

CAUSTIC 1 / CHLOR-ALKALI 2

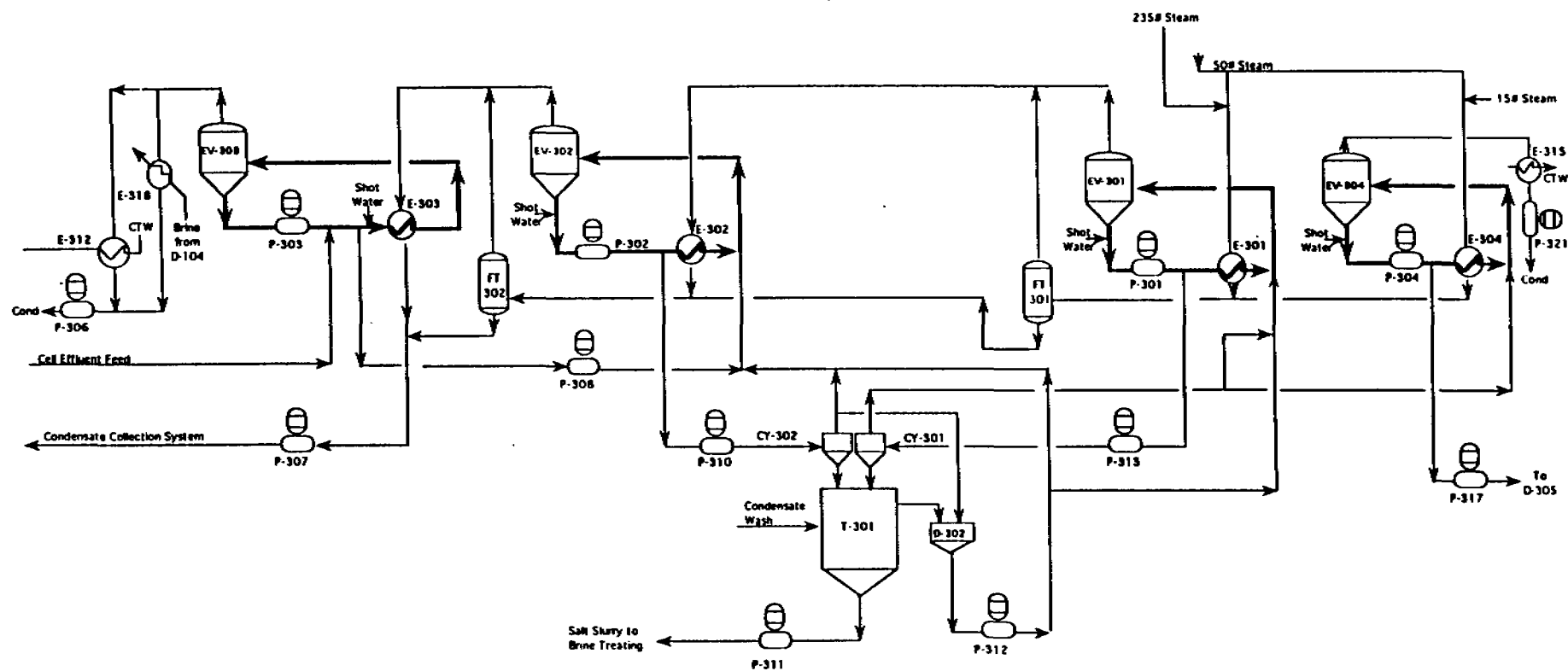
1997

REACTIVE CHEMICALS REVIEW

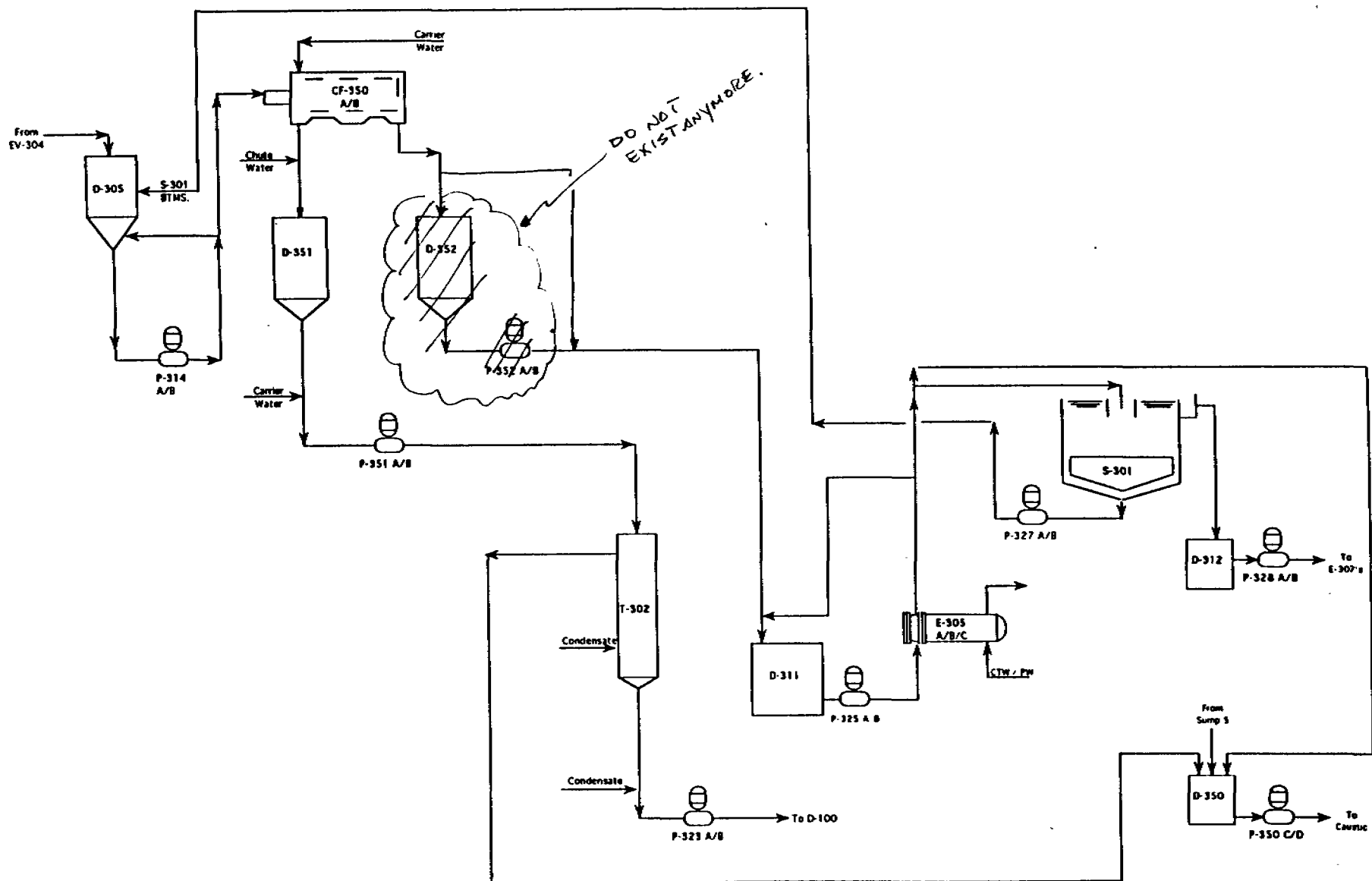
CAUSTIC AREA (Both Plants)

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NaOH EVAPORATOR AREA

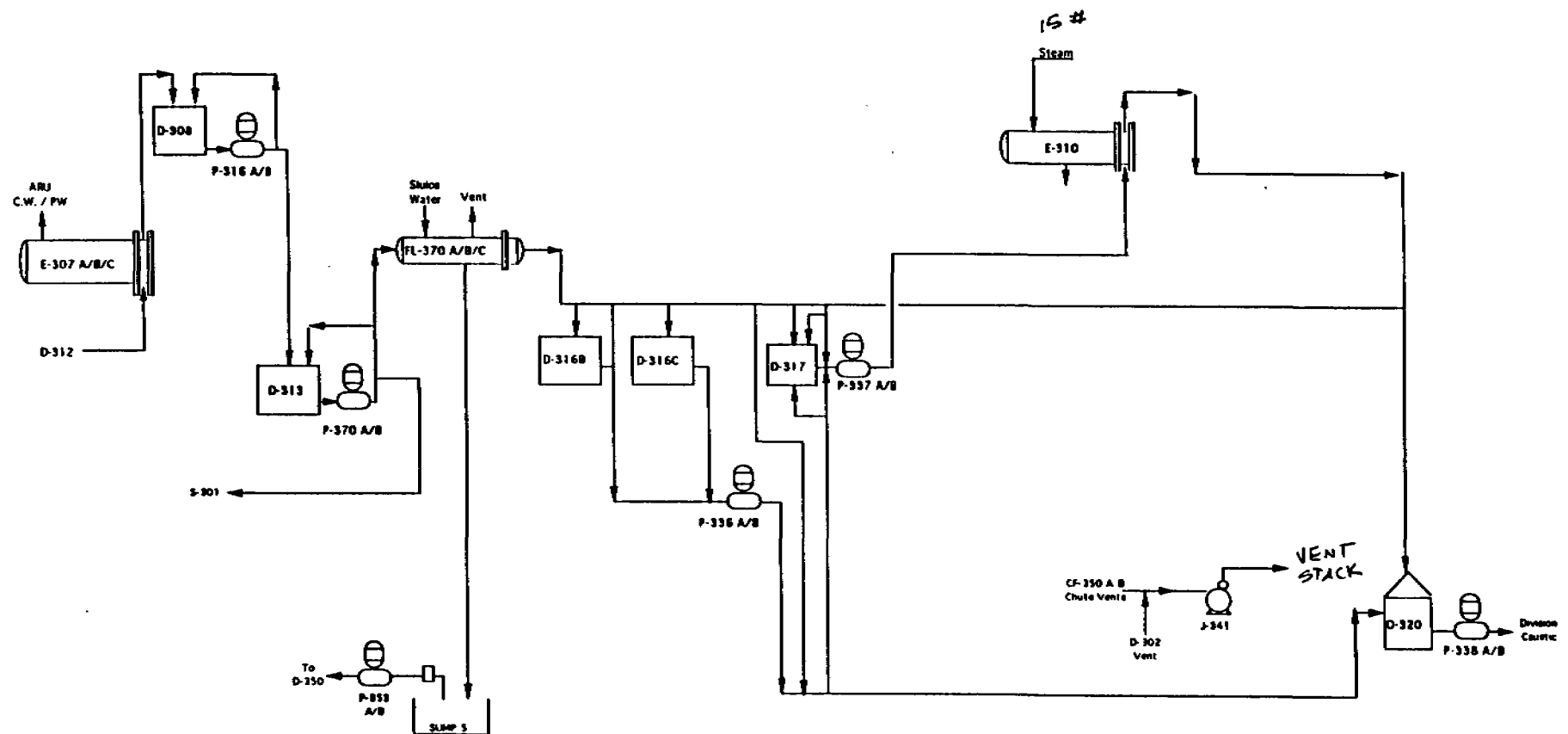


NaOH CENTRIFUGES & PRIMARY COOLING AREAS



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NaOH FINISHING AND STORAGE AREA



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DOW

CAUSTIC I/CAII

**REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997**

RAW MATERIALS/PROCESS AIDS

– RAW MATERIALS

- » Cell Effluent (8-11% NaOH, 15-17% NaCl, 72% Water)

– PROCESS AIDS

- » Steam (150# and 235#)
- » Carrier Brine (Caustic I Only)
- » Process Water
- » River Water
- » Instrument Air
- » Plant Air

– SUPPLIES

- » HCL (Used for pH Control at Caustic I-Does Not Contact Process)
- » Lithium Bromide (ARU-not in Contact With Process)

Revised 1/27/97

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DATA: I:\dow\processes\caustic\94 caustic

**REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997****RAW MATERIALS/PROCESS AIDS: SOURCE AND STORAGE****– SOURCE**

- » Cell Effluent - CL2 and CA2 (Pipelines)
- » Steam - Power I (Pipelines)
- » Carrier Brine - CL2 (Caustic I Only-Pipeline)
- » Process Water - Utilities (Pipeline)
- » River Water - Plant Pumps (Caustic I Only-Pipeline)
- » HCL - Solvents (Pipeline-Caustic 1 Only)
- » Lith. Bromide - ARU (Contained Within Unit)
- » CTW - Plant Pumps (CAII Only)

– BLOCK STORAGE

- » Cell Effluent - T-1 (Plant Feed), T-2 (User Feed), T-1A, T-2A, T-3, T-109 Tanks @ Caustic; D-301, D-316A @ CAII
- » HCL, Steam, Carrier Brine, Process Water, River Water
 - No Storage: Supplied via Pipeline on Demand
- » Lith. Bromid - Stored Within ARU

Revised 1/27/97

CAUSTIC I/CAII**REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997****RAW MATERIAL: SPECIFICATIONS****Cell Effluent**

Caustic (NaOH)	%	5-15
Iron (Fe)	PPM	<1.0
Sodium Sulfate (Na ₂ SO ₄)	PPM	<2500
Sodium Sulfite (Na ₂ SO ₃)	PPM	1-20
Sodium Chlorate (NaClO ₃)	%	<0.03

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CAUSTIC I/CAII

**REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997**

PRODUCTS/BY-PRODUCTS

– PRODUCT

» **50% Caustic (50% NaOH, 0.9% NaCl, 49.1% Water)**

– BY-PRODUCTS

» **Condensate (Boiler and Non-boiler Grade)**

» **Salt Slurry**

» **Sulfate Purge**

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**REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997****PRODUCTS/BY-PRODUCTS: IN-PLANT DISTRIBUTION****– PRODUCT**

- » Caustic - Pipelines to Storage Tanks in Plant and at Tank Farm
- » Cell Effluent - Pipelines to Users (Backflow Protection Critical)

– BY-PRODUCTS

- » Condensate - Boiler Grade Routed from Collection Tank to Power I or Used Internally
 - Non-Boiler Grade consumed in Process or Routed to Canal
- » Salt Slurry - Routed from Two Salt Columns (D-205&D-207) to CL2 or Used Internally (CAII)
 - Brine Mixed with Salt to Assist in Transfer
- » Sulfate Purge - Routed to User Feed Tank (T-2) @ Caustic

Revised 1/27/97

DOW**CAUSTIC I/CAII****REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997****PRODUCT SPECIFICATIONS****50% CAUSTIC**

Caustic (NaOH)	%	49.0-51.0
Salt (NaCl)	%	<1.0
Iron (Fe)	PPM	<5.0
Sodium Carbonate (Na ₂ CO ₃)	%	<0.2
Sodium Sulfate (Na ₂ SO ₄)	%	<0.025
Sodium Chlorate (NaClO ₃)	%	<0.15
Nickel/Copper (Ni/Cu)	PPM	<1.0
Nickel	PPM	<0.95
Arsenic (As)	PPM	<1.5
Mercury (Hg)	PPM	<0.5
Lead (Pb)	PPM	<5.0
Heavy Metals as Pb	PPM	<15.0
Silicon (Si)	PPM	<100
Manganes (Mn)	PPM	<1.0

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CAUSTIC I/CAII

REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997

BY-PRODUCT SPECIFICATIONSSalt Slurry

Caustic (NaOH)	%	1.25 Max
Salt Settle Volume (SV)	%	5-50

Boiler Grade Condensate

Conductivity	MMHOS	10 Max
Hydrazine	PPM	0

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CAUSTIC I/CAII

**REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997**

REACTIVITY: 50% NaOH

– WATER

- Dilution With Water is Exothermic
- Rapid Temperature Increase Can Result
- Heat of Dilution:



– ACIDS

- Reaction is Violent and/or Explosive

– ORGANIC COMPOUNDS

- Chloroethene and other organic cleaning agents should not be used in caustic service.
- Potential Violent Reaction

– METALS

- Rapid Reaction With Aluminum, Copper Tantalum, Tin, and Zinc.
- Can React with Amphoteric Metals in Water Solutions to Generate H₂ Gas
- Reaction With Bronze and Brass

R vided 3/4/97

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CAUSTIC I/CAII

**REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997**

- Flammability**
 - Not Flammable**

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CAUSTIC 1

**REACTIVE CHEMICALS REVIEW
FEBRUARY, 1997**

REACTIVE CHEMICAL CONCERNS

CONCERN

**Cell Effluent Distribution-
Backflow From User Plants**

Water/NaOH Heat of Dilution

**Utility Systems-
Caustic Contamination**

**Corrosion of Nickel Clad Vessels
by Hypochlorites in the Cell
Effluent Feed**

PREVENTIVE MEASURES

**User Plants Surveyed in May, 1994 to Ensure
Backflow Protection is In-place.**

**Water is Added Throughout Process. Continuous
Flow and Closed System Control Temperatur
Increase Near Normal and Eliminate Impact Of
Boiling Action, Respectively.**

**Double Block and Bleed Used at All Cross
Tie Points.**

**Cell Effluent Analyzed for Hypochlorites.
Neutralized With Sodium Bisulfite.**

Revis d 1/27/97

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**CA II/CAUSTIC AREA
CRITICAL INSTRUMENTS**

T-301 High Level Switch

P-302 Gear Low Oil Pressure

A-301 High Amps

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**CAUSTIC I
CRITICAL INSTRUMENTS**

D-205 High Level Switch

D-207 High Level Switch

T-204 High Level Switch

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Bldgs & Grnds

Caustic

Caustic

Caustic

Liquefaction

Purification

Purification

Liquefaction

Hydrogen
Recovery

Bldgs & Grnds

LAD CRITICAL INSTRUMENT LIST				CA2 PLANT						Review Date: 1/97	
PM MODULE	TAG #	GRP	DESCRIPTION	CONSEQUENCES OF FAILURE	LEVEL	REQ	FREQ	GEMTS	PROC	DRAWING #	FIELD ID
PT-1001	PT-1001		Low Breathing Air to control room	Loss of breathing air pressure	2	N	6M	Y	Y	N/A	Y
LSH-3311	LSH-3311 TSH-291	I40	T-301 high level switch	Potential personnel injury	2	N	3M	Y	Y	B1-305	Y
PSL-3228	PSL-3228	I50	P-302 gear low oil pressure	Major equipment damage	2	N	3M	Y	Y	B1-304	Y
IA-3651	IA-3651	I90	A-301 high emps	Major production loss	2-2	N	3M	Y	Y	B1-322	Y
LIQ_CL2	PT-52425 EV-52400 EV-52402 EV-52405	I80	Liquid transfer line EBV	Potential undetected leak	3	N	1M	Y	Y	B1-502F	Y
D-227B_TEMP	TT-2613A TT-2613B CV-2604	I70	D-227 B temperature transmitter	Explosive potential (laffy pots)	2	N	3M	Y	Y	B1-218C	Y
D-277A_TEMP	TT-2614A TT-2614B CV-2604	I70	D-227 A temperature transmitter	Explosive potential (laffy pots)	2	N	3M	Y	Y	B1-218C	Y
D-526_H2	AT-51310 AT-51311 AT-51312	IA18	High H2 inerts in D-526 tail gas	Explosive potential	2	N	3M	Y	Y	B1-5513	Y
AI-161_O2	AT-6091 AT-6092 AT-6093 CV-6114 E_CV-6007 MC-601	IA16	AI-161 O2 in H2 analyzer	Explosive potential	2	N	SD	Y	Y	B1-604	Y
CGD-CRIT-CHECKS	CGD Crew Maintains List	IA11	Area Combustible Monitors Analyzer House Monitors	Explosive potential Potential for asphyxiation	2	N	12M	Y	Y	N/A	Y

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ca2 xls

D Mack

Caustic
Caustic
Caustic
Bldgs & Grnds

LAD CRITICAL INSTRUMENT LIST				CAUSTIC PLANT						Review Date: 1/97	
PM MODULE	TAG #	GRP	DESCRIPTION	CONSEQUENCES OF FAILURE	LEVEL	REQ	FREQ	GEMTS	PROC	DRAWING #	FIELD ID
LSH-05600	LSH-05600	I40	D-205 HI LEVEL SWITCH	POTENTIAL PERSONNEL HAZARD	2	N	6M	Y	Y	BI-2056	Y
LSH-9013	LSH-9013	I40	D-207 HI LEVEL SWITCH	POTENTIAL PERSONNEL HAZARD	2	N	6M	Y	Y	BI-2222	Y
LSH-1537	LSH-1537	I40	T-204 HI LEVEL SWITCH	POTENTIAL PERSONNEL HAZARD	2	N	6M	Y	Y	BI-2032	Y
CGD-CRIT-CHECKS	CGD Crew Maintains list	IA11	COMBUSTIBLE GAS MONITORS ANALYZER HOUSE MONITORS	POTENTIAL FOR EXPLOSIVE MIXTURE	2	N	3M	Y	Y	N/A	Y

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Instructions

Chlor-Alkali Department

Instructions for the Reactive Chemical Matrices' Workbook

To access reactive chemical information for a specific area, follow the instructions outlined below:

- 1) Using the arrows in the lower left hand corner, scroll to the left or right to find the worksheet for the reactive chemical data for which you are searching.

Note that the arrows with the vertical lines move you to the extreme left and right of the worksheet list.

These reactive chemical worksheets include the following:

- a. Instructions - the sheet that you're currently reading
- b. Process Chemicals
- c. Materials of Construction
- d. G/A Lab Chemicals
- e. CAZ Lab Chemicals

- 2) Click the mouse on the worksheet of choice and the worksheet will appear on the screen.
- 3) Scroll up or down to find the chemical for which you are interested, and then scroll across to find the chemical or material of construction for which it is to mix with.
- 4) You can print out any of the worksheets by selecting that worksheet and executing a print request.

This document is intended to provide general information on reactive chemical data.

LAD CHLOR-ALKALI
Process Chemicals
REACTIVE CHEMICAL MATRIX

DOW CHEMICALS			REACTIVITY			PROCESS CHEMICALS																																		
HEALTH	FLAMMABILITY	REACTIVITY	Asbestos	Activated Alumina	Antifoam (DC) 1430	Balanced Polymer 78608	Betz CDP 90820	Betz Inhibitor 38K-38165	Carbon Tetrachloride	Caustic 60%	Cell Effluent	Chlorine-Gaseous	Chlorine-Liquid	Chloroform	Chlorothene	Diesel Fuel	Ethylene Glycol	Ferric Chloride	Freon 11	Freon 12	Freon 123	Hexachlorobenzene	Hexachlorobutadiene	Hexachloroethane	Hydrochloric acid	Hydrogen	Lithium Bromide	Magnesium Chloride (Anhydrous)	Magnesium Chloride (Hydrate)	Methane	Oils (all)	Silicic Acid C-31	Sodium Bisulfite	Sodium Carbonate	Sodium Hypochlorite	Sodium Thiosulfate 30%	Sulfuric Acid			
0	0	0	Asbestos	X		X		X	X																			X												
1	0	0	Activated Alumina		X	X	X	X	X	X	X	2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1	X	X	X	X	X	X	X	X	X	X	X	X	2
1	0	0	Antifoam (DC) 1430										X																											
1	0	0	Balanced Polymer 78608					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2	0	0	Betz CDP 90820						X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	1	X	X		X	X	X	X	X	X	1	1	1	1
2	0	0	Betz Inhibitor 38K-38165							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1	X	X		X	X	X	X	X	X	X	X	X	X
3	0	0	Carbon Tetrachloride							X	X	1	1	1	1	1	X	X	1	1	1	1	1	1	1	1	1	1	X	X	X	1	X	X	X	X	X	1	1	1
3	0	0	Caustic 60%								2	X	X	X	X	X	X	2	X	X	X	X	X	X	X	X	X	X	X	X	1	X	1	1	1	1	1	1	1	
3	0	0	Cell Effluent										X	X	X	X	X	X	X	X	X	X	X	X	X	1	X	X	2	X	1	1	1	1	1	1	1	1	2	
3	0	0	Chlorine-Gaseous											X	X	X	X	1	1	1	1	1	1	1	1	2	2	2	X	1	1	1	1	2	2	2	2	2	2	
3	0	0	Chlorine-Liquid												X	X	X	1	1	1	1	1	1	1	1	2	2	2	X	1	1	1	1	2	2	2	2	2	2	
2	0	0	Chloroform													X	X	X	1	1	1	1	1	1	1	1	1	1	X	X	X	1	X	X	X	1	1	1	2	
2	0	0	Chlorothene														X	X	1	1	1	1	1	1	1	1	1	1	X	X	X	1	X	X	X	1	1	1	2	
0	2	0	Diesel Fuel														X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
1	0	0	Ethylene Glycol															X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
1	0	0	Ferric Chloride																X	1	1	1	1	1	1	1	X	X	X	X	2	X	X	X	X	X	2			
2	0	0	Freon 11																X	X								1	X	X	X	1	X	X	X	1	1	1	1	
2	0	0	Freon 12																	X	X								X	X	X	1	X	X	X	1	1	1	1	
1	0	0	Freon 123																		X								X	X	X	1	X	X	X	1	1	1	1	
1	0	0	Hexachlorobenzene																							1	1	1	1	X	X	X	1	X	X	X	1	1	1	1
2	0	0	Hexachlorobutadiene																							1	1	1	1	X	X	X	1	X	X	X	1	1	1	1
3	0	0	Hexachloroethane																							1	1	1	X	X	X	1	X	X	X	1	1	1	1	1
3	0	0	Hydrochloric acid																								2	X	X	X	1	X	1	1	1	1	1	1	1	1
0	4	0	Hydrogen																									1	X	X	1	X	1	1	1	1	1	1	1	1
2	0	0	Lithium Bromide																										X	X	X	1	X	X	X	X	X	1	2	
2	0	0	Magnesium Chloride (Anhydrous)																										X	X	X	X	X	X	X	X	X	X	X	X
1	0	0	Magnesium Chloride (Hydrate)																										X	X	X	X	X	X	X	X	X	X	X	
1	4	0	Methane																																					

*This reactive chemical matrix was created using the knowledge of process engineers, process technologists, chemists, and MSD sheets.
 *This guide summarizes the potential reactivity hazards of mixtures of chemicals.
 *The information herein is given in good faith, but no warranty, expressed or implied, is made. Consult The Dow Chemical Company for further information.
 *For more detailed information, consult data on the individual chemical via MSD sheets, etc.

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LAD CHLOR-ALKALI Process Materials REACTIVE CHEMICAL MATRIX

X=Unlikely Mixture
1=Not known to be reactive
2=Reactive (Potentially hazard under some circumstances)
3=Potential Hazard (Rapid Reaction With High Energy Release)

PROCESS CHEMICALS	MATERIALS	Fiberglass	Carbon Steel	Titanium	Aluminum	Bone Char	Brass	Copper	Nickel	Polypropylene	Polyethylene	Teflon	PVC	CPVC	Kynar	Stainless Steel	Alloy 20	Monel
Air																		
Carbon Tetrachloride					2	X												
Caustic 50% < 120 degrees						X												
Caustic 50% > 120 degrees			2			X												
Cell Effluent <120 degrees						X												
Cell Effluent >120 degrees			2			X												
Chlorine-DRY						X							2					
Chlorine-WET						X							2					
Freon 11						X												
Freon 12						X												
Freon 123						X												
Hydrochloric acid						X												
Hydrogen																		
Methane						X												
Oils (all)						X												
Sodium Bisulfite			2		2	X												
Sodium Carbonate						X												
Sodium Hypochlorite			2	2	2	X		2	2	2							2	2
Sodium Thiosulfate 30%			2	2	2	X		2	1	1							1	1
Sulfuric Acid (weak <90%)			3	3	3	X		3	3	3						2	3	3
Sulfuric Acid (strong >=90%)		2	2	3	3	X		3	3	3						2	2	3

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 *This guide summarized the potential reactivity hazards of mixtures of chemicals.
 *The information herein does not constitute or by any means suggest suitable material compatibility for the chemicals and materials listed. Consult piping/instrument specifications for material of construction application.

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