'D.	STATUS CHARGE
0041	2/22	113	01	X-8	BUSHNELL	HOSE						–	2/25				
0042	3/10	113	01	X-8	BUSHNELL	BRONZE HOSE						3/9	3/16	4/1	4/1		
0043	3/21	113	01	X-6	SEMCOR	FLEXIBLE HOSE						3/11	3/14	4/1	3/25	5/2	
0044	3/18	113	9	107.000	CUSTOM FABRICATING	DRUM HEATER						4/6	4/15	4/15	4/9		
0045	3/25	113	01	–	THERMAL CONSTRUCTION	SAFETY SHOWER						4/16	4/16	4/16	4/12	4/10	

MONS 095585

SECT 0302-01