

PPG INDUSTRIES  
INDUSTRIAL CHEMICAL DIVISION  
LAKE CHARLES, LOUISIANA

CENTRAL OMC STEAM STRIPPER  
OPERATING MANUAL

**CONFIDENTIAL:**

Subject to Protective Order  
of 14th Judicial District Court  
No. 91-1145

MANUAL NO. 2

ASSIGNED TO: ERNIE PARS

OCTOBER, 1980

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SL 000001

Memorandum

To: Billy Jr.

From: Michael Tritico

Date: 12/18/97

Dear Billy,

After we hung up the phone awhile ago I began to recall some things and decided to search my old reports in this computer for "vinyl."

Here are the ones that turned up that seem to most clearly apply to what you were asking me about:

SL 007887 08/04/85 refers to end of EPA authority, takeover by DEQ, and "we no longer have the 40 minutes grace period to restore vents after a trip."

SL 047743-744 11/17/84 upset released 3.2 lbs. VC

SL 047759-60 10/05/83 18 lbs.

SL 047761-62 04/07/83 3.9 lbs.

SL 047785 10/11/79 new EPA spill reporting guidelines, if over 600 gallons of VC spill, must report

SL 026385-91 03/05/86 5 incinerator bypasses in 1 month - 140 lbs.  
3 in another month - 1,637 lbs.  
30 seconds single event - 1,615 lbs.

SL 026533-536 09/14/92 pipeline leak - 2,800 lbs.

SL 026583-86 06/14/91 1,140 lbs.

And statement that "false alarms are not uncommon in warm weather."

And a 15 second event released greater than 1,000 lbs.

SL 07319 06/13/80 WTU scrubber stack normally releases 3.6 pounds per day vinyl chloride.

SL 088773-74 05/29/81 event - 1,750 lbs.

SL 104326 07/10/87 3 lbs. Plant B leak

SL 104960-961 1975 memos about worker overexposure to VC

SL 104985-992      1987      legal dispute between LA AG and PPG lawyer  
over numerous vinyl chloride releases

SL 104993-105020    1987      more documents about that situation

SL 105465-67      ?      large fugitive emission release South Terminal  
loading operation

VEV 492752-759    1987      DEQ/ Vista settlement \$12,000 for 24 events  
releasing 8,521 lbs.

VEV 493093-96      03/30/79    Conoco objects to spending \$ to control VC  
emissions

I don't know if this is stuff you already remembered or not, but I figured that I'd  
better send it by fax tonight in case you might need it in the morning.

(Sorry my memory is damaged and it took me awhile to remember that we might  
have some of this. Thank goodness for computer memories.)

Mike 12/18/97 8:45 P.M.

## CENTRAL OHC STEAM STRIPPER AREA

### INTRODUCTION

This operations manual has been prepared to fulfill the following objectives:

- (1). To serve as a training guide for supervisors and operators involved with the Central OHC Steam Stripper Operation.
- (2). To serve as a ready reference for operations personnel.
- (3). To provide a standard procedural approach for area operations to insure the continuity of operating procedures.
- (4). To serve as a source of current data, information, procedures, etc. relating to the Central OHC Steam Stripper area.

This manual is designed to provide a logical approach to start-up and initial operation of the Central OHC Steam Stripper. As experience dictates, operational changes may need to be made in this manual at some later date. A record of such additions and deletions should be kept on the page provided for this purpose. (See next page)

Information in this manual is considered confidential. This manual is the property of PPG and as such may be recalled at any time.

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## RECORD OF CHANGES

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## NOTES ON PAGE-NUMBERING SYSTEM

The pages in this manual are numbered using a system of two numbers; the first being the section number, while the second represents a page number, illustration, or table in that section. Thus, page 1-2 represents page 2 in Section I; Figure 3.4 represents Figure 4 in Section III, and so on. This system should facilitate easy revision of this manual as required.

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I. GENERAL PROCESS DESCRIPTION:

A. FUNCTION OF THE CENTRAL OHC STEAM STRIPPER AREA:

The Central OHC Steam Stripper area functions to remove and recover soluble chlorinated hydrocarbons from aqueous effluent streams produced in the OHC-I, OHC-II and OHC-III (Vinyl) areas. The desired degree of removal of chlorinated organics results in a final steam stripper effluent containing no more than 1-5ppm organics. This low level of chlorinated organics allows PPG to ultimately dispose of the stream via the process sewer.

B. STEAM STRIPPER AREA OVERVIEW - ITS ROLE IN PLANT "B":

In the chloral treatment units chloral is treated with cell liquor (caustic) to produce sodium formate and chloroform. This mixture in the aqueous effluent streams from OHC-I, OHC-II, and OHC-III (Vinyl) is routed to the steam stripper area. The sodium formate is water soluble and is carried out with stripper bottoms. The chloroform (and other organics in effluent streams) is stripped overhead in the steam stripper and is recovered. Stripper bottoms are sent to the formate destruction unit where the dissolved sodium formate is treated with HCl and sodium hypochlorite to form salt (NaCl) and CO<sub>2</sub> (both free and dissolved carbon dioxide).

C. PROCESS DESCRIPTION:

The central OHC Steam Stripper Area consists of two steam strippers, two air-cooled condensers, four economizers, two feed tanks, a process sump and various pumps, motors and valves.

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Aqueous effluent streams from the OHC-I, OHC-II and OHC-III (Vinyl) are collected in a common header and routed to the steam stripper from: (1). reactor phase separator overflows, (2). DH still reflux drum overflows, (3). chloral treatment overflows, (4). Bicarb surge tank purges.

The collected effluent streams to be processed by the central OHC Steam Stripper area are pH-adjusted with cell liquor at the individual areas producing them prior to their combination in the steel header to the central steam stripper feed tanks. The incoming effluent is monitored for pH before it enters the feed tanks to insure maintenance of pH 10 in the tank since no provision for pH adjustment (cell liquor addition) at the steam stripper feed tanks is made; pH control is the responsibility of the individual areas producing the aqueous effluent.

The steam stripper feed tanks act as phase separators/surge drums by accumulating organics and phasing them out to the lower sections of the tanks. Each feed tank contains four (4) phases: (1). aqueous phase - steam stripper feed, (2). indeterminate phase - emulsion between aqueous and organic phases containing catalyst from OHC reactor carry-over, (3). organic phase - steam stripper overhead and phased-out organics, and (4). sludge phase - catalyst solids and tarry residue from organic phase.

Feed tank aqueous and organic phase levels determine stripper feed rates as the aqueous phase is fed to the top of the steam stripper after passing through economizers to be preheated by steam stripper bottoms.

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The steam stripper serves to steam distill and so separate soluble organics from the aqueous feed. All organics are removed overhead when 3% by volume of the feed is driven overhead. The driving force is provided by live steam injected into the base of the stripper column. Steam rising through the column removes organics from the aqueous stream moving down the column, contacting though a packed bed in the column.

Vaporized organics driven overhead are routed through air-cooled condensers and returned to the feed tanks as condensate. As they accumulate in the feed tank, phase organics are pumped to the intermediate crude storage tanks at OHC-1.

Steam stripper bottoms (now free of chlorinated organics) are pumped through the economizers to preheat the aqueous phase fed to the steam stripper. The cooled bottoms are normally routed to the formate destruction unit, although they may be routed back into the feed tanks during start-up or upsets.

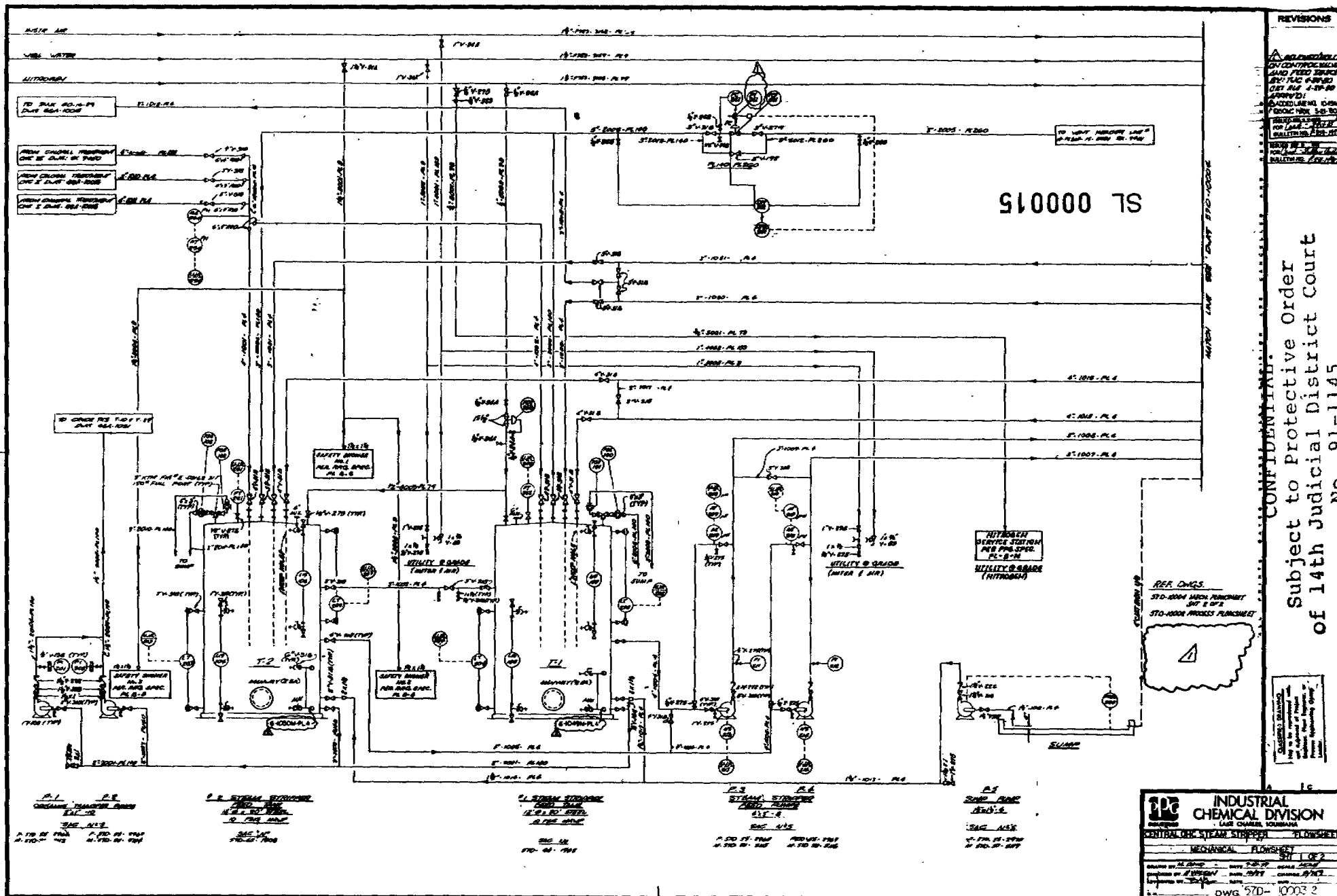
Auxiliary nozzles located on the feed tank allow for the removal of indeterminate phase and sludge phase by vacuum truck.

The process sump collects all pad run-off, seal leaks, spills, etc. from the steam stripper area and routes them back into the steam stripper feed tanks. All rupture disk vent pipes on process vessels are routed to the process pad and drain to the process sump.

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# REVISIONS

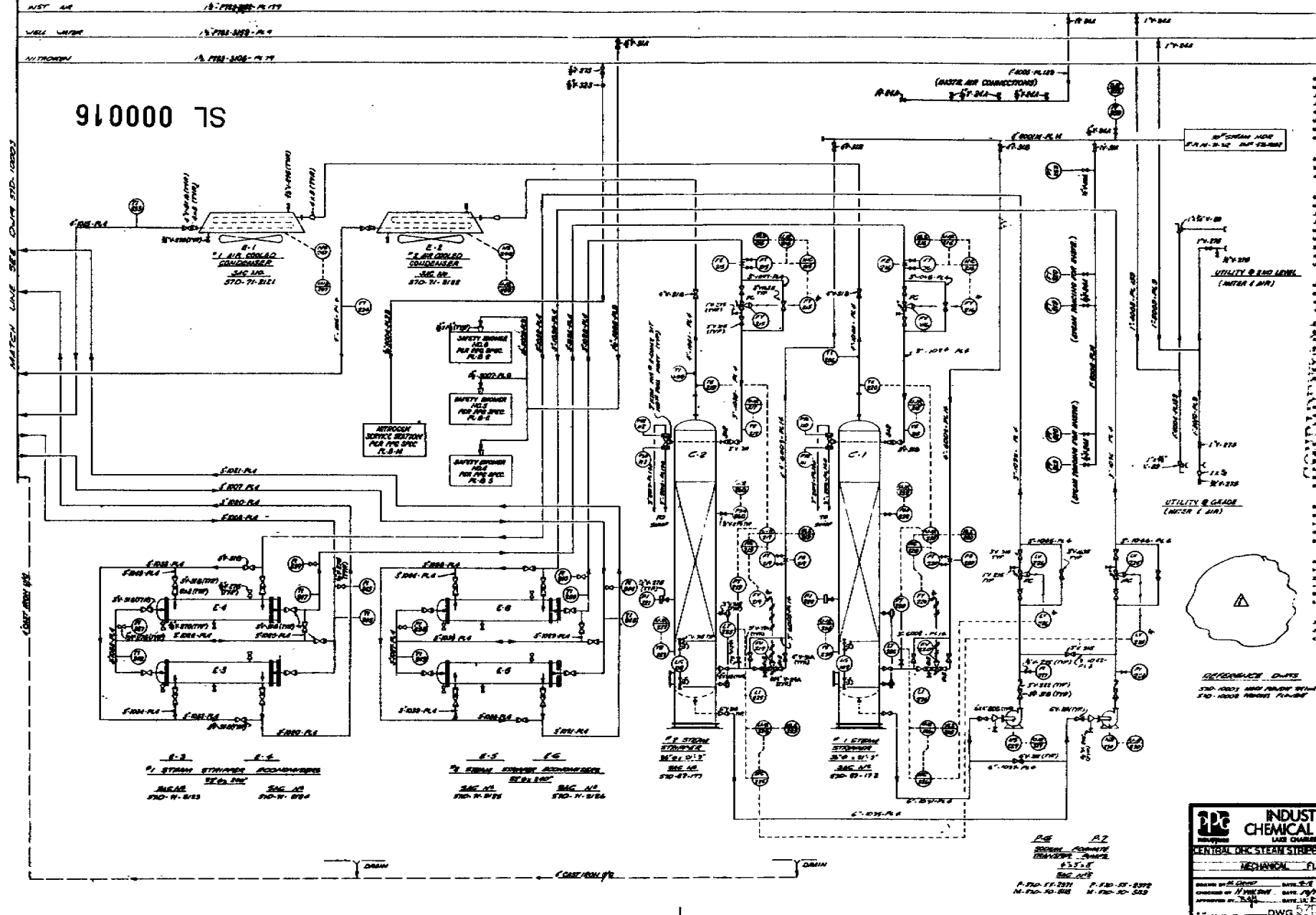
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VALVES  
BY: J.C. 4-24-80  
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BY: J.C. 4-24-80  
CN: RLS 4-25-80  
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Subject to Project  
of 14th Judicial District  
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BY: J.C. 4-24-80  
CN: RLS 4-25-80  
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INDUSTRIAL  
DIVISION  
LAKE CHARLES, LOUISIANA  
CENTRAL OIL STEAM STRIPPER FLOW SHEET  
MECHANICAL FLOW SHEET  
SHEET 2 OF 2  
DRAWN BY: J.C. 4-24-80  
CHECKED BY: J.C. 4-24-80  
DATE: 4-24-80  
DWG 570-0001.1

910000 TS



DATE: 4-24-80  
BY: J.C.  
CN: RLS  
DWG 570-0001.1

## II. SAFETY FOR THE CENTRAL OHC STEAM STRIPPER AREA

This section is designed to cover the safety rules and precautions which must be adhered to while working in the Central OHC Steam Stripper area. The development of a safely operating plant and a safety - conscious work force is based entirely on the attitudes of the people involved. A positive attitude toward the safe completion of all jobs is essential, as well as an awareness of the hazards inherent in all jobs. Individual regard for safety should be a continuous activity, carrying with it the responsibility to strive to improve the safety conditions for all jobs through observation and action. Each person involved must actively take part in the overall safety program to insure that it functions properly to make this a safer place to work for all concerned.

### A. GENERAL SAFETY RULES

The following list of general safety rules applies to the Central OHC Steam Stripper area. It is intended to supplement the Employee's Safety Manual.

The Central OHC Steam Stripper area has been included in Zone No. 17 of the present zoning system. The Directional Center will be located inside the west door of the Per/Tri maintenance shop.

#### Rules:

- (1) Personnel entering the Organics Area will deposit lighters, matches, regular flashlights, etc. at the main gate to this area.
- (2) Smoking is permitted in the control room only. Permanent lights will be provided at this location.

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- (3) The usual safety equipment will be required in the Organics Area -- that is:
- a. Hard hats
  - b. Chemical goggles (safety glasses under goggles are optional)
  - c. Respirators
  - d. Plastic-coated gloves
- (4) Established plant tagging procedures will apply in the Organics Area.
- (5) Company vehicles only will be allowed to travel the road to the Control Building without a permit.
- (6) A vehicle permit signed by the operating supervisor or lead operator will be required for any vehicle to travel north of the main piperack in this area. Never cross a barricade with a vehicle, regardless of whether it is up or down, without a vehicle pass.
- (7) An equipment permit signed by the operating supervisor will be required before the following equipment can be carried into the Organics Area:
- a. Welding machine
  - b. Cutting torch
  - c. Electrically driven drills
  - d. Any electrical equipment except explosion - proof flashlights
- (8) Only explosion-proof flashlights will be allowed in the Organics Area.
- (9) Regular plastic utility hoses are not to be used for handling organics; use Teflon-lined hoses equipped with proper quick-connect fittings and bleed-off valves.
- (10) All light circuits outside the control building are to be off and tagged out before relamping of the area is attempted.

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- (11) The grounding system for electrical equipment is inside the feed r conduit. This ground must be connected before the connection cover is installed.
- (12) Do not dump flammable organics into trapped sewers or openings where harmful vapors could be evolved.
- (13) Open samples or containers of organics are not to be left sitting around to give off vapors.
- (14) Full-face masks or Scott Air-Paks will be used for protection against organic vapors.
- (15) Liquid chlorine is not to be trapped in vaporizers, surge drums, or any isolated section of piping.
- (16) Clothing that has been wetted with organics should be removed immediately and the body thoroughly washed with soap and water. These clothes should be properly laundered before they are worn again.
- (17) Air should not be allowed to enter any process vessel that contains organics.
- (18) In case of emergency warnings, all vehicles and equipment in the area on permits will be shut off immediately. Vehicles should be parked on the roadside out of the way and evacuated. New vehicle passes will be issued to remove the vehicles.
- (19) All steam-out nozzles, hoses, and purge equipment must be properly grounded to prevent the possibility of an arc from an accumulated static charge.
- (20) Chlorine should never be heated above 450°F due to the possibility of a reaction between the chlorine and any metal it contacts.

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- (21) No smoking or open flames will be allowed in the control laboratory.
- (22) The laboratory hood fan is to operate continuously. Do not attempt to run analyses unless the fan is in service.
- (23) Always put liquid organics into tanks through standlegs or bottom nozzles. Falling liquids can generate static electricity.
- (24) The control room and electrical starter rooms are pressurized for safety; therefore, they are to be utilized by authorized personnel only. All doors and windows must be kept closed at all times.

#### B. RESPONSIBILITY FOR SAFETY

##### SUPERVISOR'S RESPONSIBILITY IN ACCIDENT PREVENTION

A supervisor of any work force is in a key position to train his people to abide by the plant safety rules and regulations; he also must instruct his people to constantly comply with these safety rules and regulations.

The results of this training and compliance keeps all plant personnel thinking and working in unison which is both important and necessary to accomplish safe working conditions within the plant.

Listed below are some of the responsibilities of a supervisor in accident prevention.

- 1. To train employees to do all jobs safely.
- 2. To issue Job Safety Instructions when required.
- 3. To enforce safety rules and regulations.
- 4. To recognize and correct unsafe acts and conditions.
- 5. To investigate all accidents and fill out the Supervisor's Accident Report.

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- 4-5
6. To investigate all near-miss accidents and correct the condition or act.
  7. To require workers to report for first aid when injured.
  8. To conduct formal safety meetings.
  9. To observe safety rules and safety practices.

#### EMPLOYEE'S RESPONSIBILITY IN ACCIDENT PREVENTION

Each employee has a personal responsibility in accident prevention. He has a responsibility to his family, to his fellow workers, and to his employer by whom he is paid to work safely. In the performance of his duties, he will be expected to observe safe practice rules as well as instructions relating to the efficient handling of his work.

- (1) Each employee will be issued a copy of the Plant Safety Manual.
- (2) Each employee will carefully study and observe all the rules in the Safety Manual, especially those applying to his particular duties. These rules will be strictly enforced and ignorance thereof will not be accepted as an excuse for their violation.
- (3) If a difference of opinion arises concerning the meaning or application of these rules or the steps necessary to carry them out, the decision of the supervisor in charge of the work will prevail.
- (4) Every employee will consider it a part of his or her duties to take an active part in promoting safety.
- (5) Employees will be careful always to place themselves in a safe and secure position. The care exercised by others must not be relied upon for protection.
- (6) When walking down the roadways, employees shall keep on the left

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side in order to face approaching vehicles.

- (7) Do not run in the plant or on the parking lots.
- (8) Salt tablets or substitutes should be taken when sweating freely.
- (9) Never take unnecessary risks or short cuts.
- (10) Conduct that may be termed "fooling" or "horseplay" is strictly forbidden and is subject to disciplinary action.
- (11) All employees shall consider it part of their duties to:
  - (a) Report unsafe conditions.
  - (b) Correct unsafe acts.
  - (c) Know disciplinary action for violation of safety rules.
  - (d) Report ALL injuries and near-miss accidents to supervision immediately.
  - (e) Know the proper procedure in reporting emergencies.
  - (f) Refrain from taking chances.
  - (g) Ask a supervisor for help whenever needed.
  - (h) Refrain from tampering with anything of which you have no knowledge.
  - (i) Attend safety meetings.
  - (j) Know the location and use of gas masks, fire fighting equipment, safety showers, etc. in your work area.
- (12) Employees shall be fully dressed when on the job. Shirt tails should be tucked in.
- (13) Do not work in clothing that is saturated with oil or chemicals.
- (14) Do not enter roped off or barricaded areas unless authorized to do so. Barricades shall be removed as soon as practical after job is completed.

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- (15) Never jump from platforms, scaffolds, loading docks or other high places.
- (16) Always use handrails when walking up or down stairways.
- (17) Avoid walking on piperacks, structural steel, etc. Use provided ladders or walkways.
- (18) Beards are not allowed in the plant.
- (19) Long sideburns which could interfere with the use of a full fac mask are prohibited.
- (20) Employees required to work around moving or rotating machinery and welding and burning operations must not wear hair longer than collar length and such that it extends out beyond the ears.
- (21) Knowing and following correct operating procedures is necessary to the safe operation of this plant.
- (22) Do not loiter or wander through operating units. Use the roadways or walkways connecting adjacent units.
- (23) No employee shall sleep on the job.
- (24) Do not stand on chairs, boxes, or other make-shift supports.

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C. EMERGENCY PROCEDURES AND WARNING SIGNALS

The Central OHC Steam Stripper area is included in the Plant "B" evacuation area. The Plant "B" evacuation horn is the regular plant horn blown in short blasts. It may be activated from any Plant "B" control room or the guard house. The OHC-I control room switch is located on the north wall. The sounding of this horn will shut down all non-process equipment in Plant "B" and will cause all non-essential personnel to leave the area. Plant "B" includes all the Organics Area - east of Columbia Southern Road

and south of Parish Road. The Plant "B" evacuation horn should be sounded in case of a major break or if there is some reason to expect a major break. Whenever the evacuation horn is sounded, the guard should be notified of the nature of the emergency if at all possible. If it is desirable to evacuate the whole plant, the guards will have to be notified and they will sound the plant evacuation alarm. The guards are the only people able to sound the all-clear signal, signified by two long blasts of the horn.

#### D. RESPIRATORY PROTECTION

In order to prevent personnel exposure to harmful chlorine and organic vapors, proper respiratory protection must be worn at the appropriate times. Three types of respiratory protection equipment are provided for personnel in the Central OHC Steam Stripper area; filter-type respirators, self-contained breathing equipment, and air-supplied masks.

The self-contained equipment consists of 30-minute Scott Air Paks and 6-minute MSA escape units. The escape unit mask can also be connected to the control room breathing air systems such that a person may continue to operate equipment inside the control room without using up the 6-minute air supply bottle or having to strap on a 30-minute air pak. Besides the standard pocket respirator, a twin cartridge full-face mask filter respirator is provided. The dual cartridge respirator is a light concentration work mask which can be used in situations where self-contained equipment is not necessary and the pocket respirator is insufficient. Good for environments containing combinations of chlorine and organic vapors not exceeding 2% by volume, the use of the dual cartridge mask requires at least

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19.5% oxygen in the atmosphere. The mask comes with interchangeable cartridges for different types of gases. After these masks have been used, they should be exchanged for new ones at the safety department. There are 30-minute air paks, 6 minute escape units and twin cartridge full face mask located in the control room for easy access.

It should be pointed out here that methane and ethylene are not filtered out by any of the filter type respirators in the plant and therefore present special problems for respirator protection. However, since neither methane nor ethylene is toxic, the area exposed to these can be evacuated before sufficient concentration is reached to suffocate any personnel. If it is necessary to enter an area where quantities of methane or ethylene are present, self-contained breathing equipment should be worn.

#### E. CLEARING PROCEDURES

One of the most important aspects of an operator's job and especially the lead operator's job is the proper clearing of equipment for maintenance work. Many accidents and injuries are the result of poor and improper clearing and tagging procedures. For complex clearing operations, such as a distillation column or reactor, the area supervisor will generally leave general clearing instructions. It is up to the operating crew to execute the instructions and follow up on some of the details of clearing that are obvious, but may have not been specifically mentioned, such as opening low point bleeds, etc. For smaller, routine jobs such as filters or pumps, the operators are expected to be able to clear these without specific instructions.

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The lead operator has the same responsibility in tagging as a supervisor does when the supervisor issues a welding or vessel entry permit. He is saying in writing (hanging a signed tag) that the equipment is then safe for maintenance mechanics to work on. On extensive piping systems, all piping should be traced out carefully to find all tagging locations. Do not depend on memory of all branches and block valve locations. It is advisable to get someone else (another operator, lead operator, or supervisor) to double check the tagging of a complex piping system.

In recent years, clearing jobs have become more complex. No longer is it acceptable to dump organics to the sewer (even the segregated sewer). Whenever possible nitrogen should be used to push liquid from a piece of equipment back into the process (remember to only use N<sub>2</sub> where process pressure is less than the N<sub>2</sub> pressure). In other cases, 55 gallon drums and organic boxes will have to be used to drain process equipment.

Now it is not only important to have equipment drained and depressurized, but it should also be nitrogen purged before maintenance work is performed on it. This is done to prevent exposure of maintenance personnel to even the smallest levels of organic vapors.

The lock and tag procedure is the cornerstone of PPG's policy for safe maintenance work. Basically, all valves required to isolate the particular section of line or vessel to be worked on must be closed. The isolated section must be depressurized and purged as necessary. A lead operator's "DO NOT OPERATE" tag must be hung on each isolation valve. Any

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electrical equipment must be tagged and locked out. The maintenance foreman will also tag each valve. Finally, the mechanics will hang their personal tags on each valve. All persons are supposed to pull their tags when jobs are completed. Valves with tags on them should never be operated. If maintenance tags are found on valves that need to be operated, the area foreman or shift engineer should be contacted so that they can arrange for the appropriate maintenance personnel to pull the tags.

The detailed procedure for clearing equipment is:

1. Isolate the tank, vessel or line.
2. Drain all liquid out of the vessel. Be alert to open all low point bleeds, orifice manifolds, etc.
3. Purge the equipment with nitrogen to remove organic fumes and evaporate residual liquid.
4. Tag each isolation valve with lead operator tags. In effect, this indicates the equipment is ready for maintenance to work on. Do not tag any valves unless the equipment is completely ready.
5. Where welding or vessel entry is required, each line connection to the vessel must be blinded off. The equipment should be purged with air.
6. Before any welding or vessel entry is done, the atmosphere should be checked out with an explosimeter by the Operations foreman. Welding and entry permits must be filled out by the Operations and Maintenance foremen before welding or entry may proceed.

Any time someone enters a vessel there must be another person outside

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to act as a manway watch. Airline masks and bottles must be available for the person inside to use immediately if the oxygen in the vessel suddenly becomes deficient.

7. When work is through and tags are removed, equipment should be nitrogen purged to remove oxygen. As this is done, the vessels should be pressurized so that each flange or connection that was opened can be leak-checked. New welds and packings on new valves should also be leak-checked.

#### F. TAGGING, SAFETY PERMITS

See the section in the safety manual entitled "Tags and Tagging Procedure".

There are essentially four tags used in Area B.

##### Types of Tags:

##### (1) "DO NOT OPERATE"

This is a plastic tag that should be placed on faulty equipment, or equipment requiring maintenance, by leadmen and foreman for both maintenance and operations. The tag should be signed, dated, and the reason given for tagging in pencil. "DO NOT OPERATE" tags may be pulled by employees of the same job classification if the situation is fully known. When tagging a piece of equipment, all control points should be closed and tagged by operations first.

##### (2) "PERSONAL TAG"

This is a white plastic tag with name, man number, and "DO NOT OPERATE" inscribed on the tag. This tag can be used by maintenance workers who are working on process equipment where they may be

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endangered. Only the named person can use and pull his personal tags.

(3) "INSTRUMENT SHUT-OFF TAG"

This is a white cardboard tag used to indicate when an instrument is out-of-service for repairs or calibration.

(4) "SUPERVISOR'S TAG"

This is a laminated red paper tag with the supervisor's name inscribed on it. Supervisor's use their tag like a "PERSONAL TAG".

Types of Permits

See the section called "Safe Work Permits" in the safety manual for more details on permits. Also see Appendix H of this manual.

(1). "WELDING, BURNING, OR OPEN FLAME PERMIT"

A Welding, Burning, or Open Flame Permit (WBOF) must be issued prior to beginning "hot work" anywhere in Plant B. A paper copy is posted in the Operations Control Room and a cardboard copy is posted conspicuously on the job site. A WBOF Permit is not valid unless signed by both an Operations Supervisor and a Maintenance or Construction Field Foreman. The maximum duration of a WBOF Permit is four (4) hours and it may not be revalidated after that time.

(2). "STRUCTURAL CHANGE, DRILLING, AND EXCAVATION PERMIT"

This yellow cardboard permit is required when maintenance or construction must change structures, do drilling, or do excavation work. Engineering or the area maintenance general foreman sign this permit.

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(3) "TANK ENTRY PERMIT"

This is an orange cardboard permit issued to maintenance for entry into vessels, tanks, manholes, pipes, and sumps. Both operations and maintenance supervisors will sign this permit. The tank must be tested for flammable organics content and oxygen content. A second man should be available to pull the man inside the tank out with the safety harness rope. Air bottles and masks should be provided for both men. All lines going into the vessel must be blinded. See clearing procedure.

(4) "VEHICLE ENTRY PERMIT"

This is a green cardboard permit issued by operating leadmen or the foreman for vehicles or spark producing equipment in process or barricaded areas for 30 minutes or less.

(5) "IGNITION SOURCE PERMIT"

The Ignition Source Permit (ISP) is similar to the WBOF Permit and is designed to control the use of tools and devices having the potential to provide a spark or source of ignition in areas of the plant where this is a concern. The ISP has a maximum duration of eight (8) hours and must be signed by an Operations Supervisor in the affected area. The paper copy is posted in the Operations Control Room and the cardboard copy is posted in a conspicuous place on the job site.

(G) MISCELLANEOUS SAFETY PRACTICES

(1) Electrical Equipment

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PPG's Electrical Engineering (and Loss Prevention) Department(s) have evaluated the Central OHC Steam Stripper area as a Class I, Group D, Division 2 installation, as is most of Plant B with a few exceptions in specific areas. The PPG Electrical Area Classification Drawings should be consulted prior to any electrical modifications. With this classification, lighting is vapor-tight, motors are TEFC (Totally Enclosed Fan Cooled), and all arcing devices are explosion-proof with seal-offs used.

(2) Relamping and Receptacles

Vapor-tight fixtures are used in the process area. The relamping procedure will be to first determine the lamps which need changing by turning on all lights. Then, turn off all lights and relamp. To simplify this procedure, circuit breakers for lights in the process area and control laboratory have been grouped in the lighting panels. Globes and guards must be replaced after relamping.

(3) Grounding

Grounding in the Central OHC Steam Stripper area has been given special attention due to problems peculiar to the handling of hydrocarbons. Grounds for motors and other electrical devices are contained in the conduit supplying the device and connected to the device frame internally. Motor change-outs should be checked to see that the ground has been replaced.

It is obviously important that the grounding system be maintained intact.

This should be kept in mind when performing maintenance work on any equipment in this area.

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H. SAFETY SHOWERS

The Central OHC Steam Stripper area contains six (6) safety showers supplied

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by the well water system in the area. Safety showers are to be used without hesitation by all personnel in the event that they are doused by chemical spills. Safety showers are well identified by highly visible fluorescent orange and white striped signposts and all personnel should become thoroughly familiar with their location. Any time saved in reaching the nearest safety shower could be critical in minimizing possible injury resulting from chemical contact.

The safety showers in the area are listed below with this location:

| SAFETY SHOWER NO. | LOCATION                                                                                     |
|-------------------|----------------------------------------------------------------------------------------------|
| 1                 | On top of feed tank #T-1.                                                                    |
| 2                 | At the auxiliary 6" nozzles on Tank #T-1<br>(ground level) near level transmitter<br>LT-208. |
| 3                 | At foot of stairs on Tank #T-2.                                                              |
| 4                 | On 1st level next to the #2 steam stripper<br>feed economizer.                               |
| 5                 | On 2nd level at flow control valve #219<br>on stripper feed, between the strippers.          |
| 6                 | On 3rd level next to #2 air-cooled con-<br>denser; next to the #2 steam stripper.            |

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#### I. CONTROL BUILDING

The control building is pressurized to prevent accumulation of any vapors inside. Since it is a pressurized building, non-explosion proof electrical equipment is used and smoking is prohibited inside. The positive pressure

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is maintained by a fan which draws its intake air across an activated carbon filter. Should a major break occur, the filter would be unable to eliminate all contaminants; therefore, the fan should be shut down. To prevent any vapors from entering the building when the fan is off, instrument air bleeds should be opened. (Do not bleed the air system down by taking too much). To prevent dust from accumulating in the control room, filter bags are in the suction of the air conditioner. For any problems with the air conditioner, notify the supervisor. Both the control room and switchgear room are equipped with emergency lanterns which will come on if normal lighting power is lost.

J. LAB AND LAB HOOD FAN

The laboratory has several nitrogen outlets. If this nitrogen were opened up and allowed to purge into the room, any person in the lab could be asphyxiated. Protection against this is given by the lab hood fan. This special hood has two fans, one discharging into the hood and one pulling out of the hood to the outside. The fan pulling out has a larger capacity, thus there is a net flow of air out of the lab, preventing concentration of fumes or nitrogen.

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K. DEFINITIONS

Some of the terms used in the following discussion are defined below:

- (1) Flash Point - The flash point of a solvent is the lowest temperature at which a vapor is given off in sufficient quantities so that the vapor-air mixture above the surface of the solvent will propagate a flame away from the source of ignition. It is the temperature below which a solvent may be used or stored in open containers without formation

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of an explosiv vapor-air mixture.

- (2) Explosive Limits - When combustible vapor is mixed with air in the proper proportions, ignition will produce an explosion. The vapor-air mixture which will form this proper proportion is called the explosive range. The explosive range includes all concentrations of a mixture of flammable vapor or gas in air in which a flash will occur or a flame will travel if the mixture is ignited. The lowest percentage at which this occurs is the lower explosive limit and the highest percentage is the upper explosive limit. Explosive limits are expressed in percent by volume of vapor in air.
- (3) Maximum Allowable Concentration (MAC) - The maximum allowable concentration for a material is the maximum concentration of that material that can be tolerated by personnel for a continuous 8-hour exposure period with no ill effects, given as MAC numbers.

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### III. CHEMICALS IN THE OHC CENTRAL STEAM STRIPPER AREA

| <u>NAME</u>                         | <u>FORMULA</u>                    | <u>ABBREVIATION</u>             |
|-------------------------------------|-----------------------------------|---------------------------------|
| Calcium Chloride                    | $\text{CaCl}_2$                   |                                 |
| Carbon Tetrachloride                | $\text{CCl}_4$                    |                                 |
| C II Liquor                         | $\text{NaOH}/\text{H}_2\text{O}$  | Caustic                         |
| Chlorine                            | $\text{Cl}_2$                     |                                 |
| Chl roform                          | $\text{CHCl}_3$                   |                                 |
| cis-Dichloroethylene                | $\text{C}_2\text{H}_2\text{Cl}_2$ | Cis-                            |
| Cuprous Chloride                    | $\text{Cu}_2\text{Cl}_2$          |                                 |
| Dichloroacetylene                   | $\text{C}_2\text{Cl}_2$           | DCA                             |
| Dowtherm A                          |                                   |                                 |
| Ethyl Chloride                      | $\text{C}_2\text{H}_5\text{Cl}$   | EC                              |
| Ethylene                            | $\text{C}_2\text{H}_4$            |                                 |
| Ethylene Dichloride                 | $\text{C}_2\text{H}_4\text{Cl}_2$ | EDC                             |
| Ferric Chloride                     | $\text{FeCl}_3$                   |                                 |
| Hydrogen Chloride                   | $\text{HCl}$                      | hydrochloric acid               |
| Methane                             | $\text{CH}_4$                     | natural gas                     |
| Methyl Chloroform                   | $\text{C}_2\text{H}_3\text{Cl}_3$ | MC                              |
| Nitrogen                            | $\text{N}_2$                      |                                 |
| Oxygen                              | $\text{O}_2$                      |                                 |
| Pentachloroethane                   | $\text{C}_2\text{HCl}_5$          | PENTA                           |
| Sodium Carbonate                    | $\text{Na}_2\text{CO}_3$          | Soda Ash                        |
| Sodium Formate                      | $\text{NaCOOH}$                   |                                 |
| Sulfuric Acid                       | $\text{H}_2\text{SO}_4$           |                                 |
| Tetrachloroethane (sym- and unsym-) | $\text{C}_2\text{H}_2\text{Cl}_4$ | s-TeCE, u-TeCE<br>sym- , unsym- |
| trans-Dichloroethylene              | $\text{C}_2\text{H}_2\text{Cl}_2$ | trans-                          |
| 1,1,2-Trichloroethane               | $\text{C}_2\text{H}_3\text{Cl}_3$ | TCE                             |
| Trichloroethylene                   | $\text{C}_2\text{HCl}_3$          | TRI                             |
| Vinyl Chloride                      | $\text{C}_2\text{H}_3\text{Cl}$   | VC, chloroethylene              |
| Vinylidene Chloride                 | $\text{C}_2\text{H}_2\text{Cl}_2$ | VDC                             |

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NAME: Calcium Chloride

FORMULA:  $\text{CaCl}_2$

MOLECULAR WEIGHT: 110.99

BOILING POINT: 2912°F (1600°C)

MELTING POINT: 1422°F (772.22°C)

SOLUBILITY IN WATER: 59.5 parts  $\text{CaCl}_2$ /100 parts  $\text{H}_2\text{O}$  at 16.2°F

347 parts  $\text{CaCl}_2$ /100 parts  $\text{H}_2\text{O}$  at 680°F

DENSITY: 156.8 lbs. per  $\text{Ft}^3$ , @ 77°F (2.512 gram/cc @ 25°C)

RELATIVE VAPOR DENSITY: Normally a solid

FLASH POINT: None

EXPLOSIVE LIMITS: None

HAZARDOUS PROPERTIES: Generally speaking, calcium compounds should be considered toxic only when they contain a toxic component (such as arsenic, etc.) or as calcium oxide or hydroxide.

The hydration of the anhydrous salt is exothermic (21.7 kcal/mole) to form the hexahydrate. Thus, care should be taken if water washing any  $\text{CaCl}_2$  solid from process equipment or pads as it may splash into the operator's eyes.

TREATMENT: Wash exposed area with water. Flush eyes for 15 minutes, then report to First Aid.

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NAME: Carbon Tetrachloride

FORMULA:  $\text{CCl}_4$

MOLECULAR WEIGHT: 154

BOILING POINT: 170.2°F (76.78°C)

FREEZING POINT: -9°F (-22.78°C)

VAPOR PRESSURE: 90.9 mm Hg. @ 68°F

VAPOR DENSITY: 5.32 (air = 1.0)

LIQUID DENSITY: 98.9 lbs. per  $\text{Ft}^3$  @ 77°F

FLASH POINT: None

EXPLOSIVE LIMITS: Nonflammable and non-explosive in air at ordinary temperatures and pressures.

MAXIMUM ALLOWABLE CONCENTRATION: 10 ppm for 8 hrs.

DETECTION ODOR CONCENTRATION: Carbon tetrachloride has a distinctive odor but, unfortunately, can be detected only in concentrations exceeding the maximum allowable concentration.

HAZARDOUS PROPERTIES: The principal hazard in the industrial use of this chemical is from inhalation of the vapor. The effects of excessive exposure of carbon tetrachloride may be both immediate and delayed. The immediate effects may include headache, symptoms resembling inebriation or drowsiness and abdominal discomfort. The delayed effects may include severe damage to the heart, liver and kidneys which may not be evident until 1-10 days after the exposure.

Skin contact with the liquid leads to dryness through the removal of natural oils from the skin. Repeated or prolonged exposure may cause dermatitis, cracking of the skin and danger of secondary infections.

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Eye contamination by liquid carbon tetrachlorid causes burning, intense irritation and other symptoms of inflammation.

Subacute or chronic carbon tetrachloride poisoning may result from prolonged or repeated exposure to the vapors or the liquid. A threshold limit value of 10 ppm by volume in air has been set by some agencies as a maximum safe concentration for a daily 8 hour exposure.

TREATMENT: In extensive skin contact the patient should get under the shower immediately, if such is available.

Clothing and shoes should be removed under the shower.

If liquid carbon tetrachloride has entered the eyes, irrigate immediately with water. This can be done with an eye bath, if available, a gentle stream of water from a hose, or by pouring water from a clean container. The eyelids should be held apart during the irrigation to insure contact of water with all the tissues of the surface of the eye and lids. If pain is still present, it is permissible as a first aid measure to instill 2 or 3 drops of 0.5 percent pontocaine solution or an equally effective aqueous topical anesthetic. No oils or oily ointments should be instilled unless ordered by a physician.

If carbon tetrachloride has been swallowed, call a physician immediately. Vomiting should be induced by having the patient stick his finger down his throat or by giving large quantities of warm salt water (2 tablespoons to a glass of water). If vomiting occurs, give more water in order to attempt to wash out the stomach.

Remove patient to an uncontaminated area. If breathing has stopped an effective means of artificial respiration should be started immediately. If oxygen inhalation apparatus is available, oxygen should be administered, but only by a person authorized for such duty by a

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physician. The patient should be kept warm, but not hot.

CAUTION: Persons exposed to carbon tetrachloride should not be given alcohol, oils, fats or epinephrine.

NEVER give anything by mouth to an unconscious patient.

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NAME: Cell Liquor (Caustic Soda, Sodium Hydroxide)

FORMULA: NaOH

MOLECULAR WEIGHT: 40.00

BOILING POINT: 253.4°F (123°C)

MELTING POINT: 605.1°F (318.39°C)

VAPOR PRESSURE: @1362°F, 1mm. Hg

LIQUID DENSITY: Normally a solid. Cell liquor is approximately 10% NaOH in a salt solution.

(100 lb/gal; 1.1 gram/ml @ 77°F)

SOLUBILITY: 42 grams/100 grams H<sub>2</sub>O @ 0°C; 347 grams/100 grams H<sub>2</sub>O @ 100°C.

FLASH POINT: None

EXPLOSIVE LIMITS: None

MAXIMUM ALLOWABLE CONCENTRATION: 1.2 ppm by volume

HAZARDOUS PROPERTIES: This material, both solid and solution, has markedly corrosive action

upon all body tissue. Caustic solution is detectable by the slippery feeling of soapy water.

Its corrosive action on tissue causes burns and frequently deep ulceration, with ultimate scarring. Prolonged contact with dilute solutions has a destructive effect upon tissue.

Mists, vapors, and dusts of this compound cause small burns, and contact with the eyes,

either in the solid or solution form, rapidly causes severe damage. Ingestion either in the

solid or solution form causes very serious damage to the mucous membranes or other tissues

with which contact is made. It can cause perforation and scarring. Thus effects of inhalation

vary from mild irritation of the mucous membranes to a severe pneumonitis. It can cause an

irritant dermatitis. Caustic soda will react with water or steam to produce heat and will at-

tack organic tissue.

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TREATMENT: Where large quantities are handled the area should be well ventilated and face masks should be worn. Speed in removing caustic from contact with the skin is important. Remove all contaminated clothing at once, then flush the skin with water thoroughly. The use of small portions of water, such as by sponging, may cause more serious injury due to heat liberated on dilution. After flushing with water, use liberal quantities of a neutralizing solution such as a 0.5% solution of boric acid, citric acid, or ammonium chloride. If any caustic soda contacts the eyes, they should be irrigated immediately with an abundant amount of water for at least 15 minutes. The eyelids should be held apart during irrigation. The eye should then be washed with a mild saline solution if available. Wash the eye with water for an additional 15 minutes. A physician should be seen immediately after the eye is thoroughly washed.

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NAME: Chlorin

FORMULA:  $\text{Cl}_2$

MOLECULAR WEIGHT: 70.91

BOILING POINT:  $-30^\circ\text{F}$  ( $-34.44^\circ\text{C}$ )

VAPOR PRESSURE @  $75^\circ\text{F}$ : 92 psig

FREEZING POINT:  $-148^\circ\text{F}$  ( $-100^\circ\text{C}$ )

LIQUID DENSITY @  $77^\circ\text{F}$ : 11.6 pounds/gallon

RELATIVE VAPOR DENSITY: 2.45 (Air = 1.0)

FLASH POINT: None

EXPLOSIVE LIMITS: None

MAXIMUM ALLOWABLE CONCENTRATION: 0.35 to 1 ppm

DETECTABLE ODOR CONCENTRATION: 3.5 ppm

HAZARDOUS PROPERTIES: Liquid chlorine as well as chlorine gas is very dangerous to the  
yes. High concentrations of chlorine gas can cause pneumonitis and edema of the lungs.  
Upon inhalation 15 ppm is very irritating to the throat and 1000 ppm is fatal. Lung irritation is one of the most serious effects of chlorine; once in lungs, chlorine combines with moisture to form  $\text{O}_2$  and  $\text{HCl}$ .  $\text{Cl}_2$  is about  $2\frac{1}{2}$  times as heavy as air, therefore, it has a tendency to collect in the low spots or stay near the ground. Chlorine can react to cause fire or explosion with temperature, ether,  $\text{NH}_3$ , hydrocarbons, hydrogen, powdered metals, polypropylene, rubber or alcohols.

TREATMENT: Remove patient from toxic area and loosen all constrictive clothing about the neck. Oxygen should be administered in all cases to prevent cyanosis and relieve the pain of deep respiratory effort. Notify a physician.

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NAME: Chloroform

FORMULA:  $\text{CHCl}_3$

MOLECULAR WEIGHT: 119.5

BOILING POINT: 143°F (61.67°C)

FREEZING POINT: -82°F (-63.33°C)

VAPOR PRESSURE: 160 mm Hg @ 68°F

VAPOR DENSITY: 4.13 (air = 1.0)

LIQUID DENSITY: 93 lbs. per  $\text{Ft}^3$  @ 68°F

FLASH POINT: None

EXPLOSIVE LIMITS: Will not burn in air

MAXIMUM ALLOWABLE CONCENTRATION: 50 ppm for 8 hrs.

DETECTION ODOR CONCENTRATION: 200 ppm (NOTE THAT THIS IS HIGHER THAN THE  
MAXIMUM ALLOWABLE CONCENTRATION)

HAZARDOUS PROPERTIES: The most important hazard of chloroform arises from the fact that repeated exposure to low atmospheric concentrations may result in damage to the liver and kidneys. In high concentrations it has narcotic properties and is an effective surgical anesthetic. Contact with skin and mucous membranes may produce irritation.

In the presence of excess water or at very high temperatures, such as occur in open flames, chloroform decomposes to give phosgene, hydrogen chloride, and other products.

In the presence of a strong alkalis and water, chloroform may become violently explosive.

On exposure to air and sunlight, chloroform slowly oxidizes to phosgene.

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TREATMENT: If substantial quantities are spilled upon a person, the contaminated clothing should be removed promptly and the affected skin area should be flushed with plenty of water. The contaminated clothing should not be worn until free of the material.

If the eyes are contaminated, they should be flushed with plenty of flowing water.

Medical attention should be obtained if any irritation persists.

If chloroform has been swallowed, vomiting should be induced as soon as possible by tickling the throat with a finger or by giving an emetic, such as two tablespoonfuls of common salt in a glass of warm water. CALL A PHYSICIAN.

Anyone showing signs of ill effects from breathing the vapor of chloroform should be removed to fresh air, kept warm and quiet and be made to rest. If breathing stops, artificial resuscitation should be given. Get medical attention promptly.

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NAME: cis-Dichloroethylene (Cis)

FORMULA:  $\text{ClHC} = \text{CHCl}$

MOLECULAR WEIGHT: 96.55

BOILING POINT: 140.36°F (60.20°C)

VAPOR PRESSURE: 3.33 psia @ 70°F

400 mm @ 41.0°C

FREEZING POINT: -112.9°F (-80.5°C)

SPECIFIC GRAVITY: 1.2756 @ 25°F

VAPOR DENSITY: 3.34

FLASH POINT: 43°F (6.11°C)

EXPLOSIVE LIMITS: UEL 12.8% (% by volume)

LEL 9.7%

MAXIMUM ALLOWABLE CONCENTRATION (MAC): TVL 200 ppm

DETECTABLE ODOR CONCENTRATION: Pleasant odor

HAZARDOUS PROPERTIES: Dangerous fire hazard. Moderate explosive hazard. Dangerous disaster control. When heated to decomposition, it emits highly toxic fumes of chlorides; can react vigorously with oxidizing materials. In case of fire, use  $\text{H}_2\text{O}$ , foam,  $\text{CO}_2$  or dry chemicals.

TREATMENT: In case of contact exposure, remove contaminated clothing and wash skin thoroughly with water. Flush eyes with water.

If taken internally, report to First Aid immediately.

For exposure by inhalation, remove patient from contaminated area - give artificial respiration and  $\text{O}_2$  if necessary. Report to First Aid.

SL 000044

CONFIDENTIAL:  
Subject to Protective Order  
of 14th Judicial District Court  
No. 91-1145

NAME: Cuprous Chloride

FORMULA:  $\text{Cu}_2 \text{Cl}_2$

MOLECULAR WEIGHT: 223.4

BOILING POINT: 2490.8°F (1366°C)

MELTING POINT: 791.6°F (422°C)

VAPOR PRESSURE: N/A

FLASH POINT: N/A

EXPLOSIVE LIMITS: N/A

MAXIMUM ALLOWABLE CONCENTRATION: N/A

DETECTABLE ODOR CONCENTRATION: N/A

HAZARDOUS PROPERTIES: Cuprous chloride is toxic and a strong irritant. Handlers should wear dust masks, safety goggles, and rubber gloves.

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NAME: Dichloroacetylene (DCA)

FORMULA:  $\text{ClC} = \text{CCl}$

MOLECULAR WEIGHT: 94.94

BOILING POINT: 89.6°F (32°C)

VAPOR PRESSURE:

FREEZING POINT: -85°F (-65°C)

LIQUID DENSITY:

FLASH POINT:

EXPLOSIVE LIMITS:

MAXIMUM ALLOWABLE CONCENTRATION (MAC): TC (human) = 0.5 ppm

DETECTABLE ODOR CONCENTRATION:

HAZARDOUS PROPERTIES: Dichloroacetylene is a gas with a disagreeable sweetish odor, narcotic and poisonous causing nerve and eye dysfunction at trace concentrations. Severe explosion hazard w/shocked, heated, in air. Dichloroacetylene is explosive and spontaneously flammable in air, burning with release of phosgene. Explosion can occur when shocked (electrical) or heated. When heated to decomposition or in contact w/acid or acid fumes, it emits highly toxic fumes of chloride. Reacts vigorously with oxidizing material.

TREATMENT: Remove exposed individual from area immediately and call or report to First Aid.

SL 000046

CONFIDENTIAL:  
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of 14th Judicial District Court  
No. 02-1-1-1

NAME: Dowtherm A

FORMULA: 26.5% diphenyl, 73.5% diphenyl oxide

BOILING POINT: 500°F @ 1 atmosphere

FREEZING POINT: 53°F (11.67°C)

FLASH POINT: 255°F (123.89°C)

Dowtherm A is heavier than air. Dowtherm A is used in our process as a liquid and is a mixture of two chemicals. It is not normally toxic or otherwise hazardous, except that at the temperatures we will use it, safeguards must be provided. It has a very distinctive odor.

HEALTH HAZARDS: Unless the fumes are so strong as to cause oxygen deficiency, there is no hazard. The odor is irritating to intolerable below the safe toxic limit.

Skin irritation is of minor consequence, however, contact should be avoided.

FIRE HAZARD: The temperatures of use are above the flash point so precautions must be taken as if it were highly flammable. Inert gas (N<sub>2</sub>) purge and "no burning and welding" procedures must be used. The best fire extinguisher is water, because its vapor concentration is very low at water temperatures.

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SL 000047

NAME: Ethyl Chlorid (EC)

FORMULA:  $\text{ClH}_2\text{C}-\text{CH}_3$

MOLECULAR WEIGHT: 64.52

BOILING POINT: 54.09°F (12.27°C)

VAPOR PRESSURE: @25°C, 1199 mm Hg

FREEZING POINT: -218.2°F (-139°C)

RELATIVE VAPOR DENSITY: 2.22 (Air = 1.00)

VAPOR PRESSURE: 1000 mm @20°

FLASH POINT: -58°F closed cup; -45°F open cup.

EXPLOSIVE LIMITS: UEL 15.4%

LEL 3.8%

AUTOIGNITION TEMPERATURE: 966°F (518.9°C)

MAXIMUM ALLOWABLE CONCENTRATION (MAC): 1000 ppm/8 hours

DETECTABLE ODOR CONCENTRATION:

HAZARDOUS PROPERTIES: Liquid irritates eyes; harmful. Vapor irritates eyes, skin, mucous membranes.

High fire hazard - heat, flame, oxidizers.

Severe explosion hazard - flame.

EC forms phosgene on combustion; use  $\text{CO}_2$  extinguishers for fires.

TREATMENT: Remove patient from exposure, use artificial respiration if needed. Call a physician.

SL 000048

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No. 91-1145

NAME: Ethylene

FORMULA:  $C_2H_4$

MOLECULAR WEIGHT: 28.05

RELATIVE VAPOR DENSITY: 0.97 (air = 1.0)

BOILING POINT:  $-219^{\circ}F$  ( $-139.44^{\circ}C$ )

FREEZING POINT:  $-273^{\circ}F$  ( $-169.44^{\circ}C$ )

EXPLOSIVE LIMITS: 2.75 to 28.60% by volume with air

DETECTABLE ODOR CONCENTRATION: Sweet

AUTOIGNITION TEMPERATURE:  $1010^{\circ}F$  in air ( $543.33^{\circ}C$ )

HAZARDOUS PROPERTIES: A simple asphyxiant. Ethylene is a flammable gas and a dangerous explosion hazard upon exposure to heat or flame. It can react vigorously with oxidizing materials. Ethylene is moderately toxic, but its slight toxic effects disappear when the patient is removed from exposure. Ethylene will displace oxygen in the air causing the victim to suffocate. Use only  $CO_2$  or dry chemical extinguishers to combat ethylene fires.

TREATMENT: Remove patient from exposure and perform artificial respiration if breathing has stopped. Report to First Aid.

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NAME: Ethylene Dichloride (EDC) (1,2-dichloroethane)

FORMULA:  $\text{CH}_2\text{ClCH}_2\text{Cl}$

MOLECULAR WEIGHT: 98.966

BOILING POINT: 182.3°F (83.5°C)

MELTING POINT: -31.9°F (-35.5°C)

VAPOR PRESSURE: @84.9°F, 100 mm. Hg.

LIQUID DENSITY: @68°F, 78.47 lbs per Ft<sup>3</sup>

RELATIVE VAPOR DENSITY: 3.35 (air = 1)

FLASH POINT: 64.9°F open cup, 55.4°F, closed cup

EXPLOSIVE LIMITS: 6.2 to 15.9% by vol.

MAXIMUM ALLOWABLE CONCENTRATION: 50 ppm., 200 mg./m.<sup>3</sup>

DETECTABLE ODOR CONCENTRATION: Much less than maximum allowable

AUTOIGNITION TEMPERATURE: 840°F (448.9°C)

HAZARDOUS PROPERTIES: Ethylene dichloride has a distinctive odor and strong local irritating effects, which give warning of its presence in relatively safe concentrations. There is irritation of the eyes and upper respiratory passages. Ethylene dichloride has a specific effect on the cornea. Exposure to the vapor, or, in animals, injection under the skin, produces a clouding which may progress to endothelial necrosis and infiltration of the cornea by lymphocytes and connective tissue cells. The narcotic action of the compound is strong, probably of the same order as chloroform. Its toxic effect upon the liver and kidneys are less than that of carbon tetrachloride, but animal experiments indicate that these organs may show congestion and fatty degeneration. Edema of the lungs has also been reported in animals. Dermatitis in man has been observed.

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In short exposures to high concentrations, the picture is one of irritation of the eyes, nose and throat, followed by dizziness, nausea, vomiting, increasing stupor, cyanosis, rapid pulse, and loss of consciousness.

Chronic poisoning, where exposure has occurred over a period of several months, may cause loss of appetite, nausea and vomiting, epigastric distress, tremors, nystagmus, leucocytosis, low blood sugar levels, and possible dermatitis if there has been skin contact.

Employees exposed regularly to ethylene dichloride should be examined at least semi-annually, by a physician acquainted with the occupational hazards involved. Physical examinations should be required also when any symptoms of poisoning occur.

Employees who may be subjected to severe exposures of ethylene dichloride vapor as in tank cleaning and repairs in intermittent operations where general ventilation is not practical, in cases of failure of piping or equipment, and in cleaning up spills, should be provided when indicated with proper eye and respiratory protection as follows:

- (a) Suitable gas-tight chemical safety goggles.
- (b) Rescue harness and life line for those entering a tank or enclosed storage space. An outside attendant should maintain constant observation.
- (c) Positive pressure hose masks with hose inlet in a vapor-free atmosphere.

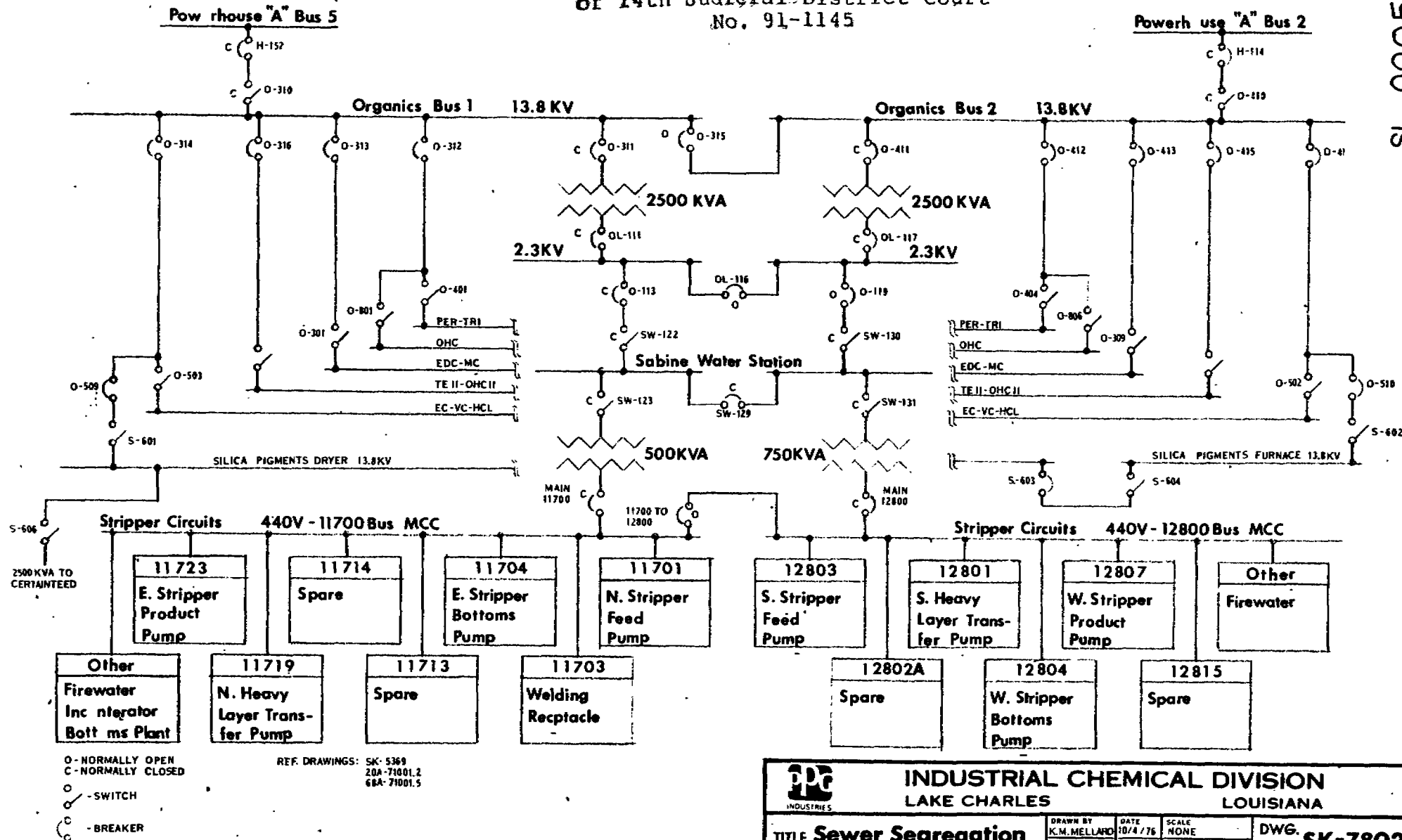
Air-line masks with reducing valve and filter suitable for use only where conditions will permit safe escape in case of failure of the compressed air supply, or self-contained breathing apparatus with stored oxygen or air, which allows greater mobility but usually requires

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|                                                                                |  |                                                                            |                                                                                            |
|--------------------------------------------------------------------------------|--|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
|                                                                                |  |                                                                            |                                                                                            |
| <b>INDUSTRIAL CHEMICAL DIVISION</b><br><b>LAKE CHARLES</b><br><b>LOUISIANA</b> |  |                                                                            |                                                                                            |
| <b>TITLE</b> <u>Sewer Segregation Stripper Feed Circuits</u>                   |  | <b>DRAWN BY</b> K.M. MELLARD<br><b>CHECKED BY</b><br><b>APPROVED BY</b>    | <b>DATE</b> 10/4/76<br><b>SCALE</b> NONE<br><b>CHARGE</b> P-377<br><b>BILL OF MATERIAL</b> |
|                                                                                |  | <b>DWG. NO.</b> <b>SK-7802</b><br><b>SHEET</b> <u>1</u> <b>OF</b> <u>1</u> |                                                                                            |

more highly trained men. In tank work small manholes may make this apparatus unsuitable because of its bulk, although the type known as self-generating is specially designed for entrance and egress through small openings.

Masks and breathing apparatus should be approved by the United States Bureau of Mines and should be equipped with full face pieces.

- (d) Industrial gas masks, approved by the United States of Mines with canisters approved for use in ethylene dichloride vapor should be used only when it is certain that the concentration of vapor is less than 2 per cent by volume (20,000 parts per million) and the atmospheric oxygen is not lower than 16 per cent, and then only for exposures not exceeding one-half hour.

TREATMENT: All contaminated clothing should be removed at once. Clothing, including shoes, soaked in ethylene dichloride should be removed and not worn again until thoroughly dry. All affected areas should be washed thoroughly with warm water and soap. After this an ointment containing lanolin should be applied in order to replace the natural skin oils. For serious or persistent cases of skin trouble and for signs and symptoms of generalized poisoning, a physician should be consulted.

If liquid ethylene dichloride has entered the eyes, they should be washed promptly with copious quantities of water for at least 15 minutes. It is advisable to irrigate the eyes gently with water at room temperature in order to minimize additional pain or discomfort. Ethylene dichloride vapor can produce injury to the eyes if the exposure is intense or in the same manner as for the liquid. Medical attention should be obtained in all these contacts with the eyes.

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No. 91-1145

# SAC LIST

## SEWER SEGREGATION PLANT

| <u>Vessels</u>                | <u>SAC #</u>     |
|-------------------------------|------------------|
| <u>Existing Stripper Unit</u> |                  |
| Preheater T-1                 | 60-1421          |
| Phase Separator T-2           | 60-1422          |
| Steam Stripper C-1            | 67-114           |
| Vent Scrubber C-2             | 67-115           |
| Economizers E-1               | 71-1655          |
| Condenser E-2                 | 71-1656          |
| <u>New Stripper Unit</u>      |                  |
| Phase Separator # 2           | 60-1889          |
| Steam Stripper #2             | 67-171           |
| Economizers                   | 71-2100, 71-2101 |
|                               | 71-2102          |
| Stripper #2 Condenser         | 71-2103          |
| WTU Preheater                 | 71-2104          |
| WTU Steam Desuperheater       | 71-2105          |
| <u>Pumps</u>                  |                  |
| <u>API Separator</u>          |                  |
| S. Heavy Layer Transfer       | 55-2419          |
| N. Heavy Layer Transfer       | 55-2418          |
| <u>Old Stripper Unit</u>      |                  |
| S. Stripper Feed Pump         | 55-2560          |
| N. Stripper Feed Pump         | 55-2561          |
| W. Stripper Product Pump      | 55-2280          |
| E. Stripper Product Pump      | 55-2281          |
| W. Stripper Bottoms Pump      | 55-2562          |
| E. Stripper Bottoms Pumps     | 55-2563          |
| <u>New Stripper Unit</u>      |                  |
| Stripper Feed Pump #3         | 55-2933          |
| Stripper Feed Pump # 4        | 55-2934          |
| Stripper Bottoms Pumps # 3    | 55-2931          |
| Stripper Bottoms Pump # 4     | 55-2932          |

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NAME: Ferric Chloride

FORMULA:  $\text{FeCl}_3$

MOLECULAR WEIGHT: 162.2

BOILING POINT: 590°F (310°C)

VAPOR PRESSURE @ 75°F: nil

SUBLIMATION POINT: 572°F (300°C)

SPECIFIC GRAVITY: 2.8 (1.00 for air)

RELATIVE VAPOR DENSITY: . Normally a black solid

FLASH POINT: None

EXPLOSIVE LIMITS: None

HAZARDOUS PROPERTIES: Ferric chloride presents no particular problem in handling. However, in the anhydrous form, it may be injurious to clothing, and all contamination of both skin and clothing should be washed off immediately.

Ferric chloride will seriously stain clothing and skin when it is contacted, so it is advisable to wear gloves and aprons when handling it.

Ferric chloride is extremely hygroscopic (absorbs water), and when this takes place, heat release occurs. When taking material from a drum\*, remove the desired quantity as quickly as possible and immediately seal the drum to prevent it from absorbing moisture from the air. The fumes from this reaction are toxic.  $\text{FeCl}_3$  also emits HCl fumes when decomposed by heat.

TREATMENT: In the case of eye contact, flush immediately and thoroughly with water and then rinse with a weak solution of sodium bicarbonate or boric acid. A physician should always

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## SAC LIST (continued)

Lift Station Pumps

|                            |         |
|----------------------------|---------|
| W. Lift Station No. 1 Pump | 55-2296 |
| E. Lift Station No. 1 Pump | 55-2297 |
| W. Lift Station No. 2 Pump | 55-2564 |
| E. Lift Station No. 2 Pump | 55-2565 |
| W. Lift Station No. 3 Pump | 55-2295 |
| E. Lift Station No. 3 Pump | 55-2294 |
| S. Lift Station No. 4 Pump | 55-2642 |
| N. Lift Station No. 4 Pump | 55-2701 |
| S. Lift Station No. 5 Pump | 55-2702 |
| N. Lift Station No. 5 Pump | 55-2704 |
| W. Lift Station No. 6 Pump | 55-2703 |
| E. Lift Station No. 6 Pump | 55-2705 |
| W. Lift Station No. 7 Pump | 55-2286 |
| E. Lift Station No. 7 Pump | 55-2287 |
| Lift Station No. 8 Pump    | 55-2733 |

Control ValvesValve #SAC #Old Stripper Unit

|                    |          |          |
|--------------------|----------|----------|
| Stripper Bottoms   | LCV 1015 | 80-13201 |
| Stripper Feed      | FCV 1002 | 80-13202 |
| Steam to Preheater | TCV 1010 | 80-13203 |
| Steam to Stripper  | FCV 1016 | 80-13204 |
| Stripper Product   | LCV 1024 | 80-13205 |
| Desuperheater      | TCV      | 80-15166 |

New Stripper Unit

|                     |          |          |
|---------------------|----------|----------|
| 175 to 50 psi steam | PCV 1103 | 80-18429 |
| Reducing Station    |          |          |
| Desuperheater       | TCV 1104 | 80-18430 |
| Steam to Preheater  | TV 1109  | 80-18401 |
| Steam to Stripper   | FV 1129  | 80-18402 |
| Stripper Feed       | FV 1141  | 80-18403 |
| Stripper Bottoms    | LV 1130  | 80-18404 |

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be consulted in such cases.

- \* Remove the drum lid carefully to relieve any pressure that may be built up inside.

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RUPTURE DISC SCHEDULE

| <u>Vessel</u>         | <u>Type</u>     | <u>Size</u> | <u>Rating</u> | <u>Order No./Loc.</u>     |
|-----------------------|-----------------|-------------|---------------|---------------------------|
| Preheater (T-1)       | Graphite/Insert | 4"          | 15#/225°F     | 23-851-0085<br>1-11-05-05 |
| Steam Stripper (C-1)  | Graphite/Insert | 4"          | 15#/225°F     | 23-851-0085<br>1-11-05-05 |
| Phase Separator (T-2) | Graphite/Insert | 2"          | 15#/225°F     |                           |

NOTE: Safety heads required with 150# FLG

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No. 91-1145

NAME: Hydrogen Chloride

FORMULA: HCl

MOLECULAR WEIGHT: 36.47

BOILING POINT: -122.6°F (-85.89°C)

MELTING POINT: -173.7°F (-114.28°C)

VAPOR PRESSURE: @ 64°F, 3040 mm. Hg.

LIQUID DENSITY: Normally a gas

RELATIVE VAPOR DENSITY: 1.268 (air = 1)

FLASH POINT: None

EXPLOSIVE LIMITS: None

MAXIMUM ALLOWABLE CONCENTRATION: 5 ppm for 10-hour working day

DETECTABLE ODOR CONCENTRATION: Unknown

HAZARDOUS PROPERTIES: Anhydrous hydrogen chloride is a gas which has a corrosive action upon the skin or mucous membranes. In this form it will cause rapid and severe burns. It is particularly dangerous to the eyes. It is not flammable; however, the gas is highly soluble in water forming hydrochloric acid, which attacks most metals with the evolution of explosive hydrogen.

TREATMENT: Immediate removal from the toxic area and thorough flushing of the patient's body and/or eyes with large quantities of water is of primary importance. Contaminated clothing should be removed from patient while he is being showered with water. It is essential that all affected body surfaces be washed with copious quantities of water for a sufficient time to remove all hydrochloric acid. No attempt should be made to neutralize the acid with alkaline solutions. Medical assistance should be summoned at the earliest possible moment.

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# COLLECTION POINT LIST

| <u>Collection Point<br/>Number</u> | <u>Description</u>              | <u>Flow*</u> |
|------------------------------------|---------------------------------|--------------|
| 1                                  | VCM Heavy Still Stack Seal      | 20 gpm       |
| 2                                  | VCM/EC Lab Drain                | 1 gpm        |
| 3                                  | HCl Scrubber at VCM             | Max 200 gpm  |
| 4                                  | EC Trench                       | NC           |
| 5                                  | HCl Header Drain                | NC           |
| 6                                  | Tri-Ethane AIBN Pad Drain       | NC           |
| 7                                  | VDCM Pump Pad Drain             | NC           |
| 8                                  | Pump Pad Drain                  | NC           |
| 9                                  | HCl Surge Drum Drain            | NC           |
| 10                                 | MC Plant Trench                 | 1 gpm        |
| 11                                 | Catalyst Pot Drain              | NC           |
| 12                                 | MC Section Scrubber Drain       | 5 gpm        |
| 13                                 | VDCM Dryer Reactivation Drain   | NC           |
| 14                                 | VDC Phase Separator Drain       | NC           |
| 15                                 | TCE Storage Tank Scrubber Drain | 5 gpm        |
| 16                                 | VDC Reactor Drain               | Max 200 gpm  |
| 17                                 | T/E Scrubber Stack Drain        | NC           |
| 18                                 | VDCM DH Still Reflux Drum Drain | 1 gpm        |
| 19                                 | VDC Pad Drain                   | NC           |
| 20                                 | T/E Scrubber Drain              | 47 gpm       |
| 21                                 | No. 1 EDC Scrubber              | Max 50 gpm   |
| 22                                 | No. 1 EDC Plant Trench          | NC           |
| 23                                 | P/T Pump Pad Drain              | NC           |
| 24                                 | No. 2 EDC Plant Trench          | NC           |
| 25                                 | GC Pot                          | 1 gpm        |

\* NC - Not Continuous

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55000 75

NAME: Methane (Marsh gas) (Natural Gas)

FORMULA: CH<sub>4</sub>

MOLECULAR WEIGHT: 16.04

BOILING POINT: -258.7°F (-161.5°C)

FREEZING POINT: -297.8°F (-183.22°C)

VAPOR PRESSURE: @ -115.8°F, 34,900 mm. Hg.

LIQUID DENSITY: @ -263.2°F, 25.91 lbs. per Ft<sup>3</sup>

RELATIVE VAPOR DENSITY: 0.555 (air = 1.0)

FLASH POINT: -306°F (-187.7°C)

EXPLOSIVE LIMITS: 5.3% to 14.0% by volume in air

MAXIMUM ALLOWABLE CONCENTRATION: 1% by volume

DETECTABLE ODOR CONCENTRATION: Odorless in pure state. PPG uses with mercaptans which give slightly sweet odor to the gas.

AUTOIGNITION TEMPERATURE: 1004°F (540°C)

HAZARDOUS PROPERTIES: A simple asphyxiant. A dangerous fire and explosion hazard. Its low density allows it to accumulate in high concentration in poorly ventilated areas. Combat fires with CO<sub>2</sub> or dry chemical extinguishers only.

TREATMENT: Patients should be removed from exposure and artificial respiration applied if necessary. Report to First Aid.

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| <u>Collection Point<br/>Number</u> | <u>Description</u>                      | <u>Flow*</u>         |
|------------------------------------|-----------------------------------------|----------------------|
| 26                                 | No. 2 EDC Plant Scrubber                | Max 50 gpm           |
| 27                                 | GC Pot                                  | 1 gpm                |
| 28                                 | Heavy Still Pad Drain                   | 5 gpm                |
| 29                                 | Pad Drain                               | 25 gpm NC            |
| 30                                 | VDC Retention Tank Pump Drain           | 2 gpm                |
| 31                                 | Pad Drain                               | 10 gpm               |
| 32                                 | Pad Drain                               | 10 gpm               |
| 33                                 | Sump Pump Discharge                     | 5 gpm                |
| 34                                 | Utility Drain                           | 15 gpm               |
| 35                                 | Reboiler Drain                          | 15 gpm               |
| 36                                 | VDCM HQMME Tank                         | 5 gpm                |
| 37                                 | VDCM Reactor Heater Pad Drain           | 10 gpm               |
| 38                                 | Condensate Pump Pad Drain               | 1 gpm                |
| 39                                 | P/T Entrainment Separator Drain         | NC                   |
| 40                                 | Loading Rack Drain                      | NC                   |
| 41                                 | Per-Tri Reactor Trench Recycle Scrubber | 15 gpm from scrubber |
| 42                                 | Auxiliary Still Line Scrubber           | 5 gpm                |
| 43                                 | Trench Around DH Still Feed Tanks       | NC                   |
| 44                                 | Per-Tri Reactor Scrubber Trench         | 60 gpm               |
| 45                                 | Per-Tri Bottoms Tank Scrubber           | 10 gpm               |
| 46                                 | Tank Drain                              | NC                   |
| 47                                 | Tank Drain                              | NC                   |
| 48                                 | Heavy Still Feed Filter Drain           | NC                   |
| 49                                 | Still Line Scrubber Drain               | 20 gpm               |
| 50                                 | Per-Tri Still Feed Filter Drain         | NC                   |

\*NC- Not Continuous

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NAME: Methyl Chloroform (MC) (1,1,1-trichloroethane)

FORMULA:  $\text{Cl}_3\text{C}-\text{CH}_3$

MOLECULAR WEIGHT: 133.41

BOILING POINT: 165.38°F (74.1°C)

VAPOR PRESSURE: 125 mm Hg @ 77°F (25°C)

FREEZING POINT: -22.7°F (-30.39°C)

LIQUID DENSITY: 11.1 lb/gal (1.3314 gm/cc) @ 77°F

RELATIVE VAPOR DENSITY: 4.60 (air = 1.00)

FLASH POINT: none

EXPLOSIVE LIMITS: UEL - None

LEL - None

MAXIMUM ALLOWABLE CONCENTRATION (MAC): 500 ppm for 8 hours continuous

DETECTABLE ODOR CONCENTRATION: 20-100 ppm

HAZARDOUS PROPERTIES: Methyl chloroform is not as toxic as other chlorinated hydrocarbons such as  $\text{CCl}_4$ ; however, it can still cause damage to the body upon continuous or prolonged exposure to large quantities of vapors or liquid. Moderate exposure is unlikely to produce injury. MC is readily absorbed through the lungs. In acute exposure, a functional depression of central nervous system leading ultimately to respiratory failure can result. Dermatitis may result from repeated skin contact, but MC is only poorly absorbed through the skin.

Eye contact results in painful discomfort, but no permanent damage to vision is likely.

TREATMENT: Remove victim to uncontaminated environment and apply artificial respiration

if breathing has stopped. Remove wet clothing and do not wear again until thoroughly dry.

If eyes were contaminated, flush with copious amounts of water. Report to First Aid.

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| <u>Collection Point<br/>Number</u> | <u>Description</u>                        | <u>Flow*</u> |
|------------------------------------|-------------------------------------------|--------------|
| 51                                 | Tank Drain                                | NC           |
| 52                                 | No. 1 Per Phase Separator Overflow        | NC           |
| 53                                 | No. 2 Per Wash Column Overflow            | NC           |
| 54                                 | No. 1 Per Wash Column Overflow            | NC           |
| 55                                 | No. 1 Per Dryer Drain                     | NC           |
| 56                                 | No. 2 Per Dryer Drain                     | NC           |
| 57                                 | Tri Product Dryers Drain                  | NC           |
| 58                                 | No. 2 Per Phase Separator Overflow        | NC           |
| 59                                 | Tri Neutralizer Overflow Scrubber Drain   | 5 gpm        |
| 60                                 | Tri Neutralizer Bottom Pump Pad Drain     | NC           |
| 61                                 | Tetra Compressor Pad Drain                | NC           |
| 62                                 | Pump Pad Drain                            | NC           |
| 63                                 | Tetra Plant Trench                        | NC           |
| 64                                 | Tetra Emergency Scrubber                  | Max 250 gpm  |
| 65                                 | TCE Storage Tank Scrubber                 | 5 gpm        |
| 66                                 | Pump Pad Drain                            | NC           |
| 67                                 | Chloral Drain                             | 1 gpm        |
| 68                                 | DH Still Feed Tank Sight Glass Drain      | NC           |
| 69                                 | Intermediate Crude Tank Sight Glass Drain | NC           |
| 70                                 | Pump Pad Drain                            | NC           |
| 71                                 | Intermediate Crude Tank Sight Glass Drain | NC           |
| 72                                 | Absorber Acid Pump Suction Drain          | NC           |
| 73                                 | Bottoms Scrubber Drain                    | 5 gpm        |
| 74                                 | Bottoms Trench Drain                      | NC           |
| 75                                 | Incinerator Pump Pad Drain                | NC           |

NC - Not Continuous

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NAME: Nitrogen

FORMULA:  $N_2$

MOLECULAR WEIGHT: 28.02

SPECIFIC GRAVITY: 1.0 (air is 79%  $N_2$ )

DETECTABLE ODOR CONCENTRATION: None

HAZARDOUS PROPERTIES: Even though nitrogen is a very safe, inactive gas, it has some inherent dangers since it is fed so universally throughout the plant. Its prime use is for padding of our equipment. The hazard involved is that a vessel may have insufficient oxygen or that nitrogen is used to purge the vessel instead of air, before man-entry.

Therefore, every vessel that is entered not only must first be checked for flammability, etc., it must also be checked for sufficient oxygen. All nitrogen lines, as well as other toxic lines, must be isolated from the vessel before entry and a clean air sweep must be provided. The apparatus for testing for sufficient oxygen is an analyzing device. Become familiar with its use.

TREATMENT: Inhalation - Remove the person from the oxygen deficient area. Administer artificial respiration if necessary.

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| <u>Collection Point<br/>Number</u> | <u>Description</u>           | <u>Flow*</u>       |
|------------------------------------|------------------------------|--------------------|
| 76                                 | Incinerator Header Drain     | NC                 |
| 80                                 | Acid Brick Pad Drain         | NC                 |
| 81                                 | Dowtherm Pump Drain          | NC                 |
| 82                                 | Aqueous Waste Pump Pad Drain | NC                 |
| 83                                 | Incinerator Pad Drain        | NC                 |
| 84                                 | Acid Brick Pad Drain         | NC                 |
| 85                                 | OHC-Tetra Lab Drain          | 1 gpm              |
| 86                                 | OHC Trench                   | NC                 |
| 87                                 | Dryer Recovery Drain         | 50 gpm             |
| 88                                 | Per-Tri Distillation Trench  | 50 gpm to scrubber |
| 89                                 | Per-Tri Lab Drain            | 1 gpm              |
| 90                                 | Shipping Building Drain      | NC                 |
| 91                                 | Shipping Building Drain      | NC                 |
| 92                                 | Per Decolorizer              | NC                 |
| 93                                 | Per-Tri Dryer Filter         | NC                 |
| 94                                 | MC Plant Trenches            | NC                 |
| 95                                 | MC Plant Trenches            | NC                 |
| 96                                 | MC Lab Drain                 | 1 gpm              |
| 97                                 | Ash Liquor Tank Drain        | NC                 |
| 98                                 | VCM Trench                   | NC                 |
| 99                                 | EC Vent Knockout Pot         | 15 gpm             |
| 100                                | Tetra AIBN Tank Drain        | NC                 |
| 101                                | Acid Pit                     | 100 gpm            |
| 102                                | Overhead Drain               | NC                 |
| 103                                | Drain                        | NC                 |

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NAME: Oxygen

FORMULA: O<sub>2</sub>

MOLECULAR WEIGHT: 32

COLOR: Colorless

ODOR: None

REACTIVITY: Very reactive

HAZARDOUS PROPERTIES: Too high a percentage of O<sub>2</sub> in the air we breathe will cause the person to pass out. Therefore, O<sub>2</sub> lines on a vessel should be isolated before man entry.

Pure O<sub>2</sub> will cause many things to burn spontaneously at a much lower temperature level than air. Normal hydrocarbon oils and greases, for example, should never be exposed to O<sub>2</sub>. Never use a gasket or valve, etc. for O<sub>2</sub> service unless you are sure it is acceptable.

At high temperatures, O<sub>2</sub> will burn steel, stainless steel, or other alloy pipe and equipment. Therefore, should a fire occur at or near an O<sub>2</sub> line, apply water to the line to keep it cool. The normal "air" explosive ranges are considerably widened with hydrocarbon or chlorinated hydrocarbons in the presence of high O<sub>2</sub>.

TREATMENT: If a pass-out should occur, remove the man from the area, apply artificial respiration if necessary, and get First Aid help.

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NAME: Pentachloroethane (PCE, PENTA)

FORMULA:  $\text{CCl}_3\text{CHCl}_2$

MOLECULAR WEIGHT: 202.31

BOILING POINT: 321°F (160.56°C)

VAPOR PRESSURE @ 75°F: 4mm

FREEZING POINT: -20°F (-28.89°C)

LIQUID DENSITY @ 77°C: 14.0#/gal., 1.681 gm/ml

RELATIVE VAPOR DENSITY: 6.98 (air = 1.0)

FLASH POINT: None

EXPLOSIVE LIMITS: None

MAXIMUM ALLOWABLE CONCENTRATION: Below 121 ppm

DETECTABLE ODOR CONCENTRATION: Unknown

HAZARDOUS PROPERTIES: Pentachloroethane is a nonflammable and toxic liquid. It has a chloroform-like odor and can cause chronic intoxication. It is considered a stronger narcotic than chloroform and is about as poisonous as tetrachloroethane, which it resembles in its action as a metabolic poison. It has a pronounced irritating effect upon the mucous membranes, causing an inflammation of the nose, throat, and respiratory passages. Chronic poisoning causes fatty degeneration of the liver, inflammation of the kidneys, bronchitis, pronounced hyperemia of the lungs, and purulent pneumonia.

TREATMENT: As described under tetrachloroethanes. Notify a physician.

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NAME: Sodium Carbonate (or Soda Ash)

FORMULA:  $\text{Na}_2\text{CO}_3$

MOLECULAR WEIGHT: 106.0

MELTING POINT:  $851^\circ\text{C}$  ( $1563^\circ\text{F}$ )

COLOR: (IN SOLUTION): Milky white; odorless small white crystals or white powder as solid with alkaline taste.

DENSITY: 2.53 gram/ml

FLASH POINT: None

SOLUBILITY DATA: 7.1 grams/100 ml  $\text{H}_2\text{O}$  @  $0^\circ\text{C}$ ; 45.5 grams/100 ml  $\text{H}_2\text{O}$  @  $100^\circ\text{C}$

EXPLOSIVE LIMITS: None

HAZARDS: This is a weak to moderate caustic solution. It is not as corrosive or dangerous to the skin as sodium hydroxide solutions but any spill or splash should be washed off instantly. Contact with the eyes will cause permanent eye damage. Sodium carbonate should be treated with the same respect as sodium hydroxide. Sodium carbonate is nonflammable, but it can react violently with Al,  $\text{P}_2\text{O}_5$ ,  $\text{H}_2\text{SO}_4$ . A 1% aqueous solution of sodium carbonate has a  $\text{pH} \sim 11.5$ .

The solid anhydride(soda ash); mp  $851^\circ\text{C}$ ,  $d = 2.53$ , decomposes @  $400^\circ\text{C}$  to evolve  $\text{CO}_2$  gas. It slowly absorbs  $\text{H}_2\text{O}$  in air. It is insoluble in alcohol. The anydride is an irritant to eyes and the respiratory tract. Soda ulcers on hands can occur from contact. Nausea, vomiting, stomach ache, diarrhea all occur after ingestion. As a safety precaution, wear rubber gloves, safety glasses, coveralls when handling this material.

TREATMENT: Flush eyes with water for 15 minutes. Wash skin with soap and water. Neutraliz spills with 6m HCl, dilute with  $\text{H}_2\text{O}$  and route to process sump.

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NAME: Sodium Formate

FORMULA:  $\text{HCOONa}$

MOLECULAR WEIGHT: 68.02

MELTING POINT: 487.4°F (253°C)

SPECIFIC GRAVITY: 1.92 @ 20°C (1.00 for air)

PROPERTIES: A white deliquescent crystal with a formic acid-like odor, slightly hygroscopic, soluble in  $\text{H}_2\text{O}$ , insoluble in ether which decomposes into sodium oxalate and  $\text{H}_2$  at high temperatures. It is a reducing agent.

HAZARDS: Sodium Formate is highly toxic and strongly irritating to tissue. Wear rubber gloves, goggles, coveralls when handling this material as a solid. It is also a slight fire hazard.

Dispose of solids by diluting with  $\text{H}_2\text{O}$ , adding soda ash, neutralizing with 6m HCl, diluting with  $\text{H}_2\text{O}$  and routing to process sump.

TREATMENT: For eye contact, irrigate eyes for 15 minutes with water and report to First Aid.

Wash spills from body with soap and water.

If ingested, notify a physician and report to First Aid.

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NAME: Sulfuric Acid

FORMULA:  $\text{H}_2\text{SO}_4$

MOLECULAR WEIGHT: 98.08

BOILING POINT: 626°F (330°C)

MELTING POINT: 50.9°F (10.5°C)

VAPOR PRESSURE: 1mm Hg @ 146°C (294.8°F)

SOLID DENSITY: N/A

VAPOR DENSITY: N/A

AUTOIGNITION: N/A

FLASH POINT: None

EXPLOSIVE LIMITS: None

MAXIMUM ALLOWABLE CONCENTRATION: 1 mg/m<sup>3</sup> of Air

DETECTABLE ODOR CONCENTRATION: 0.12 ppm (odorless)

LIQUID DENSITY: @ 25°C, 1.834 g/cc (Specific Gravity 60/60°F)

HAZARDOUS PROPERTIES: THIS IS ONE OF THE MOST TREACHEROUS CHEMICALS TO

HUMAN FLESH. The greatest hazard of sulfuric acid is physical contact. Because of its affinity for water, it dries tissue; creating heat, and resulting in a painful slow healing burn. Repeated skin contact with diluted sulfuric acid solution can cause dermatitis. It is a powerful oxidizer, and can ignite upon contact with combustibles. It emits highly toxic fumes when heated.

Sulfuric acid reacts with water to produce heat. The acid should always be added to water upon dilution, never vice versa. It is a moderate fire hazard because of its high reactivity.

TREATMENT: Skin - Immediately remove all contaminated clothing and equipment. Flush the exposed area with an abundance of water. After thorough irrigation with water, applications

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of mild alkaline solutions may be used. Do not apply oils or ointments to burned area without instructions from a physician.

Eyes - Flush with water for 15 minutes holding eyelids open. An eye anesthetic may be used for pain. Never use ointment. Call a specialist. Report to First Aid.

Swallowing - If conscious, have patient wash mouth with water. Give at least 1 oz. of milk of magnesia or aluminum hydroxide gel well diluted in water. If these are not available, drink milk mixed with whites of eggs. Do not induce vomiting or pass a stomach tube. Call a physician. Report to First Aid.

Inhalation - Remove patient from contaminated area. Give artificial respiration and oxygen if necessary. Report to First Aid.

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NAME: Symmetrical and Assymmetrical Tetrachloroethane (S. TeCE & A. TeCE)

FORMULA:  $\text{CHCl}_2\text{CHCl}_2$  and  $\text{CCl}_3\text{CH}_2\text{Cl}$

MOLECULAR WEIGHT: 167.86

BOILING POINT: S. TeCE 295°F (146.1°C); A TeCE 267°F (130.5°C)

VAPOR PRESSURE @ 75°F: S. TeCE 4mm; A. TeCE 13mm

FREEZING POINT: S. TeCE -47°F (-43.9°C); A. TeCE -97°F (-71.67°C)

LIQUID DENSITY @ 77°F: S. TeCE 1.588 gm/ml; A. TeCE 1.533 gm/ml

RELATIVE VAPOR DENSITY: 5.78 (Air = 1.0)

FLASH POINT: None

EXPLOSIVE LIMITS: None

MAXIMUM ALLOWABLE CONCENTRATION: 5 ppm for 8 hour exposure

DETECTABLE ODOR CONCENTRATION: Approximately

HAZARDOUS PROPERTIES: The tetrachloroethanes are not flammable or explosive but are the most toxic of the chlorinated ethanes that will be handled in the Plant.

The tetrachloroethanes are toxic by inhalation, by prolonged and repeated contact with skin or mucous membranes, or by oral intake. Although toxic, tetrachloroethanes may be handled safely if proper precautions are constantly observed. Prolonged or repeated exposures to the product in any form are hazardous.

The signs and symptoms of excessive absorption usually appear gradually and only after repeated exposures. In order of appearance they commonly are: unusual fatigue, loss of appetite and weight, sick stomach and vomiting, constipation, abdominal pain, jaundice, drowsiness, and in severe cases even unconsciousness and death. Some cases show marked impairment of the nervous system inducing headache, numbness and tingling in fingers and

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toes, trembling and twitching of muscles, and even paralysis of some muscles.

The signs and symptoms of tetrachloroethane poisoning given above are due to systematic poisoning characterized by marked damage to the liver, kidneys, heart, blood cells and nervous system. The clinical picture varies with the type of exposure and the amount of the material which has been absorbed either at one time or at repeated times. The most serious effects are usually on the liver and the blood. The principal route of absorption is by breathing the vapor, although it may also be absorbed by the skin. Tetrachloroethane is currently considered the most toxic of the chlorinated hydrocarbon solvents in industrial use. Continued exposure to high concentrations of the tetrachloroethanes leads to local irritation of the eyes and nose. There may be an upset stomach and vomiting, but since tetrachloroethane is less volatile than other hydrocarbon solvents, it does not often have an anesthetic effect.

Subacute tetrachloroethane poisoning is the form usually encountered. This develops gradually as a result of prolonged or repeated work in an atmosphere containing more than 5 parts of tetrachloroethane per million parts of air but under conditions where the amount absorbed causes no immediate reaction. Repeated exposure even to low concentrations seems to increase sensitivity, and may lead to subacute poisoning.

For some time, workers with subacute poisoning may show only such signs and symptoms as unusual fatigue, loss of appetite and weight, constipation and abdominal distress or pain. At any time they may develop more severe evidence of absorption such as vomiting, dizziness, tenderness and pain over the liver, and jaundice. Even if removed from further exposure, the illness may persist and grow worse over a period of days, weeks or even months, and may finally even end in death. However, if after a few months there has been

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steady improvement, complete recovery is the rule.

Some conditions under which subacute poisoning may occur in employees are as follows:

- (a) Where the ventilation is inadequate, resulting in high concentrations of more than 5 ppm of tetrachloroethane.
- (b) Where the vapor concentrations are high intermittently, due to faulty handling of the liquid.
- (c) Failure of the individual to observe precautionary measures.

Tetrachloroethane is absorbed through the skin so that systemic poisoning can occur by this route with the same signs and symptoms as described above.

Tetrachloroethane may cause dermatitis after repeated or prolonged contact with the skin, such as that which might occur in the handling of rags wet with the chemical product, dipping hands into the liquid, or wearing clothing saturated with it. Reddening, burning, and rarely, blisters may follow such exposure. In certain rare cases, the dermatitis may be caused by hypersensitivity to tetrachloroethane. The skin becomes rough, red, and dry due to the removal of skin oils. It cracks easily and is readily susceptible to infection. The skin has a chapped appearance.

Tetrachloroethane may enter the eyes either as a vapor or as a liquid (spray or splash). The resultant irritation produces lacrimation, burning and other symptoms of inflammation. It can cause serious eye damage if immediate care is neglected.

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The first symptoms after toxic amount of tetrachloroethane are taken by mouth are those of irritation of stomach and bowels, such as sick stomach, vomiting, and diarrhea with bloody stools. It is absorbed very rapidly and even a small amount may go on to produce unconsciousness and deep flushing of the skin. Death is apt to occur before such systemic changes as liver and kidney damage occur.

**TREATMENT:** Most important in the case of any poisoning is quick removal from exposure. In the case of tetrachloroethane poisoning, this means first removing the patient from the contaminated atmosphere and, insofar as possible, removing the tetrachloroethane from the patient's skin, or gastrointestinal tract, if those areas are involved. The patient should be kept quiet and comfortably warm, but not hot. A physician should be called immediately. He should be told briefly and clearly what has happened and the exact location of the patient.

A person showing symptoms of tetrachloroethane vapor poisoning should be removed promptly from the contaminated area. In case breathing has stopped, effective artificial respiration, such as that obtained by the prone pressure method or the Eve rocking method should be started immediately. If oxygen inhalation apparatus is available, oxygen should be administered, but only if one familiar with the operation of the apparatus is present to administer it. If the patient is conscious, hot tea or coffee may be given as a stimulant. A physician should be called at once.

All contaminated clothing should be removed immediately. Clothing, including shoes, soaked in tetrachloroethane should be removed and not worn again until they are thoroughly free of tetrachloroethane. All affected areas should be washed thoroughly with warm water and soap. After this, an ointment containing lanolin should be applied in order to help in replacing the natural skin oils. For serious or persistent cases of skin trouble, and for signs

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and symptoms of generalized poisoning, a physician should be consulted.

If liquid tetrachloroethane has entered the eyes, they should be washed promptly with copious quantities of water for at least 15 minutes. (It is advisable to irrigate the eyes gently with water at room temperature in order to minimize additional pain or discomfort.) Medical attention should be obtained in all cases involving contact with the eyes.

If a person has swallowed tetrachloroethane, he should be made to vomit, if conscious, by having him drink a glassful or more of lukewarm water in which a teaspoonful of salt to the glassful has been dissolved. A similar amount of warm soapy water may be used. If necessary, the patient should be encouraged to stick his finger down his throat to induce vomiting. When possible, vomiting should be induced at least three times. Following this a tablespoonful of Epsom Salt dissolved in a glass of water should be given. A physician should be called at once.

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NAME: trans-Dichloroethylen (TRANS)

FORMULA:  $\text{ClHC} = \text{CHCl}$

MOLECULAR WEIGHT: 96.95

BOILING POINT: 119.10°F (48.39°C)

VAPOR DENSITY: 3.34

FREEZING POINT: -58°F (-50°C)

SPECIFIC GRAVITY: 1.246 @ 25°C (77°F)

VAPOR PRESSURE 5.205 psia @ 70°F

FLASH POINT: 36°F (2.22°C)

EXPLOSIVE LIMITS: UEL 12.8%

LEL 9.7%

MAXIMUM ALLOWABLE CONCENTRATION (MAC): 200 ppm (TLV)

DETECTABLE ODOR CONCENTRATION:

HAZARDOUS PROPERTIES: Moderate explosion hazard as vapor exposed to flame. Dangerous fire hazard with heat or flame.

Exposure to high concentrations can cause nausea, vomiting, weakness, tremor and cramps. Can cause dermatitis from defatting action on skin.

TREATMENT: Remove victim from source of exposure and flush with water. If eyes are exposed, irrigate with water.

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NAME: 1,1,2 - Trichloroethane (TCE)

FORMULA:  $\text{CHCl}_2\text{CH}_2\text{Cl}$

MOLECULAR WEIGHT: 133.415

BOILING POINT: 236.8°F (113.78°C)

VAPOR PRESSURE: @75°F, 22mm. Hg.

FREEZING POINT: -31°F (-35°C)

LIQUID DENSITY: @77°F, 89.39 lbs. per Ft<sup>3</sup>; 11.93 lbs/gal; 1.4319 grams/ml

RELATIVE VAPOR DENSITY: 4.6 (air = 1.0)

FLASH POINT: None

EXPLOSIVE LIMITS: None

MAXIMUM ALLOWABLE CONCENTRATION: 10 ppm

DETECTABLE ODOR CONCENTRATION: Unknown

HAZARDOUS PROPERTIES: Trichloroethane can cause burns of the eyes and has a seriously harmful effect upon the liver. It has a local irritating effect upon the mucous membranes, particularly of the eyes and nose. All contact with the eyes and skin should be avoided. This material should generally be handled with caution, because its toxicological properties have not as yet been adequately evaluated.

TREATMENT: Remove patient from toxic area. Remove all contaminated clothing and wash all exposed skin surfaces thoroughly with soap and water. Flush eyes with copious quantities of water. Notify a physician; report to First Aid.

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NAME: Trichloro ethylene (Tri)

FORMULA:  $\text{Cl}_2\text{C} = \text{CHCl}$

MOLECULAR WEIGHT: 131.40

BOILING POINT: 188.60°F (87°C)

VAPOR PRESSURE: 2.5 psig at 100°F

FREEZING POINT: -99°F (-72.78°C)

LIQUID DENSITY: 11.9 lb/gal at 100°F

FLASH POINT: None

EXPLOSIVE LIMITS: UEL 90% (Not flammable at normal room temperature;  
LEL 10.5% - 12.5% moderately flammable at higher temperatures)

RELATIVE VAPOR DENSITY: 4.54 (air = 1.00)

MAXIMUM ALLOWABLE CONCENTRATION (MAC): 100 ppm/8 hours

DETECTABLE ODOR CONCENTRATION: Unknown

HAZARDOUS PROPERTIES: Reacts with strong alkalies such as caustic soda to form highly flammable and toxic dichloroacetylene. Anesthetic effect at 400 ppm. Trichloroethylene may be harmful if inhaled, by prolonged or repeated contact with skin or mucous membrane, or if swallowed. It is a central nervous system depressant.

TREATMENT: Wash skin area affected with soap and water. Eyes - wash 15 minutes for eye spills. Remove from contaminated skin. Remove from lungs or stomach - induce vomiting if necessary. Call a physician and report to First Aid.

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NAME: Vinyl Chloride (Chloroethylene, VCM, or VC)

FORMULA:  $H_2C:CHCl$

MOLECULAR WEIGHT: 62.501

BOILING POINT: 7.9°F (-13.39°C)

MELTING POINT: N/A

VAPOR PRESSURE: @ 77°F - 2660 mm Hg (51.5 psia)

FREEZING POINT: -224.7°F (-142.61°C)

SOLID DENSITY: N/A

VAPOR DENSITY: 2.15 (Air = 1.0)

AUTOIGNITION: N/A

FLASH POINT: -108.4°F - open cup; -162°F - closed cup

EXPLOSIVE LIMITS: 4 to 22% by volume

MAXIMUM ALLOWABLE CONCENTRATION: 1 ppm for 8 hrs./5 ppm for 15 min. ceiling

DETECTABLE ODOR CONCENTRATION: Faintly sweet (like phenol when inhibited)

LIQUID DENSITY: @ 77°F, 61.92 lbs per ft<sup>3</sup>; @ 68°F, 0.098 lbs per ft<sup>3</sup>

VISCOSITY: @ 77°F, 0.187 cp.

HAZARDOUS PROPERTIES: Vinyl chloride is very much like ethyl chloride. It is not very poisonous, it is extremely flammable and it has a narcotic effect. Continued exposures may cause some kidney deterioration. Inhalation of vapors greater than 500 ppm may produce a slight narcotic effect. At concentrations of 4% or greater, VC vapors may produce a deep or fatal anesthesia. The Department of Labor has declared Vinyl Chloride to be a carcinogenic (cancer-causing) compound.

The main danger with VC is the extreme flammability of the vapors. VC when burning

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will form phosgene and HCl, so never approach a fire without a gas mask.

Any spill of VC will result in an explosive mixture being formed and because of the high density of the VC gas, the mixture will tend to stay near ground. It will take very little to explode the VC vapors - static electricity spark, friction spark, or an arcing device are all dangerous when VC is spilled.

TREATMENT: Remove the injured person from the contaminated area; if breathing has stopped, perform artificial respiration. In any case, make sure the person injured is reported to First Aid immediately. If any liquid enters the eye, wash the eye continuously with a large amount of water for at least 15 minutes; then get the person to First Aid. All exposed persons should be referred to the Medical Department.

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NAME: Vinylidene Chloride (VDC)

FORMULA:  $\text{Cl}_2\text{C} = \text{CH}_2$

MOLECULAR WEIGHT: 96.95

BOILING POINT: 89°F (31.67°C)

VAPOR PRESSURE @ 75°F: 560 mm

FREEZING POINT: -187.6°F (-122°C)

LIQUID DENSITY @ 68°F: 10.15 #/gal., 1.218 gm/ml

RELATIVE VAPOR DENSITY: 3.35 (air = 1.0)

FLASH POINT: 5°F Open Cup, 0°F Closed Cup

EXPLOSIVE LIMITS: 7.3% to 16.0% by volume in air

MAXIMUM ALLOWABLE CONCENTRATION: 25 ppm, 5 ppm TLV

DETECABLE ODOR CONCENTRATION: 500 to 1,000 ppm

HAZARDOUS PROPERTIES: Vinylidene chloride is a flammable and toxic material. Vinylidene chloride is moderately irritating to the eyes and to the skin. The greatest danger from vinylidene chloride is inhalation. A single exposure for a few minutes to a high concentration of vinylidene chloride vapor rapidly produces a "drunkenness" which may progress to unconsciousness if exposure is continued. Even concentrations too low to cause an anesthetic effect, may produce organic injury to the liver and kidneys.

A secondary danger from vinylidene chloride exists. Unstabilized vinylidene chloride in contact with air will decompose and form explosive peroxides. These peroxides are evident by the presence of a white solid. For this reason, all vinylidene chloride will be stabilized and all equipment will be passed with an inert gas such as nitrogen or methane. For fire-fighting use dry chemical, foam, or  $\text{CO}_2$  extinguishers.

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TREATMENT: When the skin is contacted by vinylidene chloride it should be thoroughly washed with soap and water and all contaminated clothing removed and washed. If the eyes become contaminated, they should be flushed with water for 15 minutes or more. If a person is affected or overcome from breathing vinylidene chloride vapors, he should be removed to fresh air at once. Medical attention should be obtained immediately. Artificial respiration should be administered if breathing stops.

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## B. SPECIAL SAFETY HAZARDS

There is one material handled in the Central OHC Steam Stripper area that presents safety hazards that require special consideration. While the majority of the materials handled in the plant are toxic or hazardous to various degrees and should each be handled with its due respect, VDC deserves separate discussion.

### VDC

While VDC itself has certain toxic properties, the major hazard from this material is its tendency to form peroxides when it is unstabilized and contacts air. Two precautions are taken to avoid the peroxide formation in the plant. First, all vessels that contain VDC are padded with nitrogen to exclude the presence of air. In addition to this, all liquid VDC is stabilized with HQMME. The HQMME serves as an oxygen scavenger and prevents the peroxides from forming even when air is present. With this protective system, there should never be any peroxides in the plant; however, this material should be watched for and all precautions taken to avoid its forming.

The peroxides are polymerization catalysts and cause VDC to polymerize when they are formed. If they are present, it will be indicated by a white solid in the VDC or the VDC system equipment. This solid is polymerized VDC and contains the peroxides. If these solids are isolated and dried, they will explode violently from either heat or mechanical shock. Other catalysts, such as light, water, or iron, will cause VDC to polymerize, so the presence of a white solid does not guarantee that peroxides have been formed; however, no chances should be taken if polymer is found.

The most readily available peroxide destroyer is water, but the most effective material is caustic or cell liquor, which is also available in the plant. It is advisable to flush

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any equipment (that has contained VDC) with cell liquor, follow d by a water wash,  
before any maintenance is done on it. This will insure against accumulated peroxides  
being trapped anywhere in the equipment or piping where they would be a maintenance  
hazard.

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## APPENDICES

- A. SAMPLE LOG PRINTOUT
- B. SAMPLE DAILY REPORT PRINTOUT
- C. SAMPLE ALARM REVIEW PRINTOUT
- D. PROCESS VARIABLE - POINT NUMBER CORRESPONDENCE INDEX
- E. HIGH/LOW ALARMS AND ALARM CONDITIONS
- F. CENTRAL OHC STEAM STRIPPER AREA LINE LIST
- G. CAL-VAC RUPTURE DISC
- H. SAFETY PERMIT PROCEDURES

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Of 14th Judicial District Court  
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APPENDIX A

SAMPLE LOG PRINTOUT

|                                     |            |                     |
|-------------------------------------|------------|---------------------|
| LOGG                                |            |                     |
| 1109 OHC LOG 11/11/80               |            |                     |
| #1 #2 FAN                           |            |                     |
| OFF OFF                             |            |                     |
| #1                                  | #2         | ON HOURS            |
| 4.15                                | .00        |                     |
| #1                                  | FD/TK/BOT  | 64.00000 LEVZ       |
| #2                                  | FD/TK/BOT  | 64.00000 LEVZ       |
| #1                                  | FD/TK/TOF  | 64.00000 LEVZ       |
| #2                                  | FD/TK/TOF  | 64.00000 LEVZ       |
| #1                                  | STRIP      | 64.00000 LEVZ       |
| #2                                  | STRIP      | 64.00000 LEVZ       |
| FEED TO #1 123.0000 GPM             |            |                     |
| FEED TO #2 160.0000 GPM             |            |                     |
| STEAM TO #1 1234.000 #/HR           |            |                     |
| STEAM TO #2 152.0000 #/HR           |            |                     |
| STEAM FEED 54.40001 PSIG            |            |                     |
| #1                                  | STRIP      | 6.400000 PSIG       |
| #2                                  | STRIP      | 6.400000 PSIG       |
| #1                                  | FD/TK      | 32.00000 PSIG       |
| #2                                  | FD/TK      | 32.00000 PSIG       |
| #1                                  | STRIP      | LQ/PH 68.35491 DEGF |
| #2                                  | STRIP      | LQ/PH 68.77612 DEGF |
| #1                                  | STRIP      | O/H 78.28433 DEGF   |
| #2                                  | STRIP      | O/H 81.47688 DEGF   |
| #1                                  | FEED       | 70.03952 DEGF       |
| #2                                  | FEED       | 70.54478 DEGF       |
| STEAM TO STRIP'S TEMP 298.0000 DEGF |            |                     |
| #1                                  | STRIP FEED | 10.40000 PH         |
| #2                                  | STRIP FEED | 10.40000 PH         |

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APPENDIX B

SAMPLE DAILY REPORT PRINTOUT

|                |                      |          |  |
|----------------|----------------------|----------|--|
| DAYR           |                      |          |  |
| 1110           | OHC DAY-RPT 11/10/80 |          |  |
| #1             | #2                   | ON HOURS |  |
| 24.00          | .00                  |          |  |
| STEAM TO #1    | 1234.000             | #/HR     |  |
| STEAM TO #2    | 192.0000             | #/HR     |  |
| #1 STRIP FEED  | 10.40014             | PH       |  |
| #2 STRIP FEED  | 10.40014             | PH       |  |
| #1 STRIP O/H   | 72.25672             | DEGF     |  |
| #2 STRIP O/H   | 0.000000             | DEGF     |  |
| #1 FEED        | 71.94842             | DEGF     |  |
| #2 FEED        | 0.000000             | DEGF     |  |
| #1 STRIP LQ/PH | 71.70858             | DEGF     |  |
| #2 STRIP LQ/PH | 0.000000             | DEGF     |  |
| #1 FD/TK       | 32.00000             | PSIG     |  |
| #2 FD/TK       | 32.00000             | PSIG     |  |
| FEED TO #1     | 123.0000             | GPM      |  |
| FEED TO #2     | 0.000000             | GPM      |  |

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APPENDIX C

SAMPLE ALARM REVIEW PRINTOUT

|                                           |      |  |
|-------------------------------------------|------|--|
| ALRV                                      |      |  |
| 1109 #1 FEED LOW , 70.12374               | DEGF |  |
| 1109 #2 FEED LOW , 70.62899               | DEGF |  |
| 1109 #1 STRIP O/H LOW , 78.36838          | DEGF |  |
| 1109 #2 STRIP O/H LOW , 81.56086          | DEGF |  |
| 1109 #1 STRIP LQ/PH LOW , 68.43914        | DEGF |  |
| 1109 #2 STRIP LQ/PH LOW , 68.86036        | DEGF |  |
| 1109 #1 STRIP OPEN, 6.400000              | PSIG |  |
| 1109 #2 STRIP OPEN, 6.400000              | PSIG |  |
| 1109 #1 FD/TK OPEN, 32.00000              | PSIG |  |
| 1109 #2 FD/TK OPEN, 32.00000              | PSIG |  |
| 1109 STEAM FEED OPEN, 54.40001            | PSIG |  |
| 1109 FEED TO #1 OPEN, 123.0000            | GPM  |  |
| 1109 FEED TO #2 OPEN, 160.0000            | GPM  |  |
| 1109 STEAM TO #1 OPEN, 1234.000           | #/HR |  |
| 1109 STEAM TO #2 OPEN, 192.0000           | #/HR |  |
| 1109 #1 FD/TK/TOP OPEN, 64.00000          | LEV% |  |
| 1109 #2 FD/TK/TOP OPEN, 64.00000          | LEV% |  |
| 1110 #1 FD/TK/BOT OPEN, 64.00000          | LEV% |  |
| 1110 #2 FD/TK/BOT OPEN, 64.00000          | LEV% |  |
| 1110 #1 STRIP OPEN, 64.00000              | LEV% |  |
| 1110 #2 STRIP OPEN, 64.00000              | LEV% |  |
| 1110 #1 STRIP FEED OPEN, 10.40000         | PH   |  |
| 1110 #2 STRIP FEED OPEN, 10.40000         | PH   |  |
| 1110 FEED TO FEED TK'S OPEN, 10.40000     | PH   |  |
| 1110 SET FEED TO #1 OPEN, 24.92187        | GPM  |  |
| 1110 SET LEVEL TO #1 HIGH, 81.90626       | LEV% |  |
| 1110 SET LEVEL TO #2 HIGH, 92.40626       | LEV% |  |
| 1110 OUT TO #2 STEAM VALVE LOW , 2.343750 | %    |  |
| 1110 OUT TO #2 LEVEL VALVE OPEN, 13.75000 | %    |  |
| 1110 #1 FEED PUMP OFF , 0.000000          | %    |  |
| 1110 #2 FEED PUMP OFF                     |      |  |
| 1110 #2 STRIP PRESS HIGH                  |      |  |
| 1110 #1 SO2-FORMATE PUMP OFF              |      |  |
| 1110 #2 SO2-FORMATE PUMP OFF              |      |  |
| 1110 #1 STRIP PRESS HIGH                  |      |  |
| 1110 #1 AIR CONDENSER OFF                 |      |  |
| 1110 #2 AIR CONDENSER OFF                 |      |  |

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APPENDIX D

PROCESS VARIABLE - POINT NUMBER CORRESPONDENCE INDEX

| STEAM STRIPPER #1 |                               | STEAM STRIPPER #2 |                               |
|-------------------|-------------------------------|-------------------|-------------------------------|
| Point No.         | Process Variable              | Point No.         | Process Variable              |
| 1                 | #1 Feed Temperature           | 2                 | #2 Feed Temperature           |
| 3                 | #1 Overhead Temperature       | 4                 | #2 Overhead Temperature       |
| 5                 | #1 Liquid Phase Temperature   | 6                 | #2 Liquid Phase Temperature   |
| 7                 | #1 Stripper Pressure          | 8                 | #2 Stripper Pressure          |
| 9                 | #1 Feed Tank Pressure         | 10                | #2 Feed Tank Pressure         |
| 12                | #1 Feed Rate                  | 13                | #2 Feed Rate                  |
| 14                | #1 Steam Rate                 | 15                | #2 Steam Rate                 |
| 16                | #1 Feed Tank Top Level        | 17                | #2 Feed Tank Top Level        |
| 18                | #1 Feed Tank Bottom Level     | 19                | #2 Feed Tank Bottom Level     |
| 20                | #1 Stripper Level             | 21                | #2 Stripper Level             |
| 22                | #1 Feed pH                    | 23                | #2 Feed pH                    |
| 25                | #1 Feed Rate Setpoint         | 26                | #2 Feed Rate Setpoint         |
| 27                | #1 Steam Rate Setpoint        | 28                | #2 Steam Rate Setpoint        |
| 29                | #1 Level Setpoint             | 30                | #2 Level Setpoint             |
| 31                | #1 Feed Out Monitor           | 32                | #2 Feed Out Monitor           |
| 33                | #1 Steam Out Monitor          | 34                | #2 Steam Out Monitor          |
| 35                | #1 Stripper Level Out Monitor | 36                | #2 Stripper Level Out Monitor |

VARIABLES COMMON TO BOTH STRIPPER SYSTEMS

| Point No. | Process Variable                 |
|-----------|----------------------------------|
| 11        | Steam Pressure                   |
| 24        | Feed Tank Feed Inlet pH          |
| 37        | PRV - Positive Reference Voltage |
| 38        | RTD -                            |
| 39        | ZRV - Zero Reference Voltage     |
| 40        | Stripper Steam Feed Temperature  |

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## APPENDIX E

### HIGH/LOW ALARMS AND ALARM CONDITIONS:

|                                                                | <u>ALARM POINTS</u>                 |            |
|----------------------------------------------------------------|-------------------------------------|------------|
|                                                                | <u>HIGH</u>                         | <u>LOW</u> |
| 1. Tank Feed Inlet pH for tanks #1 and #2                      | pH 13.0                             | pH 9.0     |
| 2. pH on steam stripper feed to strippers #1 and #2            | pH 13.0                             | pH 7.0     |
| 3. Steam stripper overhead temperature for strippers #1 and #2 | 220°F                               | 200°F      |
| 4. Steam stripper bottoms temperature for strippers #1 and #2  | 230°F                               | 205°F      |
| 5. Steam feed flow to strippers #1 and #2                      | ± 20% deviation in steam feed rate. |            |
| 6. Steam stripper bottoms level for strippers #1 and #2        | 80%                                 | 20%        |
| 7. Total feed tank level for tanks #1 and #2                   | 80%                                 | 20%        |
| 8. Feed tank interface level for tanks #1 and #2               | 80%                                 | 20%        |
| 9. Steam stripper overpressure for strippers #1 and #2         | 15 psig                             |            |

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APPENDIX F

CENTRAL OHC STEAM STRIPPER AREA LINE LIST

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## LINE LIST

[illegible]

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980000 15

**IPC**  
INDUSTRIES

**INDUSTRIAL  
CHEMICAL DIVISION**  
LAKE CHARLES, LOUISIANA

CENTRAL OMC STEAM STRIPPER PIPING

PIPE LINE SCHEDULE

DRAWN BY: DATE: SCALE: 1" = 2'-0"

CHECKED BY: *A. W. [signature]* DATE: 10/27/79 REVISION: 2-19

APPROVED BY: *[signature]* DATE: 11-2-79 S.W.

DWG. 2

## REVISIONS

**REVISIONS**

| REV | DESCRIPTION                                           | DATE    |
|-----|-------------------------------------------------------|---------|
| 1   | CHANGED 8-BAY<br>REQ FROM 5% TO 10%<br>D.R.W. 7-11-60 | 7-11-60 |

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**IPC**  
INDUSTRIES

**INDUSTRIAL  
CHEMICAL DIVISION**  
LAKE CHARLES, LOUISIANA

CENTRAL OHC STEAM STRIPPER PIPING

PIPE LINK SCHEDULE  
SHEET 2 OF 2

DESIGNED BY DATE SCALE  
CHECKED BY W. HUNTER DATE 12/7 CHARGE PAT  
APPROVED BY WJH DATE 12-7-71

G.W. DWG. 570 - 10021.1

APPENDIX G  
CAL-VAC RUPTURE DISC

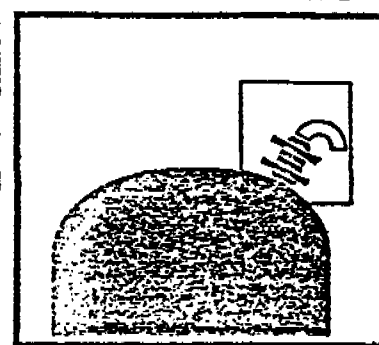
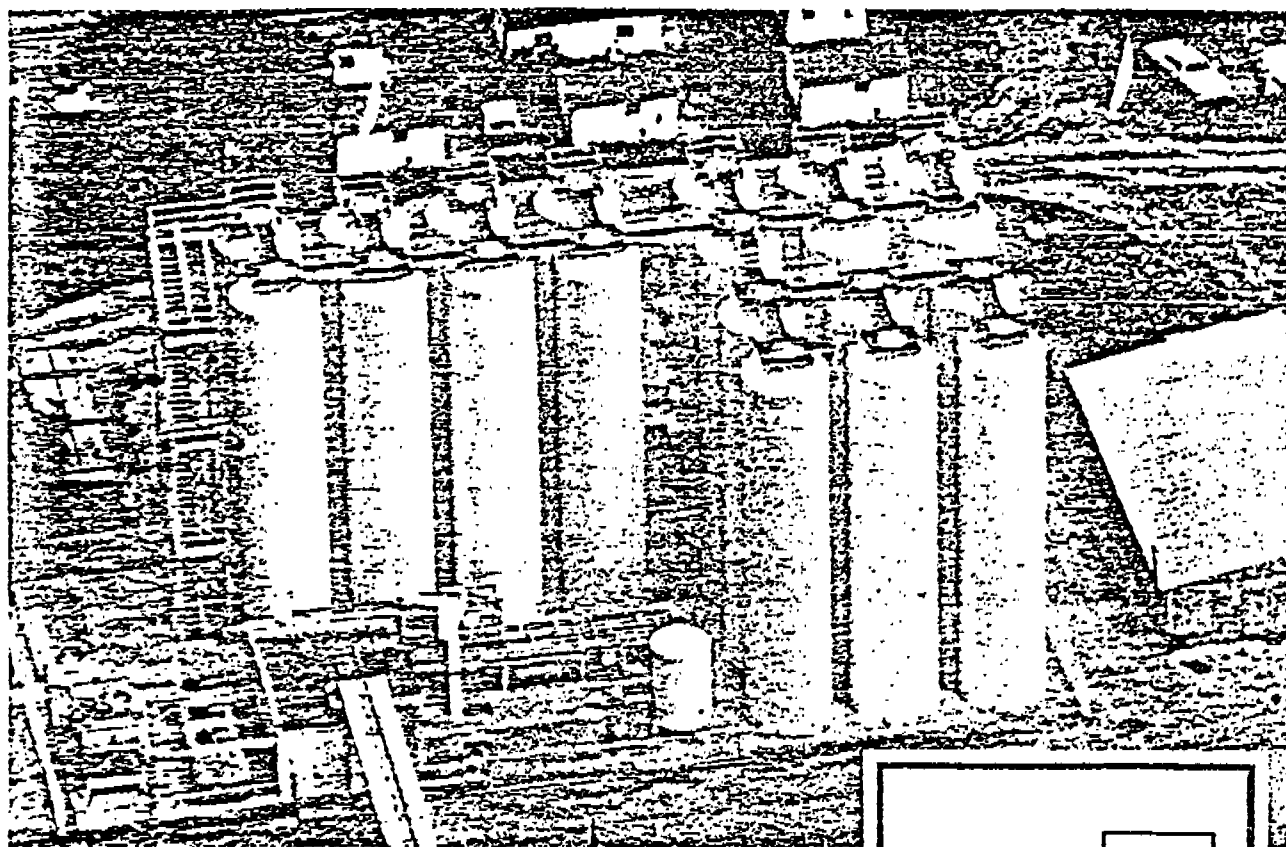
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the revolutionary Continental

**CAL\*VAC**<sup>TM</sup>  
RUPTURE DISC...

USE WITH KTM FIG # E03162-31T  
150# L PORT FULL PORT



An entirely new and better way to protect processing and storage tanks from collapsing when too much vacuum is pulled. At the same time it provides protection against damage from sudden buildups of positive overpressure.

The CAL-VAC rupture disc is NOT just another vacuum breaker. It's a fail-safe, non-mechanical device designed to provide both vacuum and positive pressure relief at standard pre-determined settings. (See table on back page for standard sizes and settings). Although the unit is designed for insert-type installation, standard sanitary fittings are available on request.

#### SOME TYPICAL APPLICATIONS

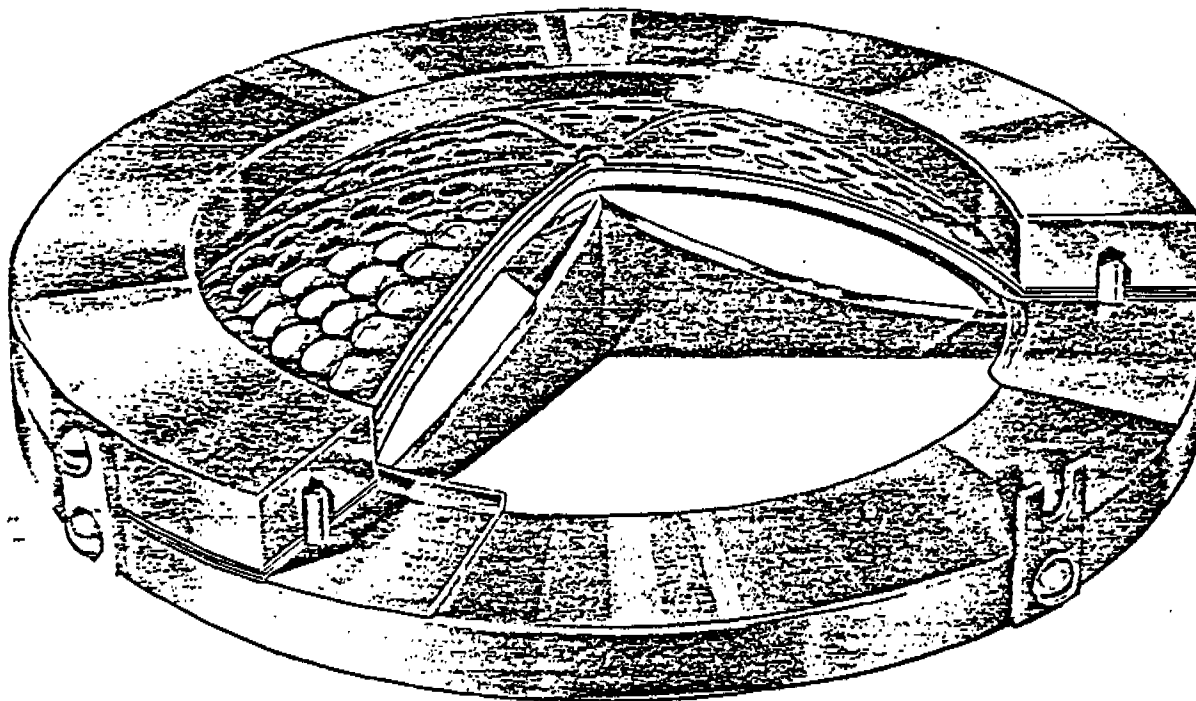
Beverage processing and storage tanks

Liquid chemical, petrochemical and gasoline storage tanks

Bulk liquid transportation equipment

SL 000089

design features of the  
**CAL\*VAC™**  
 RUPTURE DISC...



**VACUUM GIRDLE DESIGN** determines standard mini/max vacuum settings, allows system to operate within one inch water column of minimum vacuum pressure rated setting. Patents pending.

**TOP SECTION** will give positive pressure relief as calculated per standard flow relief... either as primary relieving device or as a backup device to an existing safety relief valve. (Suggest disc be rated at 1.2 to 1.5 times primary relief setting). U.S. Patents 3,445,032 and 2,953,279.

**RUPTURE DISC SEAL** distributes pressure uniformly in both positive and vacuum

directions, eliminates both external and internal leakage.

**FLAT SEAT DESIGN** reduces susceptibility to product buildup, promotes easier cleaning to meet FDA requirements.

**THINNER FLANGES** reduce weight and material cost.

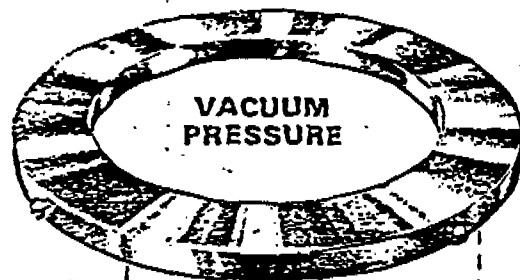
**LOCATING PINS** on inlet Safety Crown holder assure proper disc alignment.

**KNIFE BLADES** with **PRECISION-HONED EDGES** are designed to provide maximum vacuum relief.

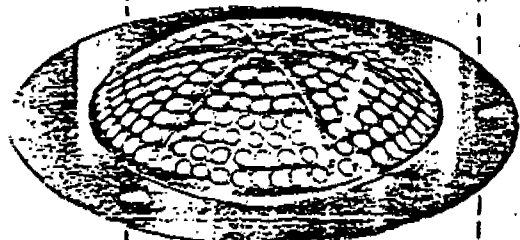
**NO MOVING PARTS** eliminate possibility of malfunction, assures a fail-safe operation.

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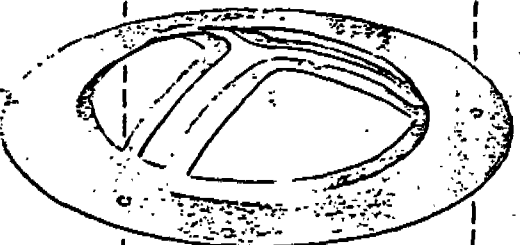
**SAFETY CROWN  
HOLDER  
(Outlet flange)**



**TOP  
SECTION**



**SEAL**



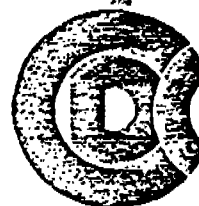
**VACUUM  
GIRDLE**



**RING  
(optional)**



**SAFETY  
CROWN  
HOLDER  
(Inlet flange)  
with  
KNIFE BLADE  
ASSEMBLY**



## standard materials of construction

### **SAFETY CROWN HOLDERS (inlet and outlet flanges)**

Carbon steel and stainless steel. Other machineable materials available on request. (NOTE: Holders can be furnished with Teflon "S" coating, nickel electroless or tantalum plating.)

### **SIDE-MOUNTED BARS**

Stainless steel with steel round head cap screws.

### **KNIFE BLADE ASSEMBLY**

17-7 PH stainless steel, heat-treated and polished.

### **TOP SECTION and RING**

Monel, nickel, Inconel, 316 SS. Other materials available.

### **SEAL and VACUUM GIRDLE:**

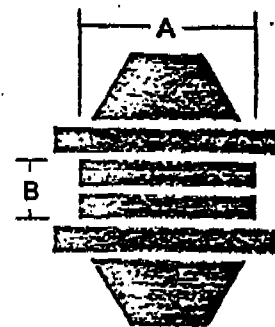
Teflon.

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**ANSI  
BOLTING  
(150 LB.)**

| SIZE | DIMENSION<br>"A" | DIMENSION<br>"B" |
|------|------------------|------------------|
| 3"   | 5¼"              | 1¼"              |
| 4"   | 6¾"              | 1¼"              |
| 6"   | 8¾"              | 1½"              |
| 8"   | 10¾"             | 1½"              |



**Standard Sizes and Settings of CAL-VAC Rupture Discs**

| RUPTURE<br>DISC<br>SIZE | VACUUM PRESSURE RELIEF                                 |                                                                    |                                                                   | POSITIVE PRESSURE RELIEF                                         |         |                                                                     |
|-------------------------|--------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------|---------|---------------------------------------------------------------------|
|                         | STANDARD VACUUM RELIEF SETTINGS                        |                                                                    | Approximate<br>Relief Area<br>in vacuum<br>direction<br>(sq. in.) | RANGE OF AVAILABLE<br>POSITIVE RELIEF PRESSURES<br>PSIG @ 72° F. |         | APPROXIMATE<br>RELIEF AREA<br>IN POSITIVE<br>DIRECTION<br>(sq. in.) |
|                         | Inches of water<br>column when vacuum<br>relief starts | Inches of water<br>column when full<br>vacuum relief is<br>reached |                                                                   | Minimum                                                          | Maximum |                                                                     |
| 3"                      | 1.0<br>2.0<br>4.0<br>5.0                               | 3.0<br>4.5<br>9.0<br>12.0                                          | 3.5                                                               | 12                                                               | 150     | 9.62                                                                |
| 4"                      | 2.0<br>3.0<br>4.0<br>5.0<br>7.0                        | 7.0<br>13.0<br>10.0<br>12.0<br>20.0                                | 5.8                                                               | 10                                                               | 125     | 15.90                                                               |
| 6"                      | 1.0<br>2.0<br>3.0<br>4.0<br>5.0                        | 4.0<br>7.0<br>5.0<br>8.0<br>11.0                                   | 10.5                                                              | 7                                                                | 100     | 33.18                                                               |
| 8"                      | 1.0<br>2.0<br>3.0<br>5.0<br>6.0<br>8.0                 | 5.0<br>5.0<br>10.0<br>8.0<br>12.0<br>10.0                          | 16.4                                                              | 4                                                                | 75      | 56.76                                                               |

TEMPERATURE LIMITATIONS, ALL SIZES: Minimum, 20° F., Maximum, 150° F.

**Disc Replacement**

**VACUUM PRESSURE RELIEF**

When vacuum relief occurs, normally the seal only needs to be replaced.

**POSITIVE PRESSURE RELIEF**

When positive overpressure relief occurs, the entire rupture disc assembly is replaced.  
(top section, seal, vacuum girdle and optional ring)



*Safety Crown*  
**CONTINENTAL DISC CORPORATION**

4103 West Riverside, Riverside, Missouri 64150  
Telephone: (816) 587-8300 Telex: 42273

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**CONTINENTAL DISC CORPORATION**

# CAL-VAC RUPTURE DISC & HOLDER PRICING

#11  
Price Sheet  
CDC 3-77

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| INSERT FLANGE ASSEMBLY FOR CAL-VAC DISCS |                |                 |        |                       |        |        |        |        |
|------------------------------------------|----------------|-----------------|--------|-----------------------|--------|--------|--------|--------|
| SAFETY<br>CROWN<br>SIZE                  | ANSI<br>RATING | FLANGE MATERIAL |        | QUANTITY - PRICE EACH |        |        |        |        |
|                                          |                | INLET           | OUTLET | 1                     | 2      | 3      | 4      | 5      |
| 3"                                       | 150            | C.S.            | C.S.   | 235.00                | 182.00 | 162.00 | 151.00 | 141.00 |
|                                          | 150            | 316             | C.S.   | 253.00                | 203.00 | 178.00 | 168.00 | 159.00 |
|                                          | 150            | 316             | 316    | 271.00                | 226.00 | 204.00 | 195.00 | 184.00 |
| 4"                                       | 150            | C.S.            | C.S.   | 244.00                | 189.00 | 166.00 | 160.00 | 154.00 |
|                                          | 150            | 316             | C.S.   | 273.00                | 236.00 | 218.00 | 204.00 | 191.00 |
|                                          | 150            | 316             | 316    | 302.00                | 265.00 | 242.00 | 235.00 | 227.00 |
| 6"                                       | 150            | C.S.            | C.S.   | 265.00                | 217.00 | 199.00 | 191.00 | 184.00 |
|                                          | 150            | 316             | C.S.   | 313.00                | 275.00 | 261.00 | 251.00 | 241.00 |
|                                          | 150            | 316             | 316    | 361.00                | 331.00 | 313.00 | 301.00 | 289.00 |
| 8"                                       | 150            | C.S.            | C.S.   | 299.00                | 258.00 | 240.00 | 232.00 | 224.00 |
|                                          | 150            | 316             | C.S.   | 377.00                | 342.00 | 312.00 | 302.00 | 292.00 |
|                                          | 150            | 316             | 316    | 447.00                | 420.00 | 380.00 | 358.00 | 341.00 |

- Different materials or designs will be quoted on request.

Above prices include knife blades (17-7 SS), alignment pins (SS), pre-assembly clips, and screws (SS). (Does not include the disc).

| CAL-VAC DISCS |                                             |        |        |        |        |                              |                                |        |
|---------------|---------------------------------------------|--------|--------|--------|--------|------------------------------|--------------------------------|--------|
| DISC<br>SIZE  | INCLUDES<br>METAL TOP, TEFLON SEAL & GIRDLE |        |        |        |        | BOTTOM<br>RING<br>(OPTIONAL) | TEFLON<br>REPLACEMENT<br>PARTS |        |
|               | QUANTITY - PRICE EACH                       |        |        |        |        |                              | SEAL                           | GIRDLE |
|               | 1                                           | 2      | 3      | 4      | 5-10   |                              |                                |        |
| 3"            | 101.45                                      | 91.90  | 82.35  | 82.35  | 82.35  | 5.25                         | 7.50                           | 25.10  |
| 4"            | 108.90                                      | 98.65  | 88.40  | 88.40  | 88.40  | 6.45                         | 9.00                           | 26.90  |
| 6"            | 167.55                                      | 150.54 | 133.55 | 133.55 | 133.55 | 7.85                         | 11.40                          | 31.55  |
| 8"            | 221.70                                      | 170.65 | 152.10 | 152.10 | 152.10 | 14.00                        | 14.50                          | 40.80  |

Metal top or bottom ring material Monel, Nickel, Inconel or 316 Stainless.

Other materials quoted on request.

Disc tags are aluminum. For Stainless Steel tags add \$.20 to price of disc.

| QUANTITY DISCOUNTS FOR IDENTICAL DISCS ORDERED AT THE SAME TIME |              |               |
|-----------------------------------------------------------------|--------------|---------------|
| 1 - 10 - 0%                                                     | 11 - 19 - 5% | 20 - UP - 10% |

SL 000093

# HOW TO INSTALL THE CAL\*VAC<sup>TM</sup> RUPTURE DISC

**CAUTION!** This unit is a precision instrument and the knife blades are razor sharp. For these two reasons, handle with extreme care!

## PRECAUTIONS REQUIRED IN LOCATING UNIT IN THE SYSTEM

1. Before installing this rupture disc unit, make absolutely sure it will be located where people or property will not be exposed to the discharge in case of rupture.
2. If toxic or flammable fumes or liquids will be released upon discharge, be sure they will vent to a safe place.

## GENERAL PROCEDURE FOR INSTALLING UNIT

1. Check all components to make sure they have not been damaged. Handle them carefully.
2. Assemble rupture disc components between holders as shown.
3. Install assembled unit in piping system using good piping and instrumentation installation practices. Make sure flow arrows point in proper direction. See Illustrations at right.

## HOW TO PREPARE THE HOLDERS

1. Disassemble holders by loosening screws in outlet flange and lift flange out of assembly clips.
2. If this is a new installation, remove knife blade shipping protector carefully. Remember the knife blades are razor sharp! DO NOT INSTALL SHIPPING PROTECTOR!
3. If this is a replacement installation, remove ruptured or old disc.
4. Clean all foreign material from rupture disc seating of both inlet and outlet flanges.

Check knife blades for damage. DO NOT INSTALL the rupture disc assembly if knife points are damaged or if there are nicks on the cutting edge.

**CAUTION:** Handle blades with care. They are extremely sharp!

## HOW TO ASSEMBLE THE CAL\*VAC RUPTURE DISC UNIT

**CAUTION!** Follow procedure carefully. Handle the CAL\*VAC rupture disc with extreme care. A rupture disc is a precision instrument.

1. Place inlet flange on a flat surface with knife blades and locating pins pointing upward as shown.
2. If optional metallic ring is being used, place ring on the locating pins as shown.
3. Place vacuum girdle on locating pins with convex side up as shown.
4. Place Teflon seal and top section of rupture disc on locating pins with convex side up as shown.

**NOTE:** In some cases the ring, vacuum girdle and metallic top section are permanently attached and may be installed as a single unit.

5. Lower outlet flange on locating pins carefully. Make sure you do not damage crown of rupture disc.
6. Fasten the complete assembly securely by tightening screws against assembly clips.

## HOW TO INSTALL THE CAL\*VAC RUPTURE DISC ASSEMBLY IN THE SYSTEM

1. Sealing gaskets are to be furnished by the customer. Place gaskets between outlet flange and companion flange and inlet flange and companion flange.
2. Insert CAL\*VAC rupture disc assembly into system.

**CAUTION:** Be sure FLOW ARROWS on name plate are pointing in PROPER VENT DIRECTION — positive pressure relief and vacuum pressure relief.

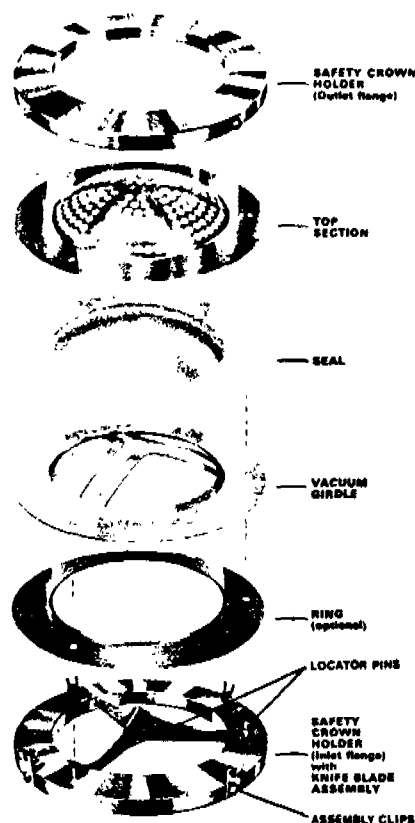
3. Install or re-install bolting. Torque unit by maintaining pressure evenly around the perimeter using cross torque bolting sequence. Refer to torque table below.

## SAVE TIME AND MONEY BY FOLLOWING SOUND PREVENTIVE MAINTENANCE PRACTICES

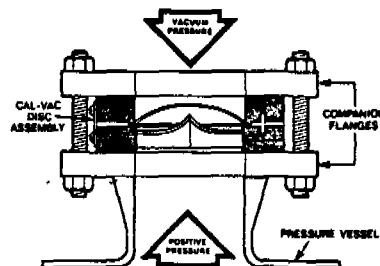
1. Replace rupture disc every year if operating conditions are normal. If severe conditions exist, shorten the change-out period as required.
2. When replacing rupture discs, check knife blades for point damage, nicks and process media buildup. Do not re-install the unit if blade edges are dull or have been damaged. Return inlet holder and knife blades to Continental Disc Corporation for replacement. See address below.
3. To avoid a major plant shutdown, maintain an inventory of three spare discs for each unit in use. Your personal experience will determine if this is adequate. Adjust your inventory accordingly.



4103 West Riverside  
Riverside, Missouri 64150  
Telephone: 816-587-8300



Be sure to assemble CAL\*VAC rupture disc components in this order



CAL\*VAC rupture disc properly installed in pressure system

## TORQUE TABLE

| SIZE | ANSI RATING | TORQUE (ft. lbs.) |
|------|-------------|-------------------|
| 3"   | 150         | 40                |
| 4"   | 150         | 30                |
| 6"   | 150         | 40                |
| 8"   | 150         | 75                |

\*Patents applied for

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APPENDIX H  
SAFETY PERMIT PROCEDURES

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prior to implementation,  
sig

## WELDING, BURNING, OR OPEN FLAME PERMIT

### When and Where Required

A Welding, Burning, or Open Flame Permit must be issued prior to beginning "hot work" (welding, burning, or open flame work) anywhere in the plant with the following exceptions:

1. Permanent designated shop locations.
2. Temporary fabricating areas may be treated as a permanent designated shop location upon mutual agreement of the Construction or Maintenance SPU Leader and the SPU Leader of the affected operating unit. Note: This exception does not apply in Plants B, the Organics Dock Storage Area, the Organics Shipping Facilities, or the South Terminal Area.

When "hot work" is performed on piping, vessels, pumps, or other equipment which contains, or may have contained, process or utility liquids or gases, a Permit shall be required even in the exempt shop locations.

### Responsibilities

Issuance of a Welding, Burning, or Open Flame Permit requires joint participation of Operations Supervision and the Maintenance Foreman or Field Engineer. Communication must take place between these individuals concerning scope of the job, other related jobs, possible unforeseen occurrences, etc. Specific consideration must be given to all items on the Permit checklist described below. PPG supervisory personnel are responsible for immediate termination of a Permit when a change in conditions warrants such action. Persons working under the protection of a Permit should keep Operations Supervision informed of observed changes in job conditions and/or breaks in job continuity and should request revalidation of the Permit any time there is a question about continued safe working conditions.

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### Checklist

Each item on the Permit checklist (see Permit Form on Page 6) must be carefully considered.

A response to each checklist item is required.

### Job Safety Instruction (JSI)

Appropriate JSI should take place between the Foreman and the persons on the job each time a WBOF Permit is issued. An explanation of each "Does Not Apply" item on the checklist should be included. PPG employees directly involved in the welding or burning operation covered by the Permit should initial the reverse side of the field copy of the Permit to indicate that JSI has been received.

### Signatures

A Welding, Burning, or Open Flame Permit is not valid unless it contains the signatures of an Operations Supervisor and a Maintenance Foreman or Construction Field Foreman.

### Duration of Permit

A WBOF Permit should only be issued when all preparations have been made and the welding, burning, or open flame work is ready to commence. The Operations Supervisor issuing the Permit specifies the start time and expiration time of the Permit. Depending on the location and nature of the job, he may specify that revalidation of the Permit is required following any break in continuity of the job such as smoke breaks, time spent in shops on fabrication, etc. Additionally, revalidation may be requested by Supervision or the personnel protected by the Permit at any time there is a question about ability to perform the welding or burning operation safely. A space for revalidation signatures by the Operations Foreman is included on the reverse side of the field copy of the Permit form. The maximum duration of a Permit is four hours, and it may not be revalidated after that time.

### Distribution of Permit

The Welding, Burning, or Open Flame Permit is printed on a two-part form. When filled out and issued, the paper original is posted in the Operations Control Room. The cardboard copy (field copy) is posted in a conspicuous place on the job site.

The Control Room copy will be used by Operations as a means of keeping informed about field activity and will serve as a checkpoint if necessary to terminate Permits due to process upsets.

The field copy is to be returned to the Maintenance Foreman/Field Engineer at the completion of the job. The Maintenance Foreman/Field Engineer shall sign the "Job Completed" blank and return the Permit to the Operations Foreman who attaches the Control Room copy and forwards both to the Senior Safety Supervisor/Engineer. Expired Permits which are replaced by new Permits during the course of the job shall be destroyed.

### General Rules

1. A WBOF Permit should only be issued when all preparations have been made and the welding or burning operation is ready to commence. (That is, don't issue a Permit at 7:30 a.m., if welding rigs have to be moved, material gathered, etc. Conditions can change in the interim.)
2. A combustible gas test must be made to insure that the work is free of a flammable atmosphere. The explosimeter reading shall be recorded on the Permit. When the possibility of a false reading exists due to inert gases such as freon or nitrogen being present, an oxygen check should be made to determine if there is a sufficient amount of oxygen present to cause combustion in the explosimeter. It is expected that a meter reading of 0% LEL will be obtained in order for the Permit to be issued. On a special exception basis, readings between 0% and 9.9% LEL will be permitted after consultation

- with a higher ranking Operations Supervisor. In no case will the Permit be issued when combustible gas tests of 10% LEL or greater are obtained.
3. When welding or burning on or around process lines or vessels which may contain flammable or explosive material (including well water), closed and tagged valves shall not be considered adequate. Installation of isolating blinds (with tags) is the preferred method of control for such cases, but where removal of spool pieces or other similar procedures provide equivalent protection, these procedures are acceptable.
  4. All valves controlling flows to and from the work shall be closed and tagged by an Operations Representative, Maintenance Foreman, and the men performing the work. When contractors are doing the work, only the Operations Representative and the Field Engineer are required to tag.
  5. All bleed valves shall be opened and tagged according to Rule No. 4.
  6. Presence of blinds must be physically verified and shall not relieve anyone of the responsibility of tagging. Blinds are considered as control points just as valves are, and must be tagged accordingly.
  7. All electrical circuit breakers pertaining to the job should be pulled and tagged according to Rule No. 4.
  8. A check should be made with an oxygen meter if necessary to determine if breathing air is needed.
  9. A check should be made to determine if a life line, safety belt, etc., is necessary.
  10. All sewer openings in Plants B near the "hot work" shall be covered and sealed. Sewer openings in other areas of the plant should be considered jointly by Operations and Maintenance/Construction, and covered if necessary.
  11. A fire extinguisher should be accessible while the "hot work" is being performed.

12. Fire watches shall be required in Plants B and in other plant locations where sparks or hot slag from welding operations could precipitate a fire. The person designated as fire watch shall use water to wet the sparks and hot slag around welding in such areas.
13. The electrode ground from an electric welding machine must be clamped directly to the metal being welded or as close as possible.
14. Operating personnel shall make use of the Control Room copy of WBOF Permits to keep informed of "hot work" in progress in their area. All vessels, piping, or other operational equipment that has to be opened, vented, etc., should be done only after proper communication with the personnel performing the "hot work".
15. The Permit shall be issued for one job and not to each welder unless the foreman decides that a specific part of the job requires a separate Permit. The Permit shall be displayed in an appropriate place on the job.
16. On weekends and during the night shifts, the Shift Supervisor or Shift Foreman, in conjunction with the Maintenance Foreman, should issue any Permits that are required.

WELDING, BURNING, OR OPEN FLAME PERMIT

Dat \_\_\_\_\_ Area \_\_\_\_\_

Job Description \_\_\_\_\_

Checklist

| (This portion to be filled in by Operations)                                                                       | Yes | Does Not Apply                                                                      |
|--------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------|
| 1. Valves closed/tagged                                                                                            |     |                                                                                     |
| 2. Bleed valves open/tagged                                                                                        |     |                                                                                     |
| 3. Connections blanked or blinded & tagged                                                                         |     |                                                                                     |
| 4. Electric circuit breakers pulled/tagged                                                                         |     |                                                                                     |
| 5. Sufficient O <sub>2</sub> for test. Meter in calibration. Free of process materials & gases. % explosive. _____ |     |  |
| (This portion to be filled in by Maint/Constr)                                                                     |     |                                                                                     |
| 1. Fresh air masks & air needed                                                                                    |     |                                                                                     |
| 2. Life line (wristlets, belt-harness) required                                                                    |     |                                                                                     |
| 3. Sewer line opening sealed                                                                                       |     |                                                                                     |
| 4. Control points checked and tagged                                                                               |     |                                                                                     |
| 5. JSI given                                                                                                       |     |                                                                                     |

Permit Start Time \_\_\_\_\_

Expiration Time \_\_\_\_\_

Maximum Duration: Four Hours

New Permit required after job interruptions such as lunch break, evacuation, safety meeting, or process upset. For other situations requiring revalidation, the Operations Foreman's signature is required on reverse side of field copy.

Operations

Maint/Constr

Foreman

Foreman

When job is complete, Maintenance Foreman/Field Engineer returns Permit to Operations Foreman who will then forward both copies to the Senior Safety Supervisor/Engineer.

Job Completed \_\_\_\_\_  
Maintenance Foreman/Field Engineer

This is a two-part, carbonless form. The paper original is to be designated as "Control Room Copy" and the card stock copy is to be labeled "Field Copy".

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I have received JSI concerning the job covered by this Permit

Signatures of PPG employees protected by Permit.

|       |       |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

The signature of an Operations Foreman is required below whenever revalidation of the Permit becomes necessary. Request for revalidation may be initiated either by PPG supervision or by personnel protected by the Permit.

Operating conditions are stable and the job covered by this Permit may resume.

|                         |
|-------------------------|
| _____ / _____           |
| Operations Foreman Time |
| _____ / _____           |
| Operations Foreman Time |
| _____ / _____           |
| Operations Foreman Time |
| _____ / _____           |
| Operations Foreman Time |
| _____ / _____           |
| Operations Foreman Time |

Note: Only the Field Copy will have this printed on reverse side.

IGNITION SOURCE PERMITPurpose

An Ignition Source Permit is similar to the Welding, Burning, or Open Flame Permit and is designed to control the use of tools and devices having the potential to provide a spark or source of ignition in areas of the plant where this is a concern.

Included among the devices covered by an Ignition Source Permit are:

1. Spark ignition vehicles which are to operate for more than 30 minutes within a restricted area. (The Vehicle Entry Permit is only intended for quick-in/quick-out use.) Cranes, fork trucks, hydroblast rigs, etc., are examples of vehicles requiring an ISP in designated areas.
2. Gasoline drive pumps, air compressors, etc.
3. Electric powered tools, pumps, etc.
4. Heat lamps
5. Hot air blowers
6. Sandblasting nozzles
7. Jack hammers, chipping guns, and similar spark producing tools
8. Electronic transmitters and similar devices having spark potential when being calibrated.

Note: This is not intended to be an all inclusive list.

When and Where Required

An Ignition Source Permit is required when using devices similar to those described above in the following locations:

1. Throughout Plants B operating areas, at the Organics Dock Storage Area, at the Organics Shipping Facilities, and at the South Terminal Area.

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- \*2. At all other locations in the plant when ignition source devices are used in work performed on process vessels, process lines, sewers, pumps, or other equipment having the potential to contain a flammable or explosive liquid or gas.
  - \*3. At any plant location where there is the possibility of an explosive atmosphere due to conditions such as a release from a safety relief device, a sewer carrying foreign material due to a process upset, or from any other abnormal conditions.
- \* The affected Operations Supervisor and Maintenance Foreman/Field Engineer are responsible for evaluating the job situation and determining the need for a Permit in these areas.

#### Responsibility for Issuing

The Maintenance Foreman/Field Engineer on a job requiring an Ignition Source Permit is responsible for initiating a request for the Permit. For situations where an ISP is required for service contractors or others not working under the supervision of a Maintenance Foreman or Field Engineer, an Operations Representative of the affected unit shall initiate a Permit request. An Operations Supervisor in the unit is responsible for verifying that the job area is free of flammable or explosive materials and for issuing the Permit. Unlike the Welding, Burning, or Open Flame Permit, the Maintenance Foreman/Field Engineer is not required to directly participate in issuance of the Permit unless warranted by unusual circumstances. For certain types of equipment such as compressors or pumps which will not be constantly attended, the issuing supervisor must see that provision is made for emergency shutdown of the equipment.

#### Responsibility for Shutting Down Equipment

Operations personnel from the issuing control room are responsible for seeing that ignition sources are shut down when process conditions call for such termination of activity. Ordinarily, an Operations Representative shall inform the person using the ignition source of the hazardous condition and the user shall turn off or shut down the machine or device. For unattended

equipment, the Operations Representative shall operate switches, breakers, etc., as required to render the ignition source safe. The Operations Supervisor who issues the Permit should take note of the shutdown point (switch, breaker, etc.) when issuing the Permit and if the point is not readily identifiable, shutdown instructions should be written on the control room copy of the Permit.

#### Duration of Permit

The Operations Supervisor issuing the Ignition Source Permit specifies the start time and expiration time of the Permit. The maximum duration of a Permit is eight hours provided that the Permit is revalidated by an Operations Supervisor following a lunch break or shift change. The Operations Supervisor is responsible for immediate termination of the Permit when a change in conditions warrants such action. For jobs interrupted by process upsets, area sirens, or plant evacuation, a NEW Permit must be issued.

#### Distribution of Permit

The Ignition Source Permit is printed on a two-part form. When filled out and issued, the paper original is posted in the Operations Control Room. The cardboard copy (field copy) is posted in a conspicuous place on the job site.

The Control Room copy will be used by Operations as one means of keeping informed about field activity and will serve as a checkpoint if it becomes necessary to terminate Permits due to process upsets.

The Field copy is to be returned to the Maintenance Foreman/Field Engineer at the completion of the job. The Maintenance Foreman/Field Engineer shall sign the "Job Completed" blank and return the Permit to the Operations Foreman who attaches the Control Room copy and forwards both to the Safety Office. Expired Permits which are replaced by renewed Permits during the course of the job shall be destroyed.

## General Rules

1. On-site visual and odor checks should be made to insure that the work area is free of flammable vapors and liquids. A combustible gas test should be made when the visual or odor checks reveal the possible presence of flammables. On those occasions when a combustible gas test is required, it is expected that a meter reading of 0% LEL will be obtained in order for the Permit to be issued. On a special exception basis, readings between 0% and 9.9% LEL will be permitted after consultation with a higher ranking Operations Supervisor. In no case will the Permit be issued when combustible gas tests of 10% LEL or greater are obtained.
2. Operating personnel shall make use of the Control Room copy of the Ignition Source Permits to keep informed of such work in progress in their area. All vessels, piping, and other operational equipment that has to be opened, vented, etc., should be done only after proper communication with the personnel working under the Ignition Source Permit. Supervisory personnel have the prerogative to call for a Permit authorization in specific cases of unusual or upset process conditions.
3. The Permit shall be issued for one job and not to each person on the job unless the foreman decides that a specific part of the job requires a separate Permit. The Permit shall be displayed in an appropriate place on the job.
4. On weekends and during the night shifts, the Shift Supervisor or Shift Foreman should issue any Permits that are required.

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REVERSE SIDE of Field Copy of Ignition Source Permit

This permit is to be revalidated in the space below before resuming work following a lunch break or shift change.

Operating conditions are stable and the job covered by this permit may resume.

\_\_\_\_\_/\_\_\_\_\_  
Operations Foreman Time

\_\_\_\_\_/\_\_\_\_\_  
Operations Foreman Time

Note: ONLY the field copy will have this printed on the reverse side.

*this note is not to  
be included on  
the form....*

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#### IV. EQUIPMENT IN THE CENTRAL OHC STEAM STRIPPER AREA

##### A. PROCESS ID NO. AND SAC NO. INDEX

| <u>EQUIPMENT</u>              | <u>PROCESS ID NO.</u> | <u>SAC NO.</u> |       |
|-------------------------------|-----------------------|----------------|-------|
| Organic Transfer Pump         | P-1                   | 57D-55-2967    | pump  |
|                               |                       | 57D-50-5113    | motor |
|                               | P-2                   | 57D-55-2966    | pump  |
|                               |                       | 57D-50-5114    | motor |
| Steam Stripper Feed Pumps     | P-3                   | 57D-55-2968    | pump  |
|                               |                       | 57D-50-5115    | motor |
|                               | P-4                   | 57D-55-2969    | pump  |
|                               |                       | 57D-50-5116    | motor |
| Sump Pump                     | P-5                   | 57D-55-2970    | pump  |
|                               |                       | 57D-50-5117    | motor |
| Sodium Formate Transfer Pumps | P-6                   | 57D-55-2971    | pump  |
|                               |                       | 57D-50-5118    | motor |
|                               | P-7                   | 57D-55-2972    | pump  |
|                               |                       | 57D-50-5119    | motor |
| Steam Stripper Feed Tanks     | T-1                   | 57D-60-1902    |       |
|                               | T-2                   | 57D-60-1905    |       |
| #1 Air-Cooled Condenser       | E-1                   | 57D-71-2121    |       |
| #2 Air-Cooled Condenser       | E-2                   | 57D-71-2122    |       |
| #1 Steam Stripper Economizers | E-3                   | 57D-71-2123    |       |
|                               | E-4                   | 57D-71-2124    |       |
| #2 Steam Stripper Economizers | E-5                   | 57D-71-2125    |       |
|                               | E-6                   | 57D-71-2126    |       |
| #1 Steam Stripper Column      | C-1                   | 57D-67-172     |       |
| #2 Steam Stripper Column      | C-2                   | 57D-67-173     |       |

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## B. EQUIPMENT DESCRIPTIONS

### 1) STEAM STRIPPER FEED PUMPS; P-3, P-4 (SAC #57D-55-2968, 2969)

The steam stripper feed pumps are Durco Mk II standard centrifugal, horizontal-mount, model 10/94 pumps designed for 200 GPM at 87 ft. discharge head. The pump body is Durcomet 100; ASTM codes A744 and A351, Durco code CD-4M (chrome steel). Impeller diameter is 10 inches; pump seals are Chempro 670.

Inlet size is 4 inches; outlet size is 3 inches. A Chempro 670 seal is used in the stuffing box. The pump is self-priming. Available NPSH is 6 ft. Specific gravity of liquid transferred is 1.16.

Pump motors are Westinghouse 15-hp motors operating at 1750 RPM; model TBFC, style 680 B655 G43 horizontal-mount. Motors are TEFC, MAC rated as explosion proof. Service is 460 Volts, 3-phase, 60 Hz drawing 19.5 Amps, nominal. Operating temperature range is 40 - 65°C ambient. Motor SAC #57D-50-5115, 5116.

### 2) STEAM STRIPPER FEED TANKS; T-1, T-2 (SAC #57D-60-1902, 1905)

Steam stripper feed tanks are 12 ft  $\varnothing$  x 20 ft (tangential) upright cylindrical unlined carbon steel tanks. The manufacturer of both tanks was Allied Fabricating and Welding Company, Inc. Both tanks meet API 620 and PPG Spec. P-759-T2, 1. Each tank is designed for 10 psig @ 110°F and code-stamped for maximum working pressure as permitted by API 620 code. All tank welds are continuous and sealed. Tanks have cone-type roofs and flat bottoms

Each foot of tank height contains approximately 846 gallons (113.1 ft<sup>3</sup>)

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of liquid.

Overpressure is relieved by a 3-inch Furan line to the incinerator vent header, line #PL260-15-5001; SK-9451. Dual, switchable 4-inch graphite (Cal-Vac) rupture disks with burst pressure of 10 psig are also in place on each tank.

Vacuum is relieved by a manually-actuated N<sub>2</sub>-makeup system when a low tank-pressure alarm sounds. A 3-inch reverse buckling graphite (Cal-Vac) rupture disk with a 2 oz. burst pressure also protects each tank from vacuum.

Normal aqueous phase analysis should be: 80% H<sub>2</sub>O, 14% NaCl, 1% NaOH, 1% NaOCo<sub>4</sub>. Liquid specific gravity is 1.10. The overhead condensate inlet nozzles on the tank roof have dip tubes extending to four feet from tank bottom.

Tank T-1 has an empty weight of 12,040 lbs., a full weight of 153,240 lbs., and the capacity is 16,000 gals.

Tank T-2 has an empty weight of 13,296 lbs., a full weight of 154,496 lbs., and the capacity is 16,000 gals.

3) STEAM STRIPPER ECONOMIZERS; E-3, E-4 and E-5, E-6 (SAC #57D-71-2123, 2124, 2125, 2126)

Two identical Con-Rad Industries, Inc. horizontal shell-and-tube exchangers are used on each steam stripper. Shells are carbon steel (SA-106B) of thickness 0.375 in. (nominal) with a 1/8 inch corrosion allowance.

Shell length is 20 ft. 1/16 inches and shell diameter is 2 ft. Working

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pressur is 200 psi @ 500°F (max.).

Fixed tubesheets are carbon steel (SA-516-70) of diameter 25 1/4 inches, with nominal thickness 1 7/8 inches, and a 1/4 inch total corrosion allowance. Tubesheets are bolted in place. Floating tubesheets are 23 inches in diameter, of carbon steel (SA-516-70), and 1 7/8 inches thick with total corrosion allowance of 1/4 inch. They are bolted in place.

Tubes are carbon steel (SA-214), 5/8 inch OD, with 0.075 inch thickness for tube walls. There are 619 straight, 20 ft.-long tubes giving 2004 sq. ft. of tube surface area.

On the heat exchanger channel side, the concave head is 3/8 -inch thick carbon steel (SA-516-70) with 1/8 inch corrosion allowance, and is installed concave side to pressure. Elliptical ratio of head is 2:1.

Flat head is 3-inch thick carbon steel (SA-105-N), with Hub-type flanges and 1/8 inch corrosion allowance.

Shell-side heads are carbon steel (SA-105); hub-type flange head is 3" thick while ring-type flange head is 3/8" thick. Corrosion allowance is 1/8" for both heads.

All exchangers meet ASME VIII and TEMA-R code requirements.

Pre-heated feed service is 80,770 lb/m (min) to 110,640 lb/hr (max)

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for both shell-and tub -sides. Feed temperatur incr ases from 150°F to 190°F tube-side as stripper bottoms on shell side are cooled from 212°F to 172°F. Normal heat load is 2.88 M Btu/hr, with max. rated load at 3.95 M Btu/hr. Bundle weight is 6900 lbs. Exchanger weight empty is 11,200 lbs. Wet weight is 15,427 lbs.

One pass is made for both shell and tube side flows.

4) SODIUM FORMATE TRANSFER PUMPS; P-6, P-7 (SAC #57D-55-2971; 2972)

These pumps are Durco Mk V centrifugal, horizontal-mount pump model 10/94. Pump casing is Durcomet 100 (chrome steel, code CD-4M). Pumps are rated for 200 GPM with discharge head of 87 ft. Available NPSH is 1 ft. BHP is 8.14 (12.88 max.).

Inlet size if 4 inches; outlet size is 3 inches. Impeller diameter is 9.5 inches. Pump seals used are Chempro 670.

Pump motors are Westinghouse horizontal, TEFC-MAC, 15-hp, 1755 RPM-rated model TBFC, Style 680 B655G43 on Model 245-T frames. Service is 460 volts, 3-phase, 60-Hz drawing 19.5 amps (nominal).

Temperature rating is for specific gravity 1.16 @ 40°C ambient. Motors are SAC #57D-50-5118, 5119.

5) SUMP PUMP; P-5 (SAC #57D-55-2970)

The sump pump is a Gould model 3796 "ST" centrifugal, horizontal-mount pump with 7.62 inch diameter impeller. Rating is 50 GPM with discharge head of 20 ft. Available NPSH is 6 ft. Service is for water, specific gravity 1.00. Inlet size is 1.5 inches; outlet

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siz is 1.5 inches. Pump casing is cast ductile iron, as is the impeller.

The pump motor is a Westinghouse model TBFC, style 680 B655 G68 horizontal-mount motor with TEFC, MAC enclosure. Rating is 1 hp @ 1180 RPM. Frame is model 145-T.

Motor service is 460 Volt, 3-phase, 60 Hz, drawing 2 amps nominally. Motor SAC #57D-50-5117.

6) ORGANIC TRANSFER PUMPS; P-1, P-2 (SAC #57D-55-2966, 2967)

These pumps are Gould model 3196 "MT" centrifugal, horizontal-mount pumps with cast ductile iron casings. Impeller diameter is 8 inches. Rating is 50 GPM at discharge head of 70 ft. Inlet diameter is 2 inches; outlet diameter is 1 inch. Service rating is for specific gravity 1.36. Available NPSH is 9 ft.

Pump motors are Westinghouse model TBFC, style 680 B655 G25 with TEFC, MAC explosion-proof enclosures rated at 5 hp @ 1750 RPM. Temperature rating is 40 - 65°C ambient. Service is 460 Volt, 3-phase, 60 Hz, drawing 7.2 amps nominal. (SAC #57D-50-5113, 5114).

7) AIR-COOLED CONDENSERS; E-1, E-2 (SAC #57D-71-2121, 2122)

The condenser/coolers were fabricated by Hudson Products Corporation. Their overall dimensions are 8 ft 7/8 in (H) x 2 ft 11 in (W) x 5 ft 9 1/4 in (L). Section sizes are 3 ft x 5 ft x 4 rows. Two passes per section are used with 1442 sq. ft. external surface area and 68 sq. ft. bare tube area per section.

Th shell material is 3/4 in thick carbon steel (SA-516-70) with a

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1/8 inch corrosion allowance. H ads are flat, 3 3/4 inches x 7 5/8 inches of carbon steel (SA-516-70). Shell weight is 1025 lbs. Working pressure is 75 psig @ 300°F (max). Rated heat transfer is 416,300 Btu/hour normally (570,800 Btu/hr max.).

The plug-type header is carbozinc #11. Tubesheets are carbon steel (SA-516-70), 3/4 inch thick, welded, with a 1/8 inch corrosion allowance.

There are 52 straight, 5 ft. long carbon steel (SA-214) tubes of 1 inch OD, 0.085 inch nominal thickness per section placed at a 2.5 inch triangular pitch. Tubes are arranged in straight banks. External transfer rate is 6.55 Btu/hr sq ft°F. Bare tube surface transfer rate is 138.9 Btu/hr sq ft°F in service; 167.1 Btu/hr sq ft°F when clean. Tube-side pressure drop is 0.2 psi. Tube-side flow is 1810 lb/hr (max), 1320 lb/hr (normally).

Two inlets, 3-inch 150 psi RFWN (SA-105) sch 160 welded on are provided. Two outlets, 3-inch 150 psi pipe (SA-106B) sch 160 welded on are also provided.

Normal service is 20% H<sub>2</sub>O, 37% CHCl<sub>3</sub>, 43% EDC at 210°F inlet temperature, 180°F outlet temperature.

Cooling is by forced draft, using ambient air (@ 100°F) [directed over tubes by] a 32-inch diameter, 3-bladed, fixed-pitch propeller driven by a 1.5 hp, 1160 RPM TEFC, MAC Westinghouse electric motor.

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Motor service is 460 Volts, 3-phase, 60 Hz. As the air is heated to 163°F, the vaporized feed is completely condensed. Air to the fan is 8863 ACFM. The air side rate is 8387 SCFM with a 610 SFM face velocity.

8) STEAM STRIPPERS; C-1, C-2 (SAC #57D-67-172, 173)

The steam strippers have 0.375 in. thick carbon steel (SA-285-C) shells of dimensions 20 ft. 9 inches tall by 3 ft. diameter. The fabricators are Allied Fabricating and Welding Company, Inc. Empty column weight is 5413 lbs. Support skirts are welded on the bottom of the column. The shell has one (1) 18-inch manhole.

Column heads, both top and bottom, have concave sides to pressure, are 0.375 inch thick carbon steel (SA-285-C) with 0.125 inch corrosion allowance and have 2.5 inch knuckle radii.

Two switchable #3 size SRV's are located on top of the shell rated for burst pressure of 20 psig.

Nozzles on the column are all welded onto the shell; none are reinforced.

| <u>Nozzle Service</u> | <u>No.</u> | <u>Type</u> | <u>Size (in)</u> | <u>Material</u> | <u>Thickness (in)</u> |
|-----------------------|------------|-------------|------------------|-----------------|-----------------------|
| Vapor out             | 1          | Flanged     | 4                | SA-53B          | 0.337                 |
| Steam in              | 1          | "           | 4                | "               | 0.337                 |
| Liquid in             | 1          | "           | 3                | "               | 0.300                 |
| Level controller      | 2          | "           | 3                | "               | 0.300                 |
| P.I.                  | 1          | "           | 1                | "               | 0.25                  |
| Sight glass           | 2          | "           | 1                | "               | 0.25                  |
| T.E.                  | 1          | "           | 1                | "               | 0.25                  |
| PHS                   | 1          | "           | 1                | "               | 0.25                  |

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Column internals include a liquid distributor at the top, packing support trays, tie downs, and 15 ft. of 2-inch Kynar Tellerettes as packing.

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## V. DETAILED PROCESS DESCRIPTION:

### A. STEAM STRIPPER FEED SYSTEM

#### 1. SOURCES OF STEAM STRIPPER FEED

The aqueous effluent streams from OHC-I, OHC-II and OHC-III (Vinyl) are pH-adjusted within these units by utilizing their own mix tanks and cell liquor addition lines. The steam strippers in the OHC-I and OHC-II areas are to be maintained (mothballed) in operational condition, normally being bypassed by the feed system to the Central OHC Steam Strippers. Steam Stripper feed consists of: (1). reactor phase separator overflow, (2). DH still reflux drum overflows, (3). chloral treatment overflows, (4). Bicarb surge tank purges. No provision for pH adjustment (by cell liquor addition) is made at the central steam stripper feed tanks. A 6" header (1000M-PL4) routes the combined aqueous effluent streams to the two 12 ft.  $\phi$  x 20 ft. (16,000 gal.) upright carbon steel feed tanks, T-1 and T-2.

Headers containing pH-adjusted aqueous effluent from the source units have sample points and are monitored for pH, as is the 6" combined effluent header (1000M-PL4). The 6" tank feed inlet line (1000M PL4) has a pH alarm (alarms to the OHC-I control room) with alarm points set at pH 9.0 for "low pH" alarm and at pH 13.0 for "high pH" alarm. It is necessary to maintain a pH 10 level within the tank

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to prevent the deterioration of the carbon steel process equipment and lines in the unit downstream of the feed tanks. PH control is essential also for the proper operation of the steam strippers since at lower pH problems with corrosion of the carbon steel process equipment may develop.

Monitoring of pH upstream of economizers is also provided by analyzers and alarm on stripper feed with alarm points of pH 7.0 and pH 13.0 for low and high pH alarms, respectively.

2. FEED TANKS/PHASE SEPARATORS:

Each feed tank contains 4 phases: (1). aqueous phase, (2). indeterminate phase, (3). organic phase, (4). sludge phase - as mentioned earlier.

Level indication is provided for the aqueous and organic phases by both level indicating transmitters which indicate a % span of instrument in the OHC-1 control room, and a level gauge/sight glass on the tank.

Since the level transmitters are at different positions on the tank to correspond to phase location (and overlap in a sense), it is possible to monitor the position of the indeterminate phase between the aqueous and organic phases in the tank. This is desirable because it facilitates easy removal of this interface by vacuum truck. Both low and high phase level alarms are provided for the aqueous phase, while a high level alarm only is provided for the organic phase. These alarms in the OHC-1 control room are termed total feed tank level and feed tank interface level, with low and high level alarm set-points of 20% span and 80% span for each alarm, respectively.

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The organic phase is pumped down once per shift (once in 8 hours) to the intermediate crude storage tanks (T-10, T-29) located at OHC-I.

One empty feed tank provides a surge capacity of 16,000 gallons or nearly a 2 hour span at normal feed rates of 137 GPM. Note, however, that feed tanks in service are never completely empty.

Tank pressure is monitored and high and low pressure alarms provided alarming to the OHC-I control room. High pressure is relieved by one of two switchable 4-inch, 10<sup>#</sup>-rated graphite rupture disks. Should one rupture disk relieve, the other may be placed in service while repairs are made on the primary one. No indication is provided in the control room to notify personnel that a rupture disk has relieved, so a visual check is necessary when a high pressure alarm sounds. Low tank pressure is alleviated by addition of makeup N<sub>2</sub> via a manually-actuated 3-way, fullport, ball valve when a low pressure alarm sounds. In addition, a 3-inch (CAL-VAC) reverse buckling graphite rupture disk with a 2-oz. burst pressure protects each tank from vacuum.

Tank vents to the incinerator vent header are regulated by an automatic PCV and a differential pressure transmitter which act to control back pressure on the vent. An emergency bypass with plug valve is provided at the PCV station.

The feed tanks may be placed in various feed tank/stripper arrangements as described below. The procedures necessary to align the system are

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described in Section VI of this manual. The various arrangements possible are: (1). feed tank T-1, stripper #1, (2). feed tank T-2, stripper #2, (3). feed tank 1, stripper #2, (4). feed tank #2, stripper #1. It is possible to select any of these arrangements under computer control, or any combination of any 2 arrangements, except the one which would place the two strippers in operation at the same time in a "CROSSED" configuration (a combination of (3.) and (4.)). It is intended that one stripper and feed tank pair only be used at one time, with the other pair normally held in reserve.

#### B. STEAM STRIPPER ECONOMIZERS

The aqueous phase fed from the feed tank to the steam strippers normally first passes via pumps (P-3, P-4) through two shell-and-tube heat exchangers in series in which it is preheated from approximately 150°F to approximately 190°F using steam stripper bottoms at approximately 210°F. The aqueous phase feed on the tube-side of the economizer is flow-controlled to maintain a constant aqueous phase level in the feed tank. Normal heat duty is 2.9M BTU/hour for two exchangers in series. This flow to the economizers is analyzed for pH and has pressure indication gauges at pump discharges. Either pump may be used to feed either column from either feed tank through various valving arrangements of the economizers. See mechanical flowsheet #2 of 2, DWG 57D-10004, for details.

Stripper bottoms used to preheat the stripper feed are cooled from approximately 210°F to 172°F and are either sent back the feed tanks or to the formate destruction unit depending on their total chlorinated organics content.

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Both pressure and temperature gauges are provided on the tube-side of all four economizers (two pairs E-3 and E-4, and E-5 and E-6) to allow their performance to be evaluated.

While one economizer can handle the normal heat load at reduced rates, using both in series reduces the load on each and so reduces maintenance requirements. Either economizer may be isolated while the other remains in service should maintenance be necessary. Economizers have carbon steel shells, heads, and tube bundles. Each exchanger contains 619 straight 5/8 inch OD tubes which provide 2004 sq. ft. of heat transfer area on the removable tube bundle. The economizer shells contain horizontal baffles which serve to maintain turbulent flow for better heat-transfer.

Adequate steam is available to operate one stripper without economizers at normal feed rates, but the economizers must be in service if both strippers are used or if maximum feed rates are used on one stripper.

#### C. STEAM STRIPPERS

The two steam strippers are identical 20' tall x 2' diameter, carbon steel columns. Aqueous phase feed to the column is introduced at the top of the column under flow-control. Feed temperature and flowrate are monitored at the column. The strippers contain 2" Kynar Tellerette packing to a depth of 15' ft. through which the aqueous feed flows down the column as it is contacted by upward-moving steam which vaporizes the organics and carries them overhead. At normal operating temperatures of 208° - 210° overhead temperature, all organics are removed when 3% by volume of stripper feed is vaporized overhead. A liquid distributor at the top of the stripper,

packing supports and hold-downs, and the packing itself are the only column internals. Fifteen (15) feet of 2-in. Kynar Tellerettes are used. Live 50 lb. steam is injected directly into the column under flow-control; no sparger is used for steam distribution. The direct injection of steam allows the omission of steam traps at the stripper, thereby reducing maintenance since steam condensate simply drains into the column. While the steam flowrate is normally flow-controlled under computer control (via a calculated heat balance based on feed rate), a manual override with pressure indication is also provided. This option is used if computer control fails. An alarm indicates a  $\pm 20\%$  deviation in steam feed rate.

Both overhead and bottoms temperatures are monitored in the steam strippers on the CRT control screen. Both high and low temperature alarms are provided on each of these; for bottoms, 230°F and 205°F respectively; for overheads, 220°F and 200°F respectively are the alarm setpoints.

Column pressure is also monitored by a high pressure alarm provided with an alarm point of 15 psig. Should over-pressure occur, the column is protected by two (switchable) 3-inch, 20-lb.-rated graphite rupture disks. Each rupture disk serves to spare the other, although no indication is given that one has relieved and they must be manually switched after it is observed that one has failed.

Stripper pot level is monitored by both a sight glass on the column and through level transmitter output in the control room. Both high and low bottoms level alarms are provided with setpoints of 80% and 20% span of instruments respectively. Level is controlled in the pot by a level control valve (LCV) in the bottoms flow stream

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through the action of the sodium formate transfer pumps. The sodium formate transfer pumps (P-6, P-7) route stripper bottoms through the feed economizers to preheat feed, then on to the sodium formate destruction unit. Pump discharge pressure indication is provided on these pumps.

Stripper overheads are condensed in an air-cooled condenser before being routed back to the feed tanks where organics will phase out to the lower portion of the tank.

#### D. AIR-COOLED CONDENSERS

Air cooled condensers (E-1, E-2) with 1442 sq ft. of external surface area and 68 sq. ft. of bare tube surface area are used to condense the vaporized organics, cooling them from 210°F to 180°F. The condensate is then re-introduced to the feed tanks (T-1, T-2). Temperature indication is provided on the vapor inlet and condensate piping of the condenser. An electric fan motor drives a 32-inch, 3-bladed fan to force ambient air over two sections, each containing 52 straight, 5 ft. long, 1-inch OD carbon steel tubes. Sample points are provided on the tube-side of the condensers.

Normal heat transfer is 416,300 BTU/hour with a tube-side heat transfer coefficient of 138.9 BTU/hr·sq. ft °F (in service).

#### E. PROCESS SUMP

The central OHC steam stripper area process sump collects all pad run-off, seal leaks, rupture disk blowouts, spills, etc. and routes them back into the stripper feed tanks via a level-controlled pump (P-5). The process sump level is not alarmed, so

operators must monitor its operation to insure that the pump operates properly.

F. RUPTURE DISC SCHEDULE

| <u>VESSEL</u> | <u>TYPE</u> | <u>NO.</u> | <u>SIZE</u>                 | <u>RATING</u> |
|---------------|-------------|------------|-----------------------------|---------------|
| Tank T-1      | CAL-VAC     | 2          | 4"                          | 10#           |
| Tank T-2      | CAL-VAC     | 2          | 4"                          | 10#           |
| Stripper C-1  | CAL-VAC     | 2          | 3"                          | 20#           |
| Stripper C-2  | CAL-VAC     | 2          | 3"                          | 20"           |
| Tank T-1      | CAL-VAC     | 1          | 3" 2 oz. (reverse buckling) |               |
| Tank T-2      | CAL-VAC     | 1          | 3" 2oz. (reverse buckling)  |               |

CAL-VAC RUPTURE DISCS:

The CAL-VAC rupture discs used in the Central OHC Steam Stripper area are a new vessel protection system produced by Continental Disc Corporation. They are fail-safe, non-mechanical devices which provide both vacuum and positive pressure relief at pre-determined settings.

In this area they are used with 3" KTM Fig #E03162-31T 150-lb full port ball valves and insert-type housings. See Appendix G for further information on CAL-VAC rupture discs.

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## VI. CENTRAL OHC STEAM STRIPPER OPERATION

### A. UTILITIES

The Central OHC Steam Stripper area is supplied with well water, steam, instrument air, and nitrogen. See Figure 6.1 for a list of lines in utility service in this area.

1. Well Water - Water is supplied via a 1.5 inch supply header in the OHC area. Well water use is limited to safety showers and utility stations in the area.
2. Steam - Fifty pound (50 lb.) steam is supplied to the area by an eight inch (8") insulated line from the desuperheater which serves the Waste Treatment unit. Live 50 lb. steam is injected directly into the bottom of the steam stripper under flow control via a four inch line. Additional steam for steam tracing is provided by a one inch line branching from the 8" header. Both flow and pressure are monitored on all steam lines.
3. Instrument Air - Instrument air is supplied to the Central OHC Steam Stripper area by a 1.5 inch OHC area header. Inside the area, a one inch line supplies instruments and utility stations.
4. Nitrogen - Nitrogen is supplied via a 1.5 inch OHC area header. Inside the area a 3/4 in. line supplies Nitrogen (N<sub>2</sub>) to utility stations and a 1/2 in. line supplies N<sub>2</sub> to pad f ed tanks for vacuum relief.

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FIGURE 6.1: CENTRAL OHC STEAM STRIPPER AREA UTILITIES

| UTILITY        | HEADER               | AREA LINE NO.  | SERVICE            |
|----------------|----------------------|----------------|--------------------|
| Well Water     | 1.5"-P723-3159-PL9   | 1"-3002-PL9    | Utility Station    |
|                |                      | 1"-3008-PL9    | "                  |
|                |                      | 1"-3009-PL9    | "                  |
|                |                      | 1.5"-3001-PL9  | Safety Shower      |
|                |                      | 1.5"-3003-PL9  | "                  |
|                |                      | 1.5"-3004-PL9  | "                  |
|                |                      | 1.5"-3005-PL9  | "                  |
|                |                      | 1.5"-3006-PL9  | "                  |
|                |                      | 1.5"-3007-PL9  | "                  |
| Steam          | 8"-PL14-31-312       | 8"-6001M-PL14  | Area Header        |
|                |                      | 4"-6002-PL14   | #1 Steam Stripper  |
|                |                      | 4"-6003-PL14   | #2 Steam Stripper  |
|                |                      | 1"-6006-PL14   | Steam Tracing      |
| Instrument Air | 1.5"-P723-3162-PL139 | 1"-4001-PL139  | Utility Station    |
|                |                      | 1"-4002-PL139  | "                  |
|                |                      | 1"-4003-PL139  | "                  |
|                |                      | 1"-4004-PL139  | "                  |
|                |                      | 1"-4005-PL139  | Instrument Air     |
| Nitrogen       | 1.5"-P723-3105-PL79  | 3/4"-5001-PL79 | N2 Service Station |
|                |                      | 3/4"-5004-PL79 | "                  |
|                |                      | 1/2"-5002-PL79 | #1 Tank Padding    |
|                |                      | 1/2"-5003-PL79 | #2 Tank Padding    |

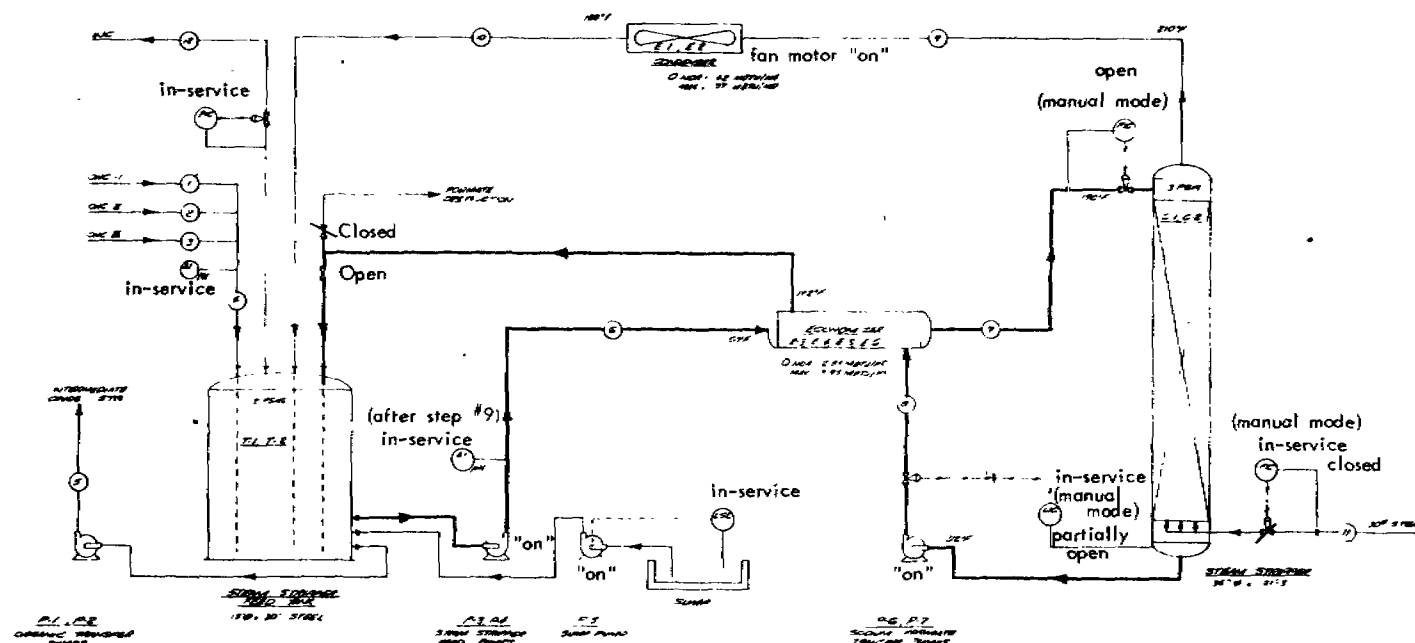
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| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |

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REF DATES

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| DD-MMM-YY | MM-YY | MM-YY | MM-YY |
| DD-MMM-YY | MM-YY | MM-YY | MM-YY |

**PPG INDUSTRIES**  
**INDUSTRIAL CHEMICAL DIVISION**  
CARE CHAMBER, INDIANAPOLIS

**CENTRAL OIL STEAM STRIPPER FLOWSHEET**

**PROCESS FLOWSHEET**

DESIGNED BY: *David* DATE: 5-17-79 SCALE: *AS SHOWN*  
CHECKED BY: *J. HULLIN* DATE: 10-79 DWG NO: *7-752*  
APPROVED BY: *W.P.* DATE: 11-79

DWG: 572-00002-0

## B. START-UP PROCEDURE

The Central OHC Steam Strippers are started-up in the manual control mode in a cold recirculation configuration. Only one steam stripper is normally operated (or started up) at any one time and only one feed tank is normally used (full). Start-up is done with a partially-full feed tank into which effluent streams from OHC-I, OHC-II, and OHC-III areas flow. In the manual control mode, a constant level is maintained in the feed tanks by varying feed flowrate to the stripper under temperature control and by varying steam flowrates to the column. For reference in start-up and other situations, a complete area line list is provided in Appendix F.

A general procedure is outlined for normal start-ups and an area-by-area checklist is provided for use with the stepwise procedure. See Figure 6.2 for the recirculation configuration.

### START-UP PROCEDURE

1. The checklist should be followed to insure that all valves in the pipeline system are properly aligned to establish the recirculation configuration desired for start-up. Start-up is done in the manual control mode.
2. Once the system is aligned for recirculation, the condenser fan motor should be started.
3. Proper levels of liquid for start-up should be present in the feed tank and a proper pH 10 observed for contents. If necessary, effluent from OHC-I, II, and III may be fed directly into the feed tank during start-up if the pH analyzers on this tank feed are placed in service.

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4. All utilities should be available and in service to control valves, transmitters, etc.
5. All indicating transmitters for pressure, temperature, level, etc. should be operating properly and proper valves for all monitored variables should be recorded on the CRT display.
6. Feed flow of aqueous phase to the stripper should be started slowly with FCV in manual control mode to build up bottoms level in the column.
7. LCV on stripper bottoms is now partially opened. When bottoms reach operating levels in the column, the LCV on stripper bottoms should be manually adjusted after flow through the pumps is established.
8. The system should now be aligned and liquid flow established in the recirculation configuration under manual control. See Figure 6.2.

At this time, leak checks should be carried out on all lines and vessels.

9. The pH analyzers on stripper feed pumps should now be placed in service.
10. Stripper pressure and temperature are monitored on the CRT display and should be closely watched as steam is introduced slowly to the stripper under manual control (FCV on steam in manual mode) until the steam line reaches equilibrium temperature.

The system will tend to pressurize until all inerts are vented, and

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hammer will occur if this step is not don slowly.

When normal overhead temperature (210°F) is achieved, the stripper is ready to be placed in the computer control mode.

11. The steam stripper should now be operating in the recirculation configuration under manual control, with overheads and bottoms returning to the feed tanks.

At this time, bottoms samples should be taken and analyzed for total organic content. If the stripper bottoms contain less than 20 ppm chlorinated organics, they may be routed to the formate destruction unit.

12. The steam stripper is now operating normally under manual control and may be switched to computer control (and brought to full rates under computer control).

Feed rate adjustments by the computer (about the base feed rate) to maintain tank levels will cause computer-aided adjustments of steam flowrate. This will alleviate the need for manual steam adjustments since the computer can perform a heat balance on the feed/steam requirements and make any necessary adjustment to steam rate as feed is adjusted.

\*Note: Any one manual loading station set to "M" for manual control for each stripper invalidates computer control over all process variables controlled, so switch all manual loading stations to "C" for computer control at the same time.

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### C. START-UP CHECKLIST

#### 1. Steam Header

- ☐ Block all downstream block valves on stripper. Close all header vent valves.
- ☐ Condensate purged into column is recirculated with feed through economizer, feed tank, and column. No steam traps at the column are used.
- ☐ The steam header should be allowed to come to equilibrium temperature slowly.
- ☐ Check that steam traps are operating properly (on the header).

#### 2. Feed Pumps

- ☐ Activate switch gear
- ☐ Close drain and sample valves
- ☐ Check oil level
- ☐ Open suction valve to one pump and check position of feed bypass block valve
- ☐ Crack discharge on same pump
- ☐ Push start button
- ☐ Check pump rotation and discharge pressure
- ☐ Open pH analyzer sample valve to place the analyzer in service on feed stream

#### 3. Feed FCV on Stripper

- ☐ Close bleed valve
- ☐ Close bypass valves
- ☐ Stroke valv

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\_\_\_\_\_ Open FCV block valv s, also one valve downstream at  
stripper should be partially open

\_\_\_\_\_ Leave FCV partially open, in normal control mode

4. Condenser

\_\_\_\_\_ Start fan motor

\_\_\_\_\_ Open block valves isolating the condenser

\_\_\_\_\_ Close bleed valves

\_\_\_\_\_ Check to see if vent PCV is in service

5. Economizers

\_\_\_\_\_ Close stripper feed and bottoms bypass valves

\_\_\_\_\_ Close sample valves and bleed valves

\_\_\_\_\_ Open process stream valves to place economizers in series

(E-3, E-4); (E-5, E-6)

\_\_\_\_\_ Check tube-side PI gauge valves & TI gauge to monitor  
operation of economizers

6. Stripper

\_\_\_\_\_ Close level transmitter (LT) drain valves. Open block valves.

\_\_\_\_\_ Close sight glass bleed valves

\_\_\_\_\_ Open block valves on sight glass

\_\_\_\_\_ Place LCV (on manual control) in a slightly open position

\_\_\_\_\_ The feed block valve on stripper should be opened now

\_\_\_\_\_ The overhead block valve on stripper is also opened now

7. Sodium Formate Transfer Pump (Stripper Bottoms Pumps)

\_\_\_\_\_ Activate switch gear

\_\_\_\_\_ Close drain and sampl valv s

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- ☐ Check oil level
- ☐ Close valve to Formate Destruction unit; open valve to feed tank
- ☐ Open suction valve on pump
- ☐ The discharge on pump should be closed; crack open now
- ☐ Push start button
- ☐ Check pump rotation and discharge pressure

8. Stripper Bottoms Level Control Valve (LCV)

- ☐ Close bypass and bleed valves on LCV
- ☐ Stroke valve
- ☐ Open LCV block valves
- ☐ Leave partially open on manual control

9. Phase Separator/Feed Tank

- ☐ A feed tank's feed line block valves may be open (or closed) during start-up
- ☐ Open valve to incinerator vent header
- ☐ Close valves to intermediate crude storage tanks
- ☐ Close sight glass clean out valves
- ☐ Open sight glass block valves
- ☐ Close condensate return block valve bypass and open block valves on return line to tank (2 valves) from condenser
- ☐ Bleed valves closed, block valves open on level and pressure transmitters on tank

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10. Process Sump Pump

- ☐ Activate switch gear

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- \_\_\_\_\_ Close drain and sample valves
- \_\_\_\_\_ Check oil level
- \_\_\_\_\_ Open suction valve on pump
- \_\_\_\_\_ Crack discharge valve on pump
- \_\_\_\_\_ Push start button
- \_\_\_\_\_ Check pump rotation and discharge pressure

11. Back Pressure Regulator Valve on Vent to Incinerator from Feed Tank

- \_\_\_\_\_ Close bypass valves
- \_\_\_\_\_ Open valve on tank vent to incinerator vent header
- \_\_\_\_\_ Check valve operation and flow to incinerator header
- \_\_\_\_\_ Differential pressure transmitter sample valves should be open

12. Nitrogen Make-Up System on Feed Tanks

- \_\_\_\_\_ Block valves on each tank should be closed unless N<sub>2</sub> is needed
- \_\_\_\_\_ N<sub>2</sub> line should be unblocked at the header
- \_\_\_\_\_ Check pressure regulator for proper operation

\*Note: N<sub>2</sub> need not be used during start-up unless a low tank pressure condition exists.

D. SHUT-DOWN PROCEDURE

Shut-down of the Central OHC Steam Stripper is essentially the reverse of the start-up procedure with the notable exception of changes in the recirculation configuration achieved on a stripper being removed from service.

Shut-down is normally carried out in the manual control mod .

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### SHUT-DOWN PROCEDURE

1. An appropriate decision concerning tank feed status should be made from the choices below:
  - a. If the stripper is to be removed from service due to lack of feed from the OHC-I, OHC-II, and OHC-III areas, the tank feed lines from these sources may be blocked off.
  - b. If the stripper is to be removed from service for maintenance (other than on the feed tank) and tank feed sources exist, then tank feed should be maintained on the feed tank currently in service (or switched to the other feed tank if desirable).
  - c. If maintenance work involves the feed tank currently in service, then tank feed should be switched to the other feed tank (not in service) to fill it in anticipation of switching over to it for either continued feed to the operating stripper or for start-up of the other stripper.

The sump pump discharge from the process sump should be switched to the appropriate feed tank now. The feed tank vents to the incinerator vent header should remain open during shut-down.

2. It is desirable to reduce the aqueous phase level in the feed tank to be removed from service, as in cases (a) and (c) above. This is done by removing tank feed and continuing normal stripper operation under manual control. Manual control is used since

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changes in aqueous phase feed level cause corresponding changes in stripper feed rate under computer-directed control. Normally this would serve to maintain a constant desired aqueous phase level in the tank, but in this case computer control would prevent the emptying of the feed tank by continuing to reduce feed rates as level falls.

3. The level of the aqueous/phase in the feed tank should be monitored as it is reduced. To reduce tank levels it is necessary to continue to route stripper bottoms to the formate destruction unit. This may be done as long as 3% by volume of stripper feed is vaporized overhead, as indicated by normal overhead temperatures (210°F) in the column. Stripper bottoms containing greater than 20 ppm organics should not be routed to the sodium formate destruction unit. An alarm will sound when the 20% span point on aqueous phase level is reached.

Overheads may still be routed to the same in-service feed tank during shut-down.

4. When the aqueous phase level is reduced to its minimum operating level (20% span) with the stripper on manual control, reduce steam flow and stop routing stripper bottoms to the formate destruction unit. For case (a), there will be no further accumulation of liquid in the feed tank when bottoms are routed back to it. For case (b), stripper bottoms are routed to the appropriate in-service feed tank. For case (c), stripper bottoms are routed to the other feed tank and help

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to fill it for operation.

5. Reducing steam rates to the column will depressurize the system and cause organics to no longer be vaporized overhead. Steam should be completely removed from the column and the steam line FCV closed in the manual mode and blocked off. A liquid recirculation configuration now exists between the stripper and the appropriate feed tank as in cases (a), (b), and (c).
6. The feed line pH analyzers may now be blocked off and removed from service.
7. Reducing feed rates to the stripper further, close block valve on feed pump discharge and remove the pump from service. Block off the feed pump.
8. Close the FCV in manual mode on the feed line to the stripper and block it off.
9. If desirable, drain the column by allowing the stripper bottoms to drain to the appropriate feed tank via the sodium formate transfer pump (stripper bottoms pump). Should stripper bottoms spill on the process pad, they will drain to the process sump and be pumped to the appropriate feed tank.
10. If desirable, reduce the out-of-service tank's total level by pumping phased-out organics to the intermediate crude storage tanks and vacuuming off the indeterminate phase.
11. All control valves should be closed in the manual mode and blocked off. All process vessels should be blocked off. All process pumps should be blocked off.

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Only the tank vent to the incin rator header should remain open on an "isolated" out-of-service tank.

E. SPECIAL PROCEDURES

1. Switching Feed Tanks while Stripper is Operating

- a. Switch to manual control mode.
- b. Reduce feed rate to the stripper from tank to be removed from service and switch tank feed to the tank to be placed in service.

This action allows time to fill the "new" tank to a safe start-up level while maintaining stripper feed from the "old" tank and lowering the aqueous phase level in the "old" tank. Rate reductions under manual control must be based on tank feed rates in order not to exhaust stripper feed before the "new" tank is ready.

Manual control over the stripper feed FCV is necessary to allow the reduction of aqueous phase level in the "old" tank. The falling level would normally, under computer control, cause a computer-directed cutback of stripper feed rate; thereby never allowing the aqueous phase level to be sufficiently lowered.

- c. Continue routing phased-out organics in the feed tank to the intermediate crude storage tanks to further reduce the tank level.

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- d. The sump pump discharge should be routed to the "new" feed tank to hasten its filling.
- e. Valves on both tanks to the incinerator vent header should be open.
- f. When a sufficient level is obtained in the "new" tank, switch the feed tanks by opening the suction line on the operating feed pump to the "new" tank via the bypass line (4"-1006-PL4) block valve.
- g. Close the suction line to the "old" tank and isolate the "old" tank.
- h. Overhead from the stripper should now be switched to the "new" (in-service) feed tank via a block valve on bypass line (3"-1017-PL4).
- i. Switch the tank outlet valves on line (2"-2001-PL140) to route phased-out organics from the in-service feed tank to the intermediate crude storage tanks.
- j. Remove the indeterminate and sludge phases from the now out-of service feed tank via auxiliary nozzles on the tank for vacuum truck service.

2. Switching Strippers while Operating

- a. Open block valve on line(s) (3 -1020, 1021-PL4) to establish a liquid recirculation loop for stripper bottoms back to feed tank on the stripper not in service. Be sure the line to formate destruction unit containing stripper bottoms is blocked off and stripper bottoms are not routed to formate destruction.

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- b. Plac the operating stripper (to be taken out of service) on manual control.
- c. Switch feed to stripper to be placed in service by using bypass valves at stripper feed pumps. This places the "new" stripper in a recirculation configuration.

Both strippers are now in the recirculation configuration.

- d. Follow normal start-up procedure from Step #8 for stripper to be placed in service.
- e. Follow normal shut-down procedure from Step #5 for stripper to be removed from service.

#### F. EMERGENCY SHUTDOWNS

##### 1. Loss of Electrical Power

##### a. Results of Power Loss

- ☐ Loss of computer control
- ☐ Loss of pressure, temperature, level transmitters and analyzers
- ☐ Loss of electric pump motors and condenser fan motors

##### b. Response of Power Loss

- ☐ Go to manual control
- ☐ Restart condenser fan motor
- ☐ Open block valve on line (3"-1020, 1021-PL4) routing stripper bottoms to feed tanks; close block valve on line to formate destruction unit. AVOID DEADHEAD-ING PUMPS !

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- \_\_\_\_\_ Restart pumps with stripper still in the recirculation configuration.
- \_\_\_\_\_ Switch to computer control once stripper temperature profile is normal, analyze stripper bottoms for total organics and if organic content is less than or equal to 20 ppm, route bottoms to formate destruction and close recirculation block valve.

c. Response to Long-Term Power Loss

- \_\_\_\_\_ Go to manual control. All control valves must be manually closed so they will not reopen if power should be unexpectedly restored.
- \_\_\_\_\_ Close FCV on steam. (It should FAIL CLOSE automatically.)
- \_\_\_\_\_ Close block valve on line (3"-1018-PL4) carrying bottoms to the formate destruction unit.
- \_\_\_\_\_ Remove all pumps from service and block them off.
- \_\_\_\_\_ Follow normal shut-down procedure from Step #5.

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2. Loss of Steam

a. Results of Steam Loss

Organics present in stripper bottoms as stripper fails --- could go to formate destruction.

b. Response to Steam Loss

- \_\_\_\_\_ Go to manual control mode
- \_\_\_\_\_ Establish r circulation of bottoms to feed tanks
- \_\_\_\_\_ Close block valve on line (3"-1018-PL4) carrying

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bottoms to the formate destruction unit.

- \_\_\_\_\_ If steam is recovered, restart the stripper for start-up Step #8. If steam is not recovered, shut down the stripper from shut-down Step #5.
- \_\_\_\_\_ Identify reason for steam loss, (if possible).

### 3. Instrument Air Loss

#### a. Results of Air Loss

- \_\_\_\_\_ Control valves on feeds (aqueous phase and steam) to stripper should FAIL CLOSED, but steam FCV should be manually closed. It should not reopen unexpectedly if instrument air is restored.

#### b. Response to Instrument Air Loss

- \_\_\_\_\_ Go to manual control. Close all valves under manual control.
- \_\_\_\_\_ Close block valve on line (3"-1018-PL4) carrying stripper bottoms to formate destruction unit.
- \_\_\_\_\_ Shut down pumps, close block valves on both feed and bottoms lines; but level control valve (LCV) on bottoms should remain open.
- \_\_\_\_\_ Open valves to establish recirculation of bottoms to feed tank.
- \_\_\_\_\_ If instrument air is restored, restart stripper from Step #8 of start-up procedure.
- \_\_\_\_\_ If instrument air is not restored, maintain stripper in the

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recirculation configuration until a decision to shut down  
(if necessary) or restart stripper is made.

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G. OPERATIONAL CHARTS, GRAPHS, TABLES:

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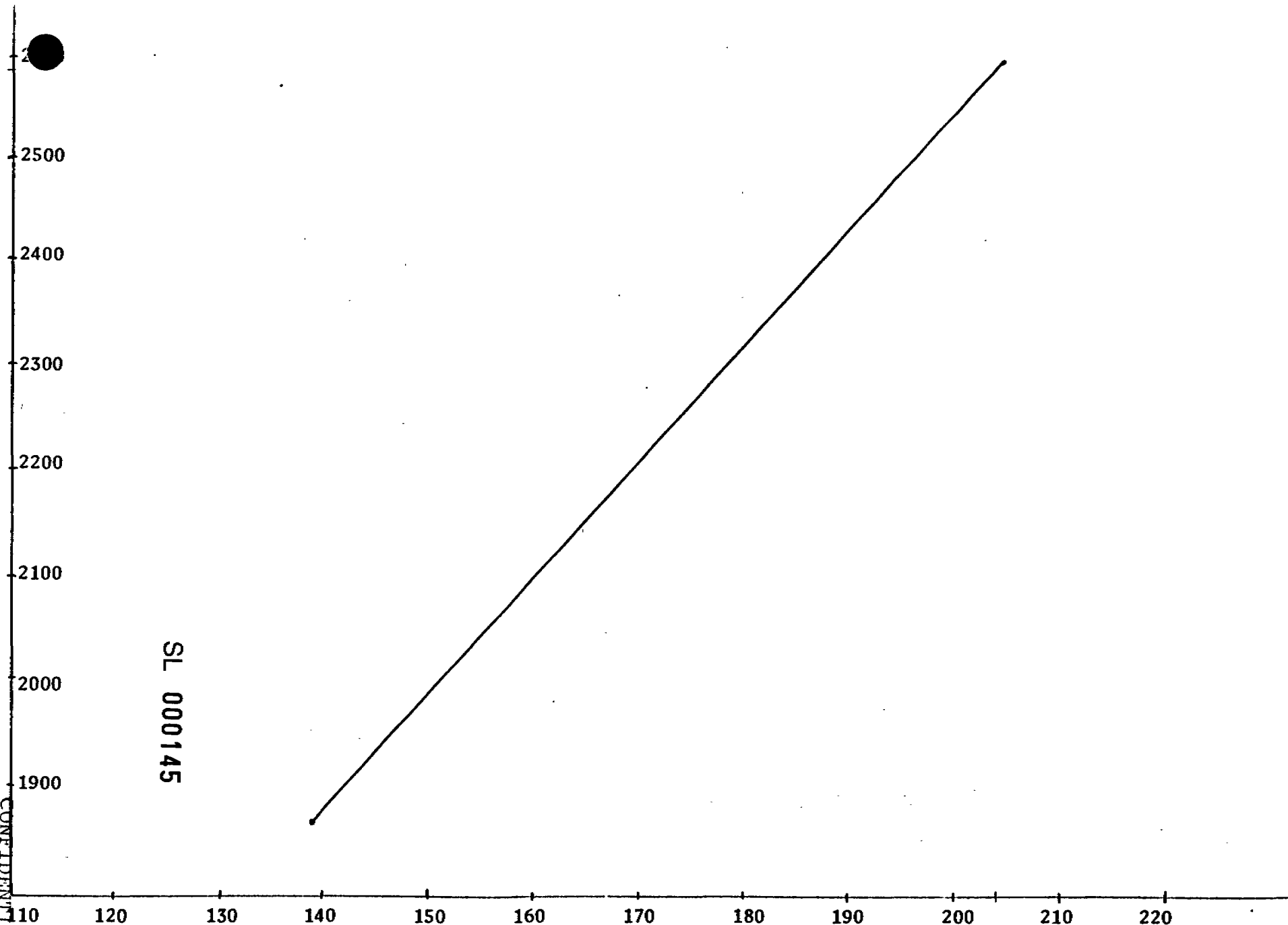
STEAM RATE (LB/HR)

2500  
2400  
2300  
2200  
2100  
2000  
1900

STRIPPER FEED RATE (GPM)

110 120 130 140 150 160 170 180 190 200 210 220

FIGURE 6:3 STEAM RATE (LB/HR) VS. STRIPPER FEED RATE (GPM)



## VII. PROCESS CONTROL AND INSTRUMENTATION

### A. General Discussion of Control

The Central OHC Steam Stripper area operates under control by a microcomputer through six (6) manual loading stations. The controlled variables are: (1) aqueous phase level in the feed tank - via stripper feed flowrate adjustment, (2) steam feed rate - by a heat balance performed by the computer, and (3) stripper bottoms level - by a level control valve.

#### 1. Steam Flow Control

The objective of the steam stripper is to remove soluble organics from the bottoms stream, but there is no continuous measure of the organics in the bottom stream; therefore, no "feedback" control scheme could be employed. No adjustment could be made in the steam flow based on a deviation from a desired organics content allowed in the bottoms stream. A "feedforward" control scheme is therefore employed instead. From operating experience it is known that if 3% by volume of the feed to the steam stripper is vaporized and driven overhead that nearly all of the organics in the feed will be driven overhead, leaving the bottoms stream with less than 20 ppm organics. This guideline was established at OHC-II. Adjustments to this guideline may be made after the Central OHC Steam Stripper is placed in service.

The microcomputer monitors the feed temperature and feed rate of aqueous phase feed going to the stripper. The heat requirement (BTU's required from associated steam flow) to bring the total feed stream to the boiling point and to vaporize 3% by volume of the feed stream is then calculated.

The microcomputer then adjusts the steam FCV to cause the actual steam

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flow to the stripper to match the required steam flow. A further adjustment is made to the steam flow based on variations of the stripper temperature from the desired stripper temperature. This variation is caused by heat loss from the surface of the steam stripper when the ambient temperature changes.

2. Feed Tank Level Control

The aqueous phase level is controlled in the feed tank with the objective that the tank not overflow or be emptied completely. The surge capacity of the feed tank is however utilized to its full advantage. To maintain the level within the feed tank at the desired point, the feed rate of aqueous phase to the steam stripper is adjusted. To avoid unnecessary adjustments in stripper feed rate, the level in the feed tank is allowed to drift near the 50% span point of the level transmitters used to monitor its position. The relationship of feed rate adjustment to level changes is proportional to the square of the deviation of the level from the 50% span point of the level transmitter. Therefore, any adjustments to feed rate caused by variations in phase level will be insignificant when the level is near the 50% span point, and very significant when the phase level is near the top or bottom of the feed tank (far from the 50% span point of the level transmitter).

3. Steam Stripper Level Control

The pot level of the steam stripper bottoms is controlled by adjustments to the level control valve in the bottoms stream.

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B. Implementation of Control

The Central OHC Steam Strippers operate under two (2) modes of control:

(1) computer control of valves to maintain process variables within desired values, and (2) manual control of valves. There are six (6) manual loading stations between the computer output and the input to the control valves. These are: (1) #1 Stripper Feed Flow, (2) #1 Steam Flow, (3) #1 Level, (4) #2 Stripper Feed Flow, (5) #2 Steam Flow and (6) #2 Level.

The manual loading stations have the following functions:

- 1.) To display process variables continuously
- 2.) Upon depression of the "OUT" switch, to display the control valve position
- 3.) As a two-position manual/computer control selector switch "C" and "M";
  - a.) with the selector switch set to manual ("M"), the operator will be controlling the valve position
  - b.) with the selector switch set to computer control ("C"), the computer will be controlling the valve position. In this mode the manual loading station receives a signal from the computer and converts it into a 4-20 ma signal to the valve. A green light on the front of the manual loading station will be illuminated while in the computer control ("C") mode.
- 4.) To indicate to the computer that the manual loading station is in computer control ("C") status via a switch.

In order to attain computer control on either stripper, all manual loading stations assigned to that stripper must be set to "computer" control ("C"). A single station set to "manual" control ("M") will prevent computer control on all variables for that stripper.

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If the #1 Feed Tank is feeding the #1 Stripper and the #2 Feed Tank is feeding the #2 Stripper, both steam strippers can be placed on computer control.

If the #1 Feed Tank is feeding to the #2 Stripper and the #2 Feed Tank is feeding to the #1 Stripper, only one (1) stripper can be placed under computer control.

An attempt to place both steam strippers under computer control in this "cross-fed" configuration will cause all controllers to go into a "hold" state with no computer control or manual control being accomplished. In addition, an alarm message "FEED CROSSED" will be printed. Under these conditions the operator must select the steam stripper that is to be placed under computer control and place the other stripper on manual control.

Should electrical power be lost to the control system or a "reset" of the computer be executed, all manual loading stations should be set to the manual ("M") control mode. After having accomplished this, the steam stripper(s) that should have computer control must have their manual loading stations set to computer control ("C") mode. Failure to follow this procedure causes all control action to go into a "hold" state with no computer control being accomplished even though the manual loading stations indicate "computer" control ("C") mode is operating.

C. Color Graphics Display (CRT)

A color graphic representation of the process flowsheet is provided to display information pertaining to the 17 variables associated with each steam stripper, and the one common variable on tank feed. A total of 35 variables in all are monitored. These variables are listed in the Appendix D and shown labeled in the proper positions as they appear "on screen" in Figure 7.1.

FIGURE 7.1

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|                            |  |  |                         |  |  |                          |  |  |  |
|----------------------------|--|--|-------------------------|--|--|--------------------------|--|--|--|
|                            |  |  |                         |  |  |                          |  |  |  |
|                            |  |  |                         |  |  |                          |  |  |  |
|                            |  |  |                         |  |  |                          |  |  |  |
|                            |  |  |                         |  |  |                          |  |  |  |
| TREND VARIABLE #1 (YELLOW) |  |  | TREND VARIABLE #2 (RED) |  |  | TREND VARIABLE #3 (BLUE) |  |  |  |
|                            |  |  |                         |  |  |                          |  |  |  |
|                            |  |  |                         |  |  |                          |  |  |  |
|                            |  |  |                         |  |  |                          |  |  |  |
|                            |  |  |                         |  |  |                          |  |  |  |
| TREND VARIABLE #4 (YELLOW) |  |  | TREND VARIABLE #5 (RED) |  |  | TREND VARIABLE #6 (BLUE) |  |  |  |

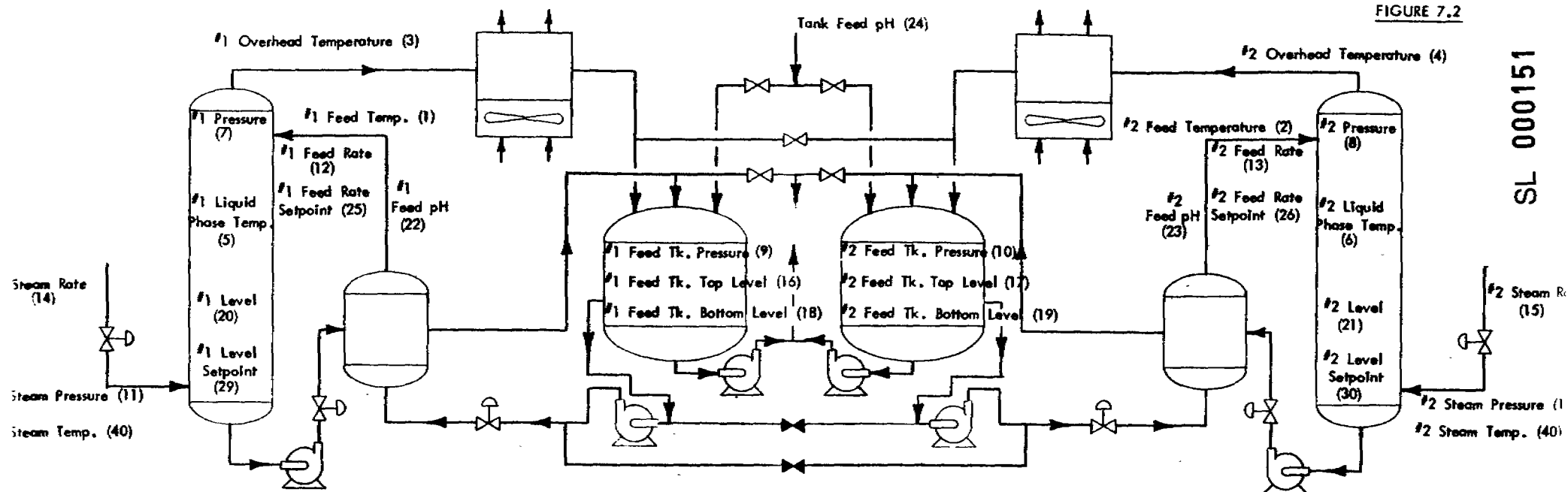
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|                                                                                       |  |                                                            |                        |                            |                          |                  |  |
|---------------------------------------------------------------------------------------|--|------------------------------------------------------------|------------------------|----------------------------|--------------------------|------------------|--|
|  |  | <b>INDUSTRIAL CHEMICAL DIVISION</b><br><b>LAKE CHARLES</b> |                        |                            |                          | <b>LOUISIANA</b> |  |
| <b>TITLE</b> CENTRAL OHC STM STRIPPER<br>CRT DISPLAY                                  |  | <b>DRAWN BY</b><br>M DAVID                                 | <b>DATE</b><br>10-7-80 | <b>SCALE</b><br>1/16" = 1" | <b>DWG. NO.</b> SK 10102 |                  |  |
|                                                                                       |  | <b>CHECKED BY</b>                                          | <b>DATE</b>            | <b>CHARGE</b>              |                          |                  |  |
|                                                                                       |  | <b>APPROVED BY</b>                                         | <b>DATE</b>            | <b>BILL OF MATERIAL</b>    | <b>SHEET 1 OF 1</b>      |                  |  |

FIGURE 7.2

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|                                                           |  |                      |  |                     |                    |                   |  |
|-----------------------------------------------------------|--|----------------------|--|---------------------|--------------------|-------------------|--|
| INDUSTRIAL CHEMICAL DIVISION<br>LAKE CHARLES<br>LOUISIANA |  | DRAWN BY<br>M. DAVID |  | DATE<br>10-3-80     | SCALE<br>1/4" = 1" | DWG. NO. SK 10103 |  |
| TITLE CENTRAL OHC STM STRIPPER                            |  | CHECKED BY<br>DATE   |  | APPROVED BY<br>DATE |                    | SHEET OF          |  |

Labels shown identifying variables' positions do not appear on the actual screen.

In addition to the graphics display, the color CRT will provide 3.5 hours of trend display of any six (6) variables selected from the 35 variables monitored. The "trend" display consists of two (2) grids onto which are overlaid historical data of three (3) variables on each grid. Associated scales, time, labels, and engineering units are displayed. Updating of "trend" variables is done every 30 seconds with the oldest data being deleted from the left side of the screen and the newest data being added on the right side of the screen. A request to change one of the variables being trended will cause a loss of the history of the variable being replaced. The newly added "trend" variable will have no history. The history of the "new" trend variable will begin at the time of the request.

The display provides valid information on monitored variables in both the manual and computer control modes of operation.

#### D. Keyboard Functions

From the keyboard, an operator may request various functions and input information to change operating conditions. This is accomplished by means of an instruction set of 4-character keycodes. Each function may have two (2) parts: Part I - the 4 character function code, and Part II - and optional structured sequence of data. A list of user instructions is provided with explanations of their use and functions in this section.

An index of monitored process variable and their corresponding point numbers is included in Appendix D. Also see Figure 7.2 for a positional guide to the

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point numbers to be used with these instructions.

The procedure for entering a request from the keyboard is : (1) type function nam ,  
(2) hit RETURN key, (3) enter associated data, separated by commas if required,  
(4) hit RETURN key if required after data. For functions not requiring any data  
entry, only steps (1) and (2) apply.

To clear or cancel a request depress the control "CTRL" key and while depressing  
it, hit the "C" key.

When requests are made too frequently, or more than one pending request is  
current, the message "RQ BUSY" is printed.

#### USER INSTRUCTION SET:

1. Keycode: "TANK" (RETURN) 1 (or 2) (RETURN)

The operator enters a "1" or a "2" to designate which feed tank is on  
stripper #1. By default, the other feed tank is on stripper #2. If a "1"  
was entered, the computer prints "NORMAL". If a "2" was entered, th  
computer prints "CROSSED". A "1" indicates that Feed Tank #1 is on  
stripper #1 and Feed Tank #2 is on stripper #2 - "NORMAL". A "2"  
indicates Feed Tank #1 on stripper #2 and Feed Tank #2 is on stripper #1 -  
"CROSSED". In the event that the feed tanks and steam strippers are  
"CROSSED", only one stripper can be on computer control. Attempting  
to place both strippers on computer control when feeds are crossed will  
cause a "hold" on all control action. If both stripper feed pumps are  
operating, crossed feed cannot b specifi d. If eith r stripper is on

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computer control, a change in feed configuration cannot be specified.

2. "PLOT" (RETURN) point number, pen number (RETURN)

The operator enters a monitored variable's point number and the pen number to change the variable being plotted on the CRT display. The correct entry format is a two digit number (1-36) for variable point number, followed by a comma, then a single digit (1-6) for pen number, followed by a "RETURN". Any value out of range for either pen number (1-6) or point value (1-36) will cause the request to be aborted.

Example: Enter "PLOT" (RETURN) 17, 2 (RETURN) replaces current trend variable at pen position #2 with the "new" variable corresponding to "point number" 17 on the CRT display.

| <u>Pen Definitions:</u> | <u>Pen Position</u> |   |               |
|-------------------------|---------------------|---|---------------|
| TOP GRID                | 1                   | - | Top Yellow    |
|                         | 2                   | - | Top Red       |
|                         | 3                   | - | Top Blue      |
| BOTTOM GRID             | 4                   | - | Bottom Yellow |
|                         | 5                   | - | Bottom Red    |
|                         | 6                   | - | Bottom Blue   |

A list of monitored process variables and associated point numbers is given in Appendix D. Also see Figure 7.2 for the correct point numbers and pen positions to be entered as data.

3. "TIME" (RETURN) MO, DAY, YR, HR, MIN (RETURN)

The operator enters month, day, year, hour, minute separated by commas and followed by "RETURN". This function allows the operator to enter the present time. The time basis is a 24-hour day.

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Example 1: Typing "TIME" (RETURN) 10, 2, 80, 14, 23 (RETURN) would enter the time 2:23 PM on Oct. 2, 1980.

Example 2: On printed messages the time 8:32 PM would appear as 2032; with the first two digits as the hour of a 24-hr. day and the second two digits as the minutes of the hours. No colon or AM/PM indication is printed.

Valid entry values are:

|        |                          |         |
|--------|--------------------------|---------|
| Month  | month of year            | (1-12)  |
| Day    | day of month             | (1-31)  |
| Year   | two digit year in decade | (80-99) |
| Hour   | hour in 24-hour day      | (0-23)  |
| Minute | minute in hour           | (0-59)  |

4. "LOGG" (RETURN)

No data is associated with this function.

This function causes a printout (hard copy) of the status of all monitored process variables to be produced. Items contained in the log output are:

1. current status of #1 and #2 condenser fans (ON/OFF)
2. hours of operation forward since 7:00 AM for strippers #1 and #2
3. feed tank #1 and #2 aqueous phase level (% span)
4. feed tank #1 and #2 indeterminate phase level (% span)
5. steam stripper pot level for strippers #1 and #2 (% span)
6. feed flow to strippers #1 and #2 (GPM)
7. steam flow to strippers #1 and #2 (lb/hour)
8. steam header pressure (psig)
9. stripper bottoms pressure for strippers #1 and #2 (psig)
10. feed tank vent pressure for tanks #1 and #2 (psig)
11. stripper bottoms temperature for strippers #1 and #2 (°F)

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12. stripper overhead temperature for #1 and #2 (°F)
13. stripper feed temperature for #1 and #2 (°F)
14. feed tank pH for tanks #1 and #2 (pH)

A sample log sheet printout is contained in Appendix A.

5. "DAYR" (RETURN)

No data is associated with this function.

This function causes a daily report to be printed. A sample daily report printout is contained in Appendix B. The daily report consists of the following information:

1. steam usage for strippers #1 and #2 (lb/hour)
2. hours of operation of each stripper while forward (hours)
3. feed tank pH for tanks #1 and #2 (average value over 24 hrs.; pH)
4. steam stripper overhead temperature for strippers #1 and #2 (avg. value over 24 hrs.; °F)
5. stripper feed temperature for strippers #1 and #2 (avg. value over 24 hrs.; °F)
6. stripper bottoms temperature for strippers #1 and #2 (avg. value over 24 hrs.; °F)
7. feed tank pressure for tanks #1 and #2 (avg. value over 24 hrs.; psig)
8. feed flow to strippers #1 and #2 while forward (avg. value over 24 hours; GPM)
9. stripper bottoms to sodium formate destruction unit (avg. value for for strippers #1 and #2 separately over 24 hr.period; GPM)

\* A copy of the daily report is forwarded to the Records Department daily. The "hours forward" in the report are cumulative, starting with a 7:00 AM starting point for the reporting day.

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6. "VALU" (RETURN) point number (RETURN)

An operator must enter the "point number" associated with a monitored process variable as required data.

This function causes the value of a process variable to be printed. A list of monitored process variables and corresponding point numbers is included in Appendix D. Also see Figure 7.2 for point numbers' location.

7. "CCRT" (RETURN)

This function causes the CRT screen to be "replenished"; the screen is completely cleared and graphics reconstructed in approximately 4 minutes. This instruction is used whenever the trend of variables fails to update.

8. "INSR" (RETURN) point number (RETURN)

This function requires the operator to enter a "point number" as data. It causes a monitored process variable that was previously taken out-of-service to be placed "in-service"; "INSR".

See Appendix D or Figure 7.2 for point numbers.

9. "OTSR" (RETURN) point number (RETURN)

The operator must enter a "point number" as data. This function causes a process variable to be taken "out-of-service"; "OTSR". A typical reason for using "OTSR" would be to calibrate or replace a transmitter. After maintenance is completed, the variable should be put back in service using the "INSR" function. See Appendix D or Figure 7.2 for point numbers.

CAUTION: Care must be taken when placing a variable used in computer

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control in "out-of-service" status. It is recommended that if a control variable is taken out of service that the associated stripper be set to "manual" mode.

10. "ALRV" (RETURN)

No data is associated with this function.

This function causes a printout of all variables exceeding their alarm conditions at the time of the request. The report will indicate whether a variable is high, low, open (faulty input signal), or out-of-service at the time of the request. The time of the request appears to the left of the message.

11. "LTIM" (RETURN) log time interval (RETURN)

The operator must enter a "log interval" in minutes.

This instruction allows an operator to change the time interval between periodic log report printouts. The log time interval must be a value of 5 minutes or more.

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