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PROJECT FILE ALSO EXISTS W/ BACKGROUND & DESIGN INFORMATION

JOHN DRISKILL
PPG - LAKE CHARLES

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PPG INDUSTRIES, INC.

LAKE CHARLES COMPLEX

"A" DOCK
EDC LOADING
OPERATIONS MANUAL
With Marine Vapor Recovery

June 1993

LAKE CHARLES QUALITY POLICY

We the employees of the Lake Charles Plant are dedicated to meeting the requirements of our customers 100% of the time. We will do our jobs in a way that contributes to the success of our customers, the success of our company and at the same time, promotes the well-being of the members of our Lake Charles team.

SL 085471

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CFR 154.840 CROSS-REFERENCE INDEX

154.840 (Personnel Training)	Cross Reference to "A" Dock EDC Operations Manual
(b)(1) Purpose of the Vapor Control System	Section I
(2) Principles of the Vapor Control System	Section III
(3) Components of the Vapor Control System	Section IV.B and Appendix A
(4) Hazards Associated with the Vapor Control System	Sections II.E, II.F and III
(5) Coast Guard Regulations	Appendix E
(6) Operating Procedures	
(i) Testing and Inspection Procedures	Section IV.C.2
(ii) Pre-Transfer Procedures	Section IV.C.2
(iii) Connection Sequence	Section IV.C.2
(iv) Startup Procedures	Section IV.C.3
(v) Normal Operations	Section IV.C.3
(7) Emergency Procedures	Sections II.B, II.C, II.D, II.G, IV.D, and IV.E

SECTION I

INTRODUCTION

I. INTRODUCTION

In order to comply with EPA's Clean Air Act, which regulates the emission of ethylene dichloride (EDC) to the atmosphere, PPG Industries installed an EDC vapor recovery unit for barge and ship loading at its "A" Dock Facility. PPG Industries chose the SORBATHENE Vapor Recovery Unit (SVRU) for the recovery of EDC vapors. This vapor recovery method is considered by PPG to be Maximum Achievable Control Technology (MACT) as required under the Clean Air Act. This unit will recover greater than 99.9% of the EDC emitted from the marine vessel during loading operation. The SVRU was constructed by AWD Technologies, Inc., a subsidiary of Dow Chemical Company, and the system was designed in accordance with the U. S. Coast Guard Regulations cited in the Federal Register, 33 CFR Part 154.

Attached is an operating manual describing the liquid loading, vapor handling, and vapor recovery unit operations at "A" Dock. This operating manual has the following basic purposes:

- To aid in training personnel with the equipment, chemicals, and safe operating procedures for "A" Dock.
- To serve as a ready source of reference.
- To fulfill U. S. Coast Guard requirements.

The next section of this manual is the Safety Section. This section contains instructions for emergency situations, chemical information, and safe maintenance procedures.

The remaining sections of the manual include a general process description of the dock facilities and operating procedures for the loading of EDC into barges and

ships. Procedures for operating the SVRU which removes EDC vapors released by displacement during barge loading are included. Startup and shutdown procedures are also described.

As a reference section, the Appendices contain P&ID's, a plot plan, a material balance, and the applicable Coast Guard Regulations applied in the design of the loading and vapor recovery system.

The "Safety First" attitude reflected by management should be the attitude of each of us. The safe, successful operation of the dock area depends on how each one of us performs.

SECTION II

SAFETY

II. SAFETY

A. General Safety Rules

The following list of general safety rules is applicable to the "A" Dock area. They are to be used in conjunction with the Employee's Manual of Accident Prevention.

1. Personnel entering the South Terminal, where "A" Dock is located, will deposit lighters, matches, regular flashlights, etc., at the entry to this area.

2. No open flames, burning or welding will be permitted in this area, unless absolutely necessary and approved by supervision. Refer to Section II.H.3.

3. The usual safety equipment will be required in the "A" Dock area, which is:

   a. Safety Hats

   b. Safety Glasses with Side Shields

   c. Chemical Goggles (safety glasses under goggles are optional)

   d. Respirators

   e. Chemical Resistant Gloves

   f. Safety Shoes

g. Flame Retardant Clothing

4. The established plant tagging procedure will apply to the "A" Dock area. Refer to Section II.H.2.

5. A vehicle permit signed by the Operating Supervisor or Certified Tankerman will be required before any vehicle is allowed to enter a restricted area.

6. The vehicle entry permit must be reissued any time the vehicle leaves the area and returns.

7. Keep all road barricades in place while loading.

8. In case of an emergency warning, all vehicles and equipment in the area on permit will be shut off immediately.

9. Any time there is a substantial vapor release or an emergency situation exists, sound the unit evacuation siren in the control room so that all vehicles and maintenance equipment can be shut down and non-essential personnel evacuated from the area.

10. An equipment permit signed by the Shipping Supervisor will be required before the following equipment may be carried into the "A" Dock area:

    a. Welding machines

    b. Cutting torches

    c. Electrically driven drills

d. Any electrical equipment, except explosion-proof flashlights

11. If welding or burning must be done anywhere in the "A" Dock area:

a. A complete explosion test must be made which is good only for the immediate area in which the burning is done.

b. A fire watch must be present.

c. The area should be flooded with water.

d. All sewer openings must be sealed.

e. All sparks must be hosed out during welding.

f. All lines must be blinded from the process and open to the atmosphere.

g. Supervision must approve the burning, issue the necessary permits, and see to it that all precautions are taken.

12. The Lead Tankerman or Tankerman must place control points in a safe condition and lock out all lines, equipment, and electrical machinery before Maintenance can work on it. The placement of this lock is certification that the equipment is deactivated and free of any materials or conditions that could cause an accident. The Lead Tankerman must verify all control points and locks and sign the Job Ready Tag.

13. Do not permit air to enter any of the process equipment which contains EDC.

14. Always purge EDC from a vessel with nitrogen.

15. Always purge air from a vessel with nitrogen until the O_2 is less than 2% before allowing EDC back into the vessel.

16. Only explosion-proof flashlights will be permitted in the "A" Dock area.

17. All light circuits outside the control building must be off and tagged out before relamping of the area.

18. Only explosion proof or intrinsically safe equipment will be used in the "A" Dock area.

19. Regular plant utility hoses are not to be used for handling EDC. For EDC, use Teflon-lined hoses.

20. Clothing which has been wet with EDC should be removed immediately and the body thoroughly washed with soap and water. These clothes should be properly laundered before they are used again.

B. Fire Protection

1. <u>On Shore Fire</u>

If there is a large fire in the area, sound the evacuation horn in the control room and leave the area. Notify the guards of the fire (call 2700). A course of action can then be planned with supervision.

TO REPORT A FIRE - CALL 2700 !!!!!!!

If there is a small fire in the area, proceed with the following:

- Sound the necessary alarms.
- Report the fire to the guards and stay on the phone until help arrives.
- Do not attempt to put out the fire, unless otherwise instructed or necessary for personal safety.
- If safe, isolate the leak source and allow the fire to burn itself out.
- Try to stay upwind of the fire. This smoke may contain significant quantities of HCl.

In the event that a fire extinguisher be used, the following instructions for the dock areas apply:

15# CO_2

- Pull pin.
- Aim hose at base of fire.
- Squeeze discharge valve handle.
- Sweep base of fire with CO_2 gas.

30# Dry Chemical

- Pull up hose and break seal.
- Aim hose at base of fire.
- Squeeze hose discharge valve handle.
- Sweep base of fire with dry chemical.

150# and 300# Dry Chemical Wheel Mounted

- Unwrap hose.
- Turn N_2 cylinder valve counterclockwise to pressurize dry chemical.
- Aim hose at base of fire.
- Pull hose discharge valve handle.
- Sweep base of fire with dry chemical.

Stang Monitor Nozzle

- Point water nozzle in direction of fire.
- Install water valve handle.
- Open water valve.
- Position water nozzle as needed.

2. Off Shore Fire

Rapid Movement of Vessels Threatened by Fire

Vessels moored at a PPG Industries dock that are threatened by fire or a hazardous condition must be moved to a safe location if possible. Emergency shutdown procedures, detailed in the loading procedure of this manual, should be followed in the event of a fire or hazardous condition. The PPG Industries shift foreman will be responsible for overseeing the movement. The telephone numbers and location of tug companies are listed below and are available to move vessels away from the docks. PPG Industries also has a small tugboat capable of moving barges away from the docks.

Telephone Numbers and Tug Company Locations

PPG Industries	(318) 491-4500
PPG Industries Shipping Shift Foreman	(318) 491-4336

Towing Companies

Port of Lake Charles 150 Marine Lake Charles, Louisiana	(318) 439-3661
Sabine Towing 150 Marine Lake Charles, Louisiana	(318) 439-8982
Harbor Docking and Towing 150 Marine Lake Charles, Louisiana	(318) 439-3462

C. Emergency Shutdown

Ethylene Dichloride

A stop load button is located on the handrail on the NW side of the dock (HS-1022B) and in the South Terminal Control Room (HS-1022A). Manual shutdowns executed with the stop load button and automatic shutdowns triggered by high and low vapor line pressure, high oxygen content, and high barge level initiate the same shut down procedure.

NOTE: A green strobe light remains on while loading is in progress.

Either manual or automatic shutdown of loading will: (1) stop the loading pump (P-204/205), (2) close the liquid valve on the EDC line (SDV-1050), and (3) close the valve on the vapor line to the vapor recovery unit (SDV-1006). This action also puts the nitrogen flow control valve (FV-1016) on fixed flow control, and the vapor recovery unit continues cycling to clear EDC and remain ready to receive vapor, so that loading can restart without a vapor recovery unit warmup.

A high barge level alarm will activate a red strobe light and a high high barge level will activate a red strobe light and horn located at the dock. The trouble or pre-shutdown alarm system, except for high barge level shutdown, will activate an amber-colored strobe light and continuously blasting horn located at the dock. These alarms can be acknowledged by the tankerman at the dock or in the control room. The shutdown alarms will activate both the amber strobe light and a red strobe light located at the dock. The continuously blasting horn will also sound. Lights will remain on after acknowledgement until the alarm situation is cleared.

If operating deviations within the vapor recovery unit cause a shutdown of the vapor recovery unit, shutdown of the loading operations will also be triggered as described above. In this case, the nitrogen flow control valve is closed and a nitrogen blanket is maintained in the vapor line through a bypass valve (PCV-1017). A total restart of both the vapor recovery unit (including warmup) and loading is also required.

D. Emergency Names and Numbers

EMERGENCY PHONE NUMBERS

PPG Industries	(318) 491-4500
PPG Shipping Shift Foreman	(318) 491-4336
PPG Shipping Dock Foreman	(318) 491-4478
PPG Shipping Area Supervisor	(318) 491-4260
PPG Customer Service	(318) 491-4457
U.S. Coast Guard	(318) 433-3765
National Response Center	(800) 424-8802

E. Safety and Personnel Protective Equipment

Respiratory Protection

In order to prevent personnel exposure to harmful EDC vapors, proper respiratory protection must be worn at the appropriate times. The short exposure tolerance for EDC is one ppm for 15 minutes.

Three types of respiratory protection equipment are provided for personnel in the "A" Dock area: filter-type; self-contained breathing equipment; and air-supplied mask.

A standard pocket respirator is to be carried at all times. Besides the standard pocket respirator, a twin cartridge full-face mask filter respirator (Comfo-II) 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 19.5% oxygen in the atmosphere. The mask comes with interchangeable cartridges for different types of gases.

A full face Comfo-II mask must be worn while installing and removing loading hoses. The mask will prevent the employee from inhaling EDC vapors.

The self-contained equipment consists of 30-minute Scott Air Packs 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 pack.

Hard Hat

A hard hat must be worn at all times while in an operating area in the PPG Plant (unless a full face mask is worn). The hat is intended to prevent head injuries caused by falling objects or overhead obstructions.

Safety Glasses

Safety glasses with side shields must be worn at all times while in an operating area in the PPG Plant. Safety glasses are intended to prevent foreign objects or chemical splashes from injuring the eyes.

Goggles

Goggles are required while installing and removing loading hoses and while taking samples. The goggles are intended to prevent chemical splashes from injuring the eyes.

Safety Shoes

Steel toed shoes or boots containing thick leather or rubber soles must be worn at all times while in an operating area in the PPG Plant. The shoes/boots are intended to prevent foot injuries from falling objects, to provide proper ankle support while walking on uneven surfaces or climbing ladders, and to prevent slipping on wet or oily surfaces.

Gloves

Chemical resistant gloves are to be worn while installing and removing loading hoses and while taking samples. The gloves are intended to prevent chemical exposures from burning the skin.

Fire Retardant Clothing

Operating personnel are required to wear fire retardant clothing while in the "A" Dock area. The clothing is intended to protect personnel from flash fires. A full fire retardant "jump" suit or shirt and pants may be worn. Visitors in the plant will be issued fire retardant lab coats.

F. Chemical Hazards - MSDS

The MSDS's for Ethylene dichloride and Nitrogen are attached.

ETHYLENE DICHLORIDE
UN1184 RQ

Clear, colorless liquid; chloroform like odor — CAS No. 107-06-02

CARGO TRANSFER - Use authorized personnel only, properly protected.

WARNING!

- **FLAMMABLE**
- **VAPOR HARMFUL**
- **POSSIBLE CANCER HAZARD BASED ON TESTS WITH LABORATORY ANIMALS — OVEREXPOSURE MAY CREATE CANCER RISK**

HANDLING AND STORAGE

- Container and system must be electrically grounded before unloading.
- Do not allow to collect in poorly ventilated or confined areas.
- Ethylene dichloride vapors are heavier than air and will collect in low areas.
- Avoid contact with flames, hot surfaces or electric arcs. May form toxic and corrosive fumes of hydrogen chloride and possibly phosgene.
- Adequate ventilation must be maintained in storage area to reduce fire hazard in the event of a leak.
- AVOID CONTAMINATING WATER SUPPLIES - Handling, storage and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.

PRECAUTIONS

- KEEP AWAY FROM HEAT, SPARKS, OR FLAME. Ethylene dichloride vapors are flammable and may be explosive, emitting toxic and corrosive fumes of hydrogen chloride and possibly phosgene.
- DO NOT BREATHE VAPORS. High vapor concentration can cause unconsciousness or death.
- DO NOT SWALLOW. Swallowing may cause injury or death.
- USE WITH ADEQUATE VENTILATION. Ventilation should be sufficient to limit employee exposure to ethylene dichloride below permissible exposure limits. OSHA: 1 ppm, 8-hour TWA (Time Weighted Average); 2 ppm 15-minute STEL (Short-Term Exposure Limit).
- AVOID CONTACT WITH EYES. May cause pain, irritation, and watering.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation and dermatitis.
- WASH THOROUGHLY AFTER HANDLING.

IN CASE OF ACCIDENT

IF THIS HAPPENS	DO THIS
EXPOSURE	■ **INHALATION:** Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to mouth. If breathing is difficult, give oxygen. Call a physician. ■ **EYE/SKIN CONTACT.** Immediately flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. Call a physician. Wash contaminated clothing before reuse or discard. Discard shoes. ■ **SWALLOWING: If conscious**, give a quart of water to drink. **DO NOT** induce vomiting. Take immediately to a hospital or physician. **If unconscious**, or in convulsions, take immediately to a hospital. **DO NOT** induce vomiting or give anything by mouth to an unconscious person. NOTES TO PHYSICIAN: NEVER administer adrenaline for swallowing or inhalation overexposure. Increased sensitivity of the heart to adrenaline may be caused by overexposure to ethylene dichloride. Saline cathartics should be considered following high dose ingestion.
FIRE	FLAMMABLE. Firefighters wearing NIOSH/MSHA - approved, self-contained breathing apparatus should use dry chemicals, foam or carbon dioxide to fight fire. Water spray should be used to keep fire exposed containers cool. Ethylene dichloride reacts vigorously with oxidizing agents. When in contact with flames, hot glowing surface or electric arcs, the formation of toxic and corrosive hydrogen chloride and phosgene is possible.
SPILL OR LEAK	Evacuate area, provide maximum ventilation and remove all sources of ignition. Only personnel with proper protective equipment should be permitted in area. Dike area to contain spill. DO NOT allow ethylene dichloride to contaminate nearby water sources. Collect spilled material on sawdust or vermiculite, sweep up and hold in closed containers for disposal.
EMERGENCY	Contact PPG Industries, Inc., Natrium, WV (304) 843-1300

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

SL 085501

L94C-789C

PPG INDUSTRIES, INC. ONE PPG PLACE PITTSBURGH, PA 15272

* * * ETHYLENE DICHLORIDE (EDC)

MSDS NUMBER:	0094
DATE:	05/03/89
EDITION:	010
TRADE NAME:	ETHYLENE DICHLORIDE (EDC)
CHEMICAL NAME/SYNONYMS:	1,2 DICHLOROETHANE
CHEMICAL FAMILY:	CHLORINATED HYDROCARBONS
FORMULA:	CH2CLCH2CL
CAS NUMBER:	00107 06 2
U.S. DOT SHIPPING NAME:	ETHYLENE DICHLORIDE
U.S. DOT HAZARD CLASS:	FLAMMABLE LIQUID
SUBSIDIARY RISK:	N/A
I.D. NUMBER:	UN1184
REPORTABLE QUANTITY:	5000 LBS/2270 KG

SECTION 1 * PHYSICAL DATA

BOILING POINT @ 760 MM HG:	180 F
VAPOR DENSITY (AIR=1):	3.4
SPECIFIC GRAVITY (H20=1):	1.255 @ 20/20 C
PH OF SOLUTIONS:	APPROX. 7
FREEZING/MELTING POINT:	-32.6 F (-35.3 C)
SOLUBILITY (WEIGHT % IN WATER):	0.869 G/100 ML
BULK DENSITY:	10.3 LBS/GAL @ 25 C
VOLUME % VOLATILE:	100%
VAPOR PRESSURE:	87 MM HG @ 25 C
EVAPORATION RATE:	(ETHYL ETHER=1): .27
HEAT OF SOLUTION:	UNKNOWN

APPEARANCE AND ODOR:
COLORLESS LIQUID; SWEET CHLOROFORM ODOR

SECTION 2 * INGREDIENTS

MATERIAL	PERCENT
ETHYLENE DICHLORIDE	100

SECTION 3 * FIRE/EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED):
56 F (13.3 C) TAG CLOSED CUP

FLAMMABLE LIMITS IN AIR (% BY VOLUME)
LEL: 6.2%
UEL: 15.6%

EXTINGUISHING MEDIA:
DRY CHEMICALS, FOAM, OR CARBON DIOXIDE

SPECIAL FIRE FIGHTING PROCEDURES:
FIRE FIGHTERS MUST WEAR NIOSH/MSHA-APPROVED, SELF-CONTAINED BREATHING APPARATUS. WATER SPRAY SHOULD BE USED TO KEEP FIRE EXPOSED CONTAINERS COOL.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
FIRES WILL FORM TOXIC AND CORROSIVE FUMES OF HYDROGEN CHLORIDE, AND UNDER SOME CONDITIONS MAY FORM TRACE QUANTITIES OF PHOSGENE. REACTS WITH OXIDIZING MATERIALS AND BASES. HYDROLYZES SLOWLY AT ELEVATED TEMPERATURES TO PRODUCE HYDROGEN CHLORIDE.

SECTION 4 * HEALTH HAZARD DATA

TOXICITY DATA:

LC50 INHALATION:	(RAT) 1000 PPM/7 HOURS
LD50 DERMAL:	(RABBIT) 2890 MG/KG
SKIN/EYE IRRITATION:	SKIN-MILD/EYE-SEVERE IRRITANT
LD50 INGESTION:	(RAT) 670 MG/KG
FISH,LC50 (LETHAL CONCENTRATION):	SEE SECTION 5

CLASSIFICATION: (POISON, IRRITANT, ETC.)

INHALATION:	MODERATELY TOXIC
SKIN:	MODERATELY TOXIC
SKIN/EYE:	SEE SECTION 5
INGESTION:	SLIGHTLY TOXIC
AQUATIC:	SEE SECTION 5

SECTION 5 * EFFECTS OF OVEREXPOSURE

THIS SECTION COVERS EFFECTS OF OVEREXPOSURE FOR INHALATION, EYE/SKIN CONTACT, INGESTION AND OTHER TYPES OF OVEREXPOSURE INFORMATION IN THE ORDER OF THE MOST HAZARDOUS AND THE MOST LIKELY ROUTE OF OVEREXPOSURE.

IS CHEMICAL LISTED AS A CARCINOGEN OR POTENTIAL CARCINOGEN?
NTP - YES IARC - YES OSHA - NO

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:
PROLONGED EXPOSURE TO HIGH CONCENTRATIONS OF ETHYLENE DICHLORIDE MAY COMPLICATE EXISTING LIVER OR KIDNEY DISEASES.

PERMISSIBLE EXPOSURE LIMITS:
OSHA: 1 PPM, 8-HOUR TWA (TIME WEIGHTED AVERAGE); 2 PPM, 15-MINUTE STEL (SHORT-TERM EXPOSURE LIMIT); 29 CFR 1910.1000 (REV. 3/1/89).

ACUTE:

INHALATION: EXPOSURE TO HIGH CONCENTRATIONS HAVE CAUSED THE FOLLOWING SYMPTOMS IN EXPOSED PEOPLE: HEADACHE, NAUSEA, VOMITING, AND WEAKNESS. THIS MAY BE FOLLOWED BY UNCONSCIOUSNESS AND RESPIRATORY AND CIRCULATORY FAILURE. WHERE DEATHS HAVE OCCURRED, THEY HAVE BEEN ASSOCIATED WITH LIVER AND KIDNEY FAILURE, PULMONARY EDEMA, CELLULAR DEGENERATION, NECROSIS, AND HEMORRHAGIC LESIONS OF INTERNAL ORGANS.

EYE CONTACT: ETHYLENE DICHLORIDE IS A SEVERE EYE IRRITANT. IF NOT WASHED OUT IMMEDIATELY, SERIOUS DAMAGE MAY RESULT. LITERATURE REPORTS INDICATE AN IMMEDIATE IRRIGATION OF THE EYE WILL PREVENT SERIOUS INJURY.

SKIN CONTACT: WHEN ETHYLENE DICHLORIDE IS HELD UNDER A OCCLUDED PATCH, SEVERE IRRITATION WILL OCCUR. WHEN IT IS NOT HELD TIGHT TO THE SKIN, IT WILL NOT CAUSE SERIOUS IRRITATION. REPEATED OR PROLONGED CONTACT WILL PRODUCE DRYING AND REDDENING OF THE SKIN DUE TO THE EXTRACTION OF FAT.

INGESTION: HUMAN CASE REPORTS OF ACCIDENTAL OR INTENTIONAL INGESTION HAVE BEEN REPORTED. INGESTION OF QUANTITIES RANGING FROM 8-200 ML HAVE BEEN REPORTED TO BE LETHAL IN HUMANS. THE PROGRESSION OF SYMPTOMS IS SIMILAR TO THAT FROM OVEREXPOSURE VIA INHALATION. THERE IS TYPICALLY A ONE-HOUR PERIOD AFTER INGESTION WHERE NO SIGNS OCCUR. THIS IS FOLLOWED BY DIZZINESS, NAUSEA, VOMITING AND UNCONSCIOUSNESS. A RAPID WEAK PULSE, DILATED PUPILS, PULMONARY EDEMA, AND CYANOSIS MAY ALSO OCCUR. DEATH IS USUALLY RELATED TO CIRCULATORY AND RESPIRATORY FAILURE.

THE ODOR THRESHOLD (6-110 PPM) OF ETHYLENE DICHLORIDE IS NOT AN ADEQUATE WARNING TO PREVENT OVEREXPOSURE. THE ODOR IS CHARACTERIZED AS BEING SWEET AND NOT UNPLEASANT.

GENERAL: ETHYLENE DICHLORIDE CAN BE TAKEN INTO THE BODY BY INGESTION, INHALATION OR SKIN ABSORPTION. BY ANY OF THESE MEANS IT CAN BE HIGHLY TOXIC. ACUTE POISONING MAY CAUSE HEADACHE, DIZZINESS, FEELINGS OF

DRUNKENNESS, LOSS OF CONSCIOUSNESS, INTERNAL BLEEDING, AND DEATH. REPEATED EXPOSURES CAN BRING ON NAUSEA, VOMITING, STOMACH PAIN, IRRITATED MUCOUS MEMBRANES, LOSS OF APPETITE, LIVER AND KIDNEY FAILURE AND POSSIBLE DEATH. NUMEROUS CASES OF ETHYLENE DICHLORIDE POISONING, BOTH FATAL AND NONFATAL, HAVE BEEN DOCUMENTED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH. WITH SKIN ABSORPTION OR INHALATION, THE FIRST EFFECTS ARE HEADACHE, WEAKNESS, EYE IRRITATION, CYANOSIS (BLACKENING OF SKIN) AND NAUSEA.

CHRONIC:
THE PRIMARY TARGET ORGAN IN BOTH EXPERIMENTAL ANIMALS AND EXPOSED HUMAN POPULATIONS ARE THE LIVER AND KIDNEY. THERE IS ALSO SOME EVIDENCE THAT CHRONIC EXPOSURE TO ETHYLENE DICHLORIDE MAY HAVE ADVERSE EFFECTS ON THE CENTRAL NERVOUS SYSTEM.

THE NATIONAL CANCER INSTITUTE CONDUCTED CARCINOGENICITY BIOASSAYS IN OSBORNE-MENDEL RATS AND B6C3F1 MICE. ANIMALS IN THESE STUDIES WERE DOSED ORALLY BY GAVAGE WITH ETHYLENE DICHLORIDE IN CORN OIL. DOSES HAD TO BE ADJUSTED SEVERAL TIMES DURING THE STUDY IN RESPONSE TO SIGNS OF TOXICITY. TIME WEIGHTED AVERAGE DOSES (IN MG/KG/DAY) WERE: 47 OR 95 FOR MALE AND FEMALE RATS; 97 OR 195 FOR MALE MICE AND 149 OR 299 FOR FEMALE MICE. IN THE RAT STUDY, CARCINOMA OF THE FORESTOMACH, HEMANGIOSARCOMA OF THE CIRCULATORY SYSTEM, AND CARCINOMA OF THE MAMMARY GLAND WERE OBSERVED. THERE WAS A HIGH MORTALITY RATE FOR THE RATS DURING THIS STUDY FROM CAUSES OTHER THAN CANCER. THE MEAN SURVIVAL TIME FOR THE HIGH DOSE ANIMALS WAS ONLY 55 WEEKS WITH 0/50 ALIVE IN WEEK 101. THIS SIGNIFICANT MORTALITY MAY HAVE AFFECTED THE OUTCOME OF THE STUDY. IN THE MOUSE STUDY, HEPATOCELLULAR CARCINOMAS, ALVEOLAR/BRONCHIOLAR ADENOMAS, MAMMARY CARCINOMAS AND ENDOMETRIAL TUMORS WERE OBSERVED.

AN INHALATION STUDY IN SPRAGUE-DAWLEY RATS AND SWISS MICE PROVIDED NO EVIDENCE OF CARCINOGENICITY AFTER LIFETIME EXPOSURES. ANIMALS WERE EXPOSED TO 5 PPM, 10 PPM, 50 PPM AND 150 PPM FOR 78 WEEKS. AT THE END OF THE STUDY NO EXPOSURE RELATED CANCER WAS FOUND AT ANY TARGET ORGANS IN EITHER SPECIES.

PHARMACOKINETIC ANALYSIS OF THE KNOWN METABOLIC PATHWAYS OF ETHYLENE DICHLORIDE IN MICE, RATS AND HUMANS HAVE BEEN CONDUCTED. SUCH COMPARISONS SUGGEST THAT THE CONFLICTING OUTCOME OF THE BIOASSAYS WITH REGARD TO CARCINOGENICITY ARE DUE TO ROUTE OF EXPOSURE DEPENDENT DIFFERENCES IN METABOLISM AND THAT THE ANIMAL BIOASSAYS SIGNIFICANTLY OVERESTIMATE HUMAN CANCER RISK.

THE RESULTS OF REPRODUCTIVE AND TERATOGENICITY STUDIES IN ANIMALS

INDICATES THAT ETHYLENE DICHLORIDE HAS LITTLE POTENTIAL FOR PRODUCING ADVERSE REPRODUCTIVE AFFECTS OR FOR ADVERSELY AFFECTING THE DEVELOPING CONCEPTUS, EXCEPT WHEN THE MOTHER IS EXPOSED TO DOSES HIGH ENOUGH TO PRODUCE MATERNAL TOXICITY.

ETHYLENE DICHLORIDE IS LISTED BY NTP IN GROUP II (SUBSTANCE THAT MAY REASONABLY BE ANTICIPATED TO BE CARCINOGEN) AND IS AN IARC 2B CARCINOGEN

FISH, LC50 (LETHAL CONCENTRATIONS):

DAPHNIA MAGNA	- 48-HOUR -	218,000 MICROGRAM/L
BLUEGILL	- 96-HOUR -	550,000 MICROGRAM/L
FATHEAD MINNOW	- 96-HOUR -	118,000 MICROGRAM/L

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* EMERGENCY AND FIRST AID PROCEDURES

INHALATION:

REMOVE PATIENT TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO-MOUTH. IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN.

EYE OR SKIN CONTACT:

IMMEDIATELY FLUSH EYES AND SKIN WITH WATER (SOAP AND WATER FOR SKIN) FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. CALL A PHYSICIAN. WASH CONTAMINATED CLOTHING BEFORE REUSE OR DISCARD. DISCARD SHOES.

INGESTION:

IF CONSCIOUS, DRINK LARGE QUANTITIES OF WATER. DO NOT INDUCE VOMITING. TAKE IMMEDIATELY TO A HOSPITAL OR PHYSICIAN. IF UNCONSCIOUS, OR IN CONVULSIONS, TAKE IMMEDIATELY TO A HOSPITAL. DO NOT ATTEMPT TO INDUCE VOMITING OR GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

NOTES TO PHYSICIAN (INCLUDING ANTIDOTES):

NEVER ADMINISTER ADRENALINE FOR SWALLOWING OR INHALATION OVEREXPOSURE. INCREASED SENSITIVITY OF THE HEART TO ADRENALINE MAY BE CAUSED BY OVEREXPOSURE TO ETHYLENE DICHLORIDE. SALINE CATHARTICS SHOULD BE CONSIDERED FOLLOWING HIGH DOSE INGESTION. OVEREXPOSURES MAY CAUSE VOMITING AND PROTRACTED RETCHING VIA CNS MECHANISMS.

SECTION 6 * REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID: FLAMES, INTENSE HEAT SOURCES, ELECTRIC ARCS

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: ELEVATED TEMPERATURES

INCOMPATIBILITY (MATERIALS TO AVOID):

REACTS WITH OXIDIZING MATERIALS AND BASES OR WATER AT ELEVATED TEMPERATURES. WILL CORRODE ALUMINUM AT ELEVATED TEMPERATURES.

HAZARDOUS DECOMPOSITION PRODUCTS:

DECOMPOSES UPON CONTACT WITH FLAME, HOT SURFACES OR ELECTRIC ARCS EMITTING TOXIC FUMES OF HYDROGEN CHLORIDE AND POSSIBLE TRACES OF PHOSGENE.

SECTION 7 * SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS SPILLED OR RELEASED:

EVACUATE AREA, PROVIDE MAXIMUM VENTILATION, AND REMOVE ALL SOURCES OF IGNITION. ONLY PERSONNEL EQUIPPED WITH NIOSH/MSHA APPROVED, SELF-CONTAINED BREATHING APPARATUS OR FULL FACEPIECE AIRLINE RESPIRATORS WITH AUXILIARY SCBA'S OPERATED IN THE PRESSURE DEMAND MODE SHOULD BE PERMITTED IN AREA. DIKE AREA TO CONTAIN SPILL AND PUMP SPILLED MATERIAL INTO METAL CONTAINERS FOR DISPOSAL OR RECLAIMING. RECOVER ANY REMAINING MATERIAL ON ADSORBENTS SUCH AS SAWDUST OR VERMICULITE, AND PLACE IN METAL CONTAINERS FOR DISPOSAL. AFTER ALL VISIBLE TRACES AND ALL VAPORS HAVE BEEN REMOVED, THOROUGHLY WET VACUUM THE AREA OF SPILL. IF AREA OF SPILL IS POROUS, REMOVE AS MUCH CONTAMINATED EARTH, GRAVEL, ETC. AS NECESSARY AND PLACE IN CLOSED CONTAINERS FOR DISPOSAL.

WASTE DISPOSAL METHOD:

CONTAMINATED SAWDUST, VERMICULITE, OR POROUS SURFACE MUST BE DISPOSED OF IN A PERMITTED HAZARDOUS WASTE MANAGEMENT FACILITY. RECOVERED LIQUIDS MAY BE REPROCESSED OR INCINERATED OR MUST BE TREATED IN A PERMITTED HAZARDOUS WASTE MANAGEMENT FACILITY. CARE MUST BE TAKEN WHEN USING OR DISPOSING OF CHEMICAL MATERIALS AND/OR THEIR CONTAINERS TO PREVENT ENVIRONMENTAL CONTAMINATION. IT IS YOUR DUTY TO DISPOSE OF THE CHEMICAL MATERIALS AND/OR THEIR CONTAINERS IN ACCORDANCE WITH THE CLEAN AIR ACT, THE CLEAN WATER ACT, THE RESOURCE CONSERVATION AND RECOVERY ACT, AS WELL AS ANY OTHER RELEVANT FEDERAL, STATE, OR LOCAL LAWS/REGULATIONS REGARDING DISPOSAL.

SECTION 8 * SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:

USE NIOSH/MSHA-APPROVED ORGANIC RESPIRATOR OR USE AIR-SUPPLIED RESPIRATORY

PROTECTION WHEN CONCENTRATIONS EXCEED THE PERMISSIBLE EXPOSURE LIMITS. SEE SECTION 7 FOR RESPIRATORY PROTECTION IN THE EVENT OF SPILLS OR LEAKS. . THE RESPIRATOR USE LIMITATIONS MADE BY NIOSH/MSHA OR THE MANUFACTURER MUST BE OBSERVED. RESPIRATORY PROTECTION PROGRAMS MUST BE IN ACCORDANCE WITH 29 CFR 1910.134.

VENTILATION(TYPE):

USE GENERAL OR LOCAL EXHAUST VENTILATION SUFFICIENT TO LIMIT EMPLOYEE EXPOSURE TO ETHYLENE DICHLORIDE BELOW PERMISSIBLE LIMIT.

EYE PROTECTION:

SPLASHPROOF CHEMICAL SAFETY GOGGLES

GLOVES:

POLYVINYL ALCOHOL, VITON(R).

OTHER PROTECTIVE EQUIPMENT:

BOOTS, APRONS, OR CHEMICAL SUITS SHOULD BE USED WHEN NECESSARY TO PREVENT SKIN CONTACT. PERSONAL PROTECTIVE CLOTHING AND USE OF EQUIPMENT MUST BE IN ACCORDANCE WITH 29 CFR 1910.132 AND 29 CFR 1910.133.

SECTION 9 * SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORING:

* POSSIBLE CANCER HAZARD BASED ON TESTS WITH LABORATORY ANIMALS -- OVER-EXPOSURE MAY CREATE CANCER RISK.
* CONTAINER AND SYSTEM MUST BE ELECTRICALLY GROUNDED BEFORE UNLOADING.
* DO NOT USE IN POORLY VENTILATED OR CONFINED AREAS.
* ADEQUATE VENTILATION MUST BE MAINTAINED IN STORAGE AREAS TO REDUCE FIRE HAZARD IN THE EVENT OF A LEAK.
* ETHYLENE DICHLORIDE VAPORS ARE HEAVIER THAN AIR AND WILL COLLECT IN LOW AREAS.
* STORE ONLY IN CLOSED, PROPERLY LABELED CONTAINERS.
* KEEP AWAY FROM HEAT, SPARKS, OR FLAME. ETHYLENE DICHLORIDE VAPORS ARE FLAMMABLE AND MAY BE EXPLOSIVE.
* AVOID CONTAMINATION WITH WATER SUPPLIES! HANDLING, STORAGE AND USE PROCEDURES MUST BE CAREFULLY MONITORED TO AVOID SPILLS OR LEAKS. ANY SPILL OR LEAK HAS THE POTENTIAL TO CAUSE UNDERGROUND WATER CONTAMINATION WHICH MAY, IF SUFFICIENTLY SEVERE, RENDER A DRINKING WATER SOURCE UNFIT FOR HUMAN CONSUMPTION. CONTAMINATION THAT DOES OCCUR CANNOT BE EASILY CORRECTED.
* AVOID CONTACT WITH FLAMES, HOT SURFACES OR ELECTRIC ARCS. MAY FORM TOXIC AND CORROSIVE FUMES.

OTHER PRECAUTIONS:

* DO NOT BREATHE VAPORS. HIGH VAPOR CONCENTRATIONS CAN CAUSE UNCONSCIOUSNESS

OR DEATH.
* USE WITH ADEQUATE VENTILATION. VENTILATION MUST BE SUFFICIENT TO LIMIT EMPLOYEE EXPOSURE TO ETHYLENE DICHLORIDE BELOW THE PERMISSIBLE EXPOSURE LIMITS. OBSERVANCE OF LOWER LIMITS (SEE SECTION 5) IS ADVISABLE.
* AVOID CONTACT WITH EYES. MAY CAUSE PAIN, IRRITATION AND WATERING.
* AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. MAY CAUSE IRRITATION AND DERMATITIS.
* DO NOT SWALLOW. SWALLOWING MAY CAUSE INJURY OR DEATH.
* WASH THOROUGHLY AFTER HANDLING.
* DO NOT EAT, DRINK OR SMOKE IN WORK AREAS.

COMMENTS:

TSCA - ETHYLENE DICHLORIDE IS ON THE TSCA INVENTORY UNDER CAS NO. 107-06-2

SARA TITLE III - A) LISTED IN 311/312 CATEGORIES AS FLAMMABLE, ACUTE AND CHRONIC, B) LISTED IN SECTION 313 AS 1,2-DICHLOROETHANE, C) NOT LISTED IN SECTION 302.

CERCLA - LISTED IN TABLE 302.4 AS A HAZARDOUS SUBSTANCE WITH A REPORTABLE QUANTITY OF 5000 POUNDS. RELEASES TO AIR, LAND, OR WATER WHICH EXCEED THE RQ MUST BE REPORTED TO THE NATIONAL RESPONSE CENTER, 800-424-8802.

RCRA - WASTE ETHYLENE DICHLORIDE AND CONTAMINATED SOILS/MATERIALS FROM SPILL CLEANUP ARE U077 HAZARDOUS WASTE AS PER 40 CFR 261.33 AND MUST BE DISPOSED OF ACCORDINGLY UNDER RCRA. SEE 40 CFR 261.33(C) AND 261.7(B)(3) FOR CLEANING REQUIREMENTS FOR EMPTY CONTAINERS.

CALIFORNIA PROP. 65 - THIS PRODUCT IS A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

R. KENNETH LEE
MANAGER, PRODUCT SAFETY

OCCURRENCE:
Purging and padding equip.

NAME: Nitrogen

FORMULA: N_2

MOLECULAR WEIGHT: 28.02

BOILING POINT: -320.4°F

MELTING POINT: n/a

VAPOR PRESSURE: n/a

FREEZING POINT: n/a

SOLID DENSITY: n/a

VAPOR DENSITY: n/a

AUTOIGNITION: n/a

FLASH POINT: n/a

EXPLOSIVE LIMITS: n/a

MAXIMUM ALLOWABLE CONC: n/a

DETECTABLE ODOR CONC: Odorless

PHYSICAL APPEARANCE: Colorless, odorless, inert gas

SPECIFIC GRAVITY: 1.0 with relation to air (Air is 78% N_2)

HAZARDOUS PROPERTIES: Even though nitrogen is a very safe, inactive gas, it has some inherent dangers since it is used so universally throughout the plant. Its prime use is for padding and sweeping of equipment that has, or has had, flammable organics in it. 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, MUST BE CHECKED FOR FLAMMABILITY AND SUFFICIENT OXYGEN. NITROGEN LINES, AS WELL AS TOXIC LINES MUST BE ISOLATED FROM THE VESSEL BEFORE ENTRY AND A CLEAN AIR SWEEP PROVIDED.

TREATMENT: Inhalation: Remove person from the oxygen deficient area. Administ r artificial respiration and oxygen if necessary.

G. Spill Prevention and Response

If an EDC spill occurs, this general procedure should be followed:

- Activate required warning devices (road signs, warning lights, etc.).
- Put on a Scott Air Pack.
- Isolate leak.
- Notify supervision.

If an EDC spill is collected in a drip pan, the tankerman will notify the Shipping Shift foreman who will call for the vacuum truck service for removal of the collected liquid.

H. Maintenance Procedures

The following safety procedures directly apply to the "A" Dock area. Refer to the PPG Safety Procedures and Bulletins manual for the following safety procedures: Scaffold Guidelines; Asbestos Work Practices; Blue Flag, Derail, and Rail Car Storage; Opening Vessels to Atmosphere; Vehicle Entry Permit; Roof Work Permit; Structural Change, Drilling and Evacuation Permit; Respiratory Protection Program; and the Lake Charles Hazard Communication Program.

1. Clearing Procedures

One of the responsibilities of the Lead Tankerman or Tankerman is to clear equipment and piping for maintenance work. There are a few general rules that apply no matter what is being cleared. The main thing is that the equipment or piping must be cleared so that maintenance workers are not subjected to unsafe working conditions. It must be remembered that the maintenance workers are not as aware as Tankermen are of how to treat various chemicals. They also do not have a complete understanding of plant operating procedures and piping systems.

Another very important consideration is locking of equipment and piping by the Lead Tankerman. The Lead Tankerman has the same responsibility toward locking 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 maintenance mechanics can work safely on equipment. One other thing that should be done when extensive piping systems are locked is to trace out the piping carefully for all locking locations. Do not depend on remembering all the block

valve locations. It is recommended that someone (another Tankerman) double check the locking of a complex piping system.

A third factor that must be considered in all cases is to make sure that it is possible to purge completely through a cleared piece of equipment or piping. Also, purges at low points must be possible to make sure these drains are not plugged.

The above discussion covers general considerations for clearing. However, there must be detailed written instructions covering the clearing of equipment and piping for EDC. The instructions must contain specific information about the hazard potential of the chemical. More complete information about EDC is given on the page that follows.

Clearing Procedures for Equipment Containing Non-Volatile Organics (EDC)

Hazards of Non-volatile Organics (EDC):

- Flammable.
- Vapors are toxic.
- Strong irritant to skin and eyes.
- Will cause severe skin dryness.

Treatment if Contact with Body:

- Wash thoroughly and remove contaminated clothing.

- If shoes, belts, billfolds, or any other leather goods are soaked with EDC, they should be thoroughly washed and allowed to dry before being used again.

- Apply skin cream to the affected area.

Protective Clothing Required:

- Fire retardant clothing.

Other Safety Precautions:

- Clearing should not be done when maintenance workers are in the area if at all possible.

- Only organic hoses in good condition should be used.

Clearing Procedures:

- Isolate equipment or line.
- Push (with N_2) all liquid into other process equipment if possible. Use Teflon-lined hoses. Drain to a liquid dump box if the liquid cannot be pushed into other process equipment. Do not drain any quantities of EDC or contaminated water to the sewer.
- Check all bleeds and drains to make sure a purge is coming out.
- Tag out.

Special Maintenance Worker Precautions:

- Break loose bolts of a flange first on the side away from the worker.

General Procedures:

- The tank or vessel will be emptied and all valves will be locked and tagged.

- The vapor contents of the tank will be purged with an inert gas.

- Blinds will be inserted in all connecting lines.

- The equipment will be steam purged where possible to vaporize and remove all flammable materials. If steam cannot be utilized, an inert gas will be used.

- After all flammables are gone, purge the equipment with plenty of air.

- The equipment will then be checked with an explosion meter before work is begun. The necessary welding and burning permits must be issued. See the Employee's Manual of Accident Prevention for complete rules.

- If entry into the vessel is required, the vessel must be also checked with an oxygen meter and a vessel entry permit issued. Refer to the Employee's Manual of Accident Prevention for complete rules to be followed for vessel entry.

- Safety belts and safety lines will be required in top exit tanks.

- A manway watch is required while someone is in the vessel.

2. Lock Procedures

a. Purpose

To protect employees from injury caused by the uncontrolled release of energy.

b. Scope

This procedure covers the servicing and/or maintenance of machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees.

c. Application

This procedure applies to the control of energy during servicing and/or maintenance of machines and equipment. Normal production operations are not covered by this procedure but are covered by unit standard operating procedures. Non-routine operation activities are covered by this procedure.

d. Procedure

The basic principle of this procedure is the requirement that all energy sources that could adversely affect employees doing a job will be locked in a safe position by the affected employees.

(1) When employee(s) are working on or around equipment that normally falls under their control, all energy control points which, if opened or activated, could result in harm to

employee(s) must be locked out by the affected employee(s) with personal locks. This shall be done in accordance with a written standard operating procedure. Where a standard operating procedure does not exist for a specific job, the employee(s) performing the work shall list the energy control points associated with the job on a "Job Ready" tag, sign and date the tag, and attach the tag to a prominent control point associated with the job.

(2) All other work performed on or around equipment that has the potential for an uncontrolled release of energy will be done in accordance with the following:

(a) The equipment owner shall:

i) Ensure equipment has been shut down, isolated, blocked, cleared, cleaned, etc.

ii) List the energy control points associated with the job on a "Job Ready" tag.

iii) Control all job related energy sources by placing them in a safe condition and locking with an Owner Lock (i.e., valves, breakers, blinds used as isolation points, etc.).

NOTE: All Owner Lock(s) isolating electrical energy sources shall have a "Do Not Operate" tag attached. The tag shall be signed and dated by the Equipment Owner.

iv) Place the key(s) to the Owner Lock(s) used to isolate energy sources in a Lockout Box. (A Lockout Box will not be used if the Equipment Owner chooses to have all employees working on the job place a Personal Lock on each control point.)

v) Verify that the equipment will not operate (push start button, etc.).

NOTE: Anyone that could be affected by this action shall be notified in advance.

vi) Sign, date and attach the "Job Ready" tag to the Lockout Box. If a Lockout Box is not used, the "Job Ready" tag shall be attached to a prominent control point associated with the job.

(b) The supervisor of the employee(s) performing the work (e.g., Maintenance Supervisor/Field Engineer) shall provide appropriate Job Safety Instruction (i.e., use of personal protective equipment, scaffolding, etc.) and sign and date the "Job Ready" tag indicating acceptance of the job.

(c) All employees working on the job that are protected by a controlled energy source (including Supervision and Staff Personnel) <u>are required to</u>:

i) Review the "Job Ready" tag and <u>personally check</u> each control point.

ii) Place their Personal Lock on the Lockout Box. If the Equipment Owner has chosen to not use a Lockout Box, the Personal Locks will be placed on each control point.

NOTE: All Personal Lock(s) isolating electrical energy sources shall have a "Do Not Operate" tag attached. The tag shall be signed and dated by the employee applying the Personal Lock.

iii) Verify that the equipment will not operate (push start button, etc.).

NOTE: Anyone that could be affected by this action shall be notified in advance.

(d) When the equipment repairs, adjustments, etc. are completed, the supervisor of the employee(s) performing the work shall initial the job complete box and enter the date and time on the "Job Ready" tag and notify the Equipment Owner.

(e) The Equipment Owner shall verify completion of work.

(f) At the completion of the job, all locks will be removed.

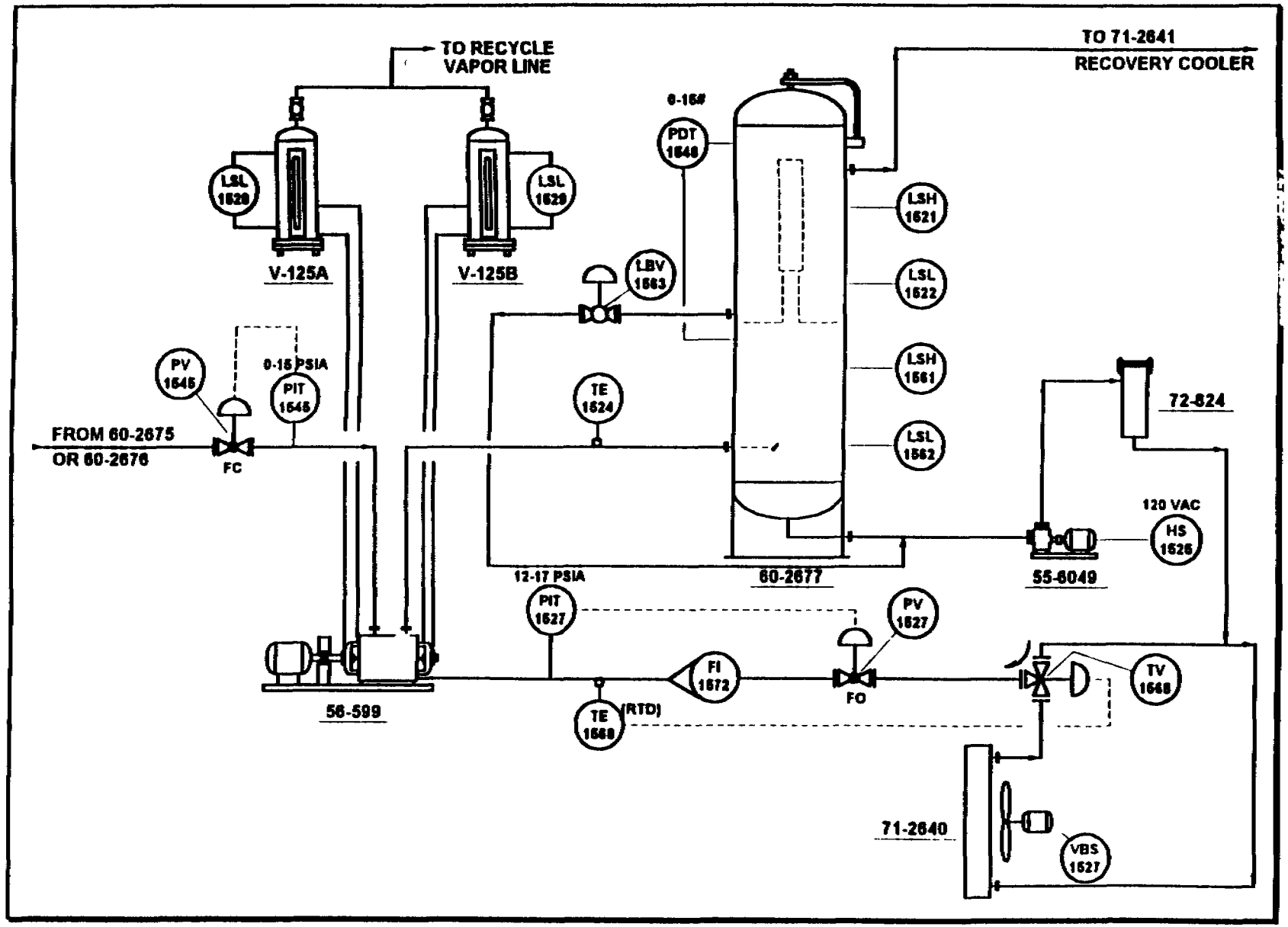

Figure 3.b - Bed Desorption System

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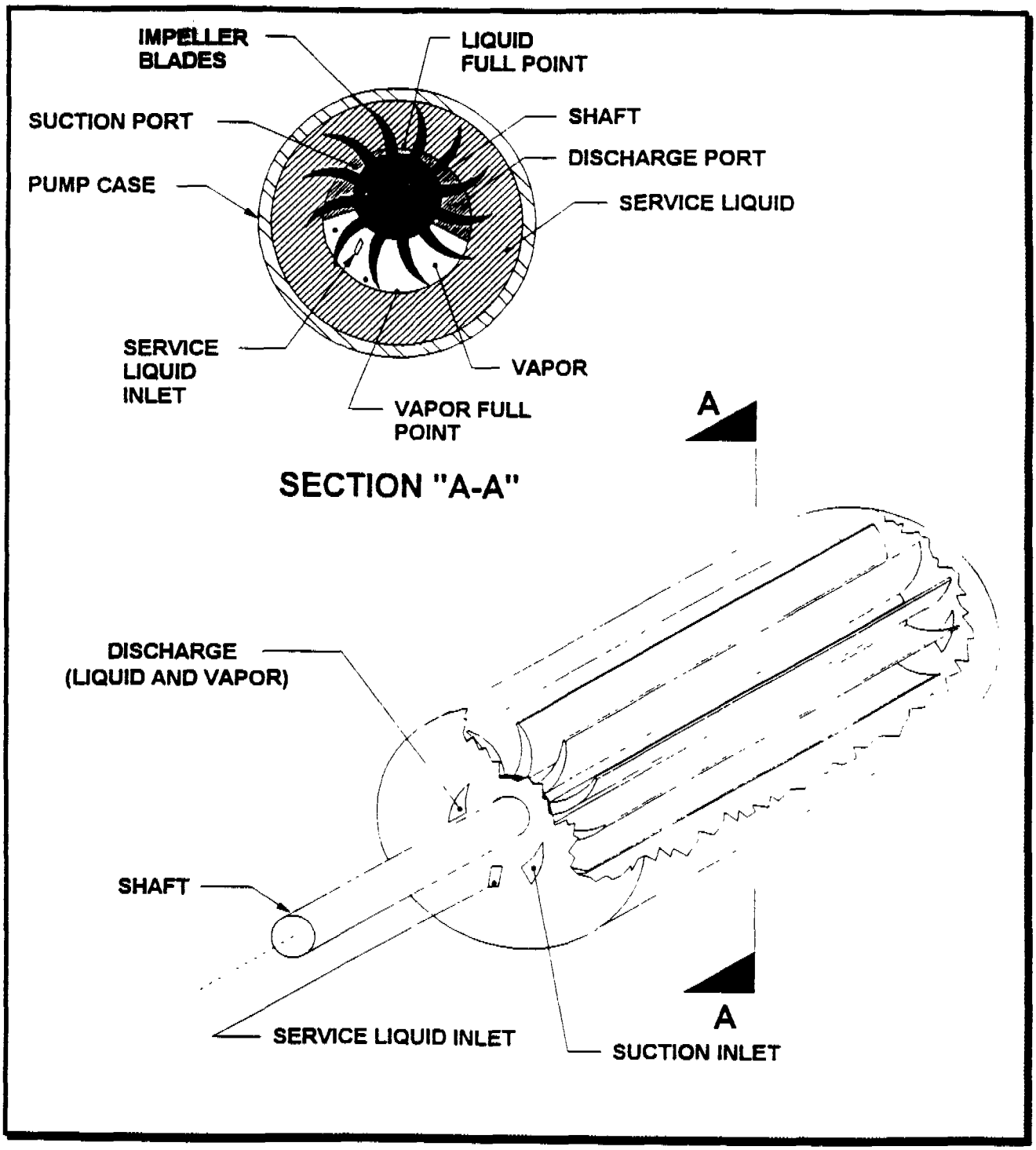

Figure 3.b.1.1 - Vacuum Pump (56-599) Level Detail

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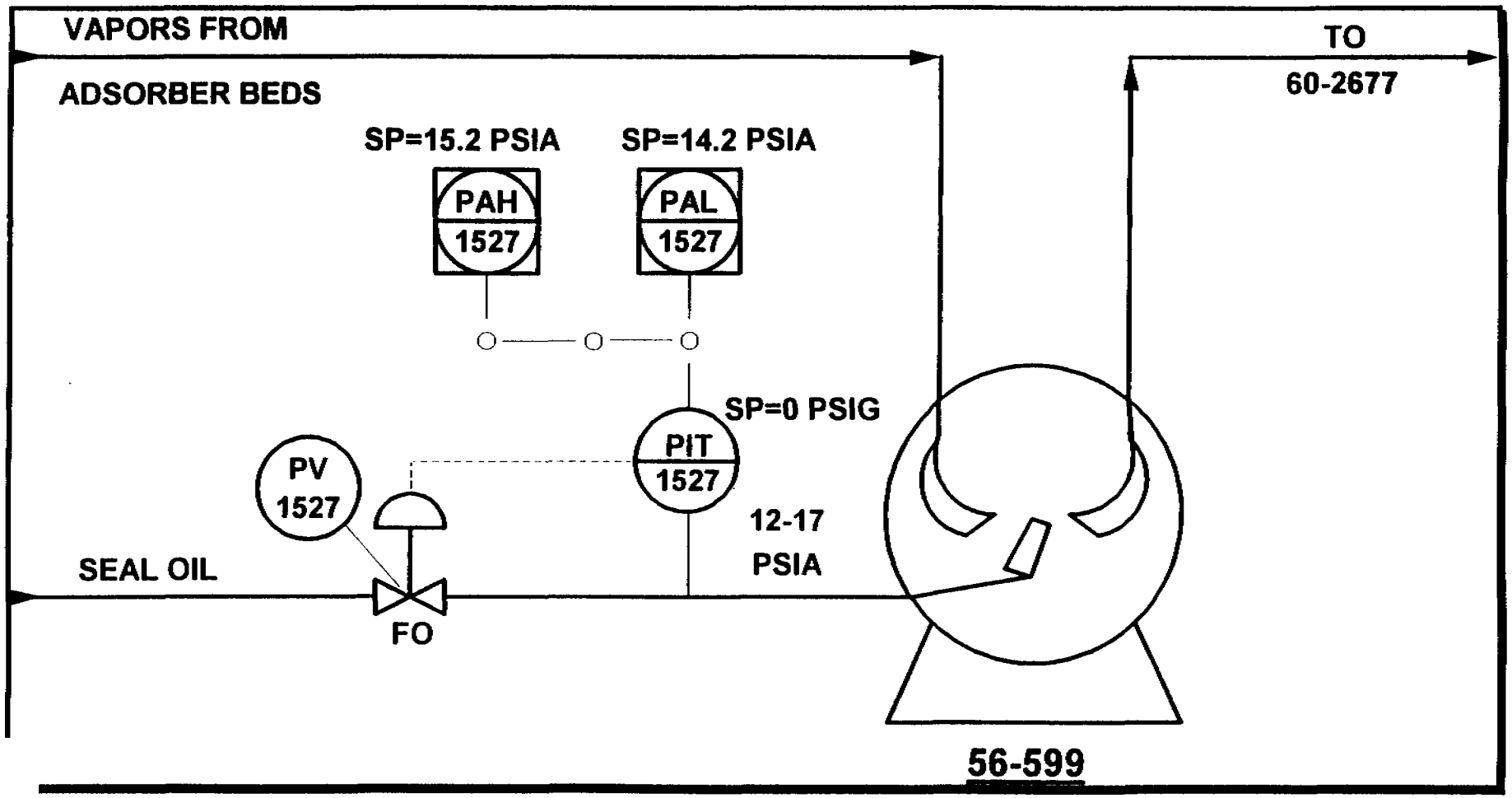

Figure 3.b.1.2 - Vacuum Pump (56-599) Level Control

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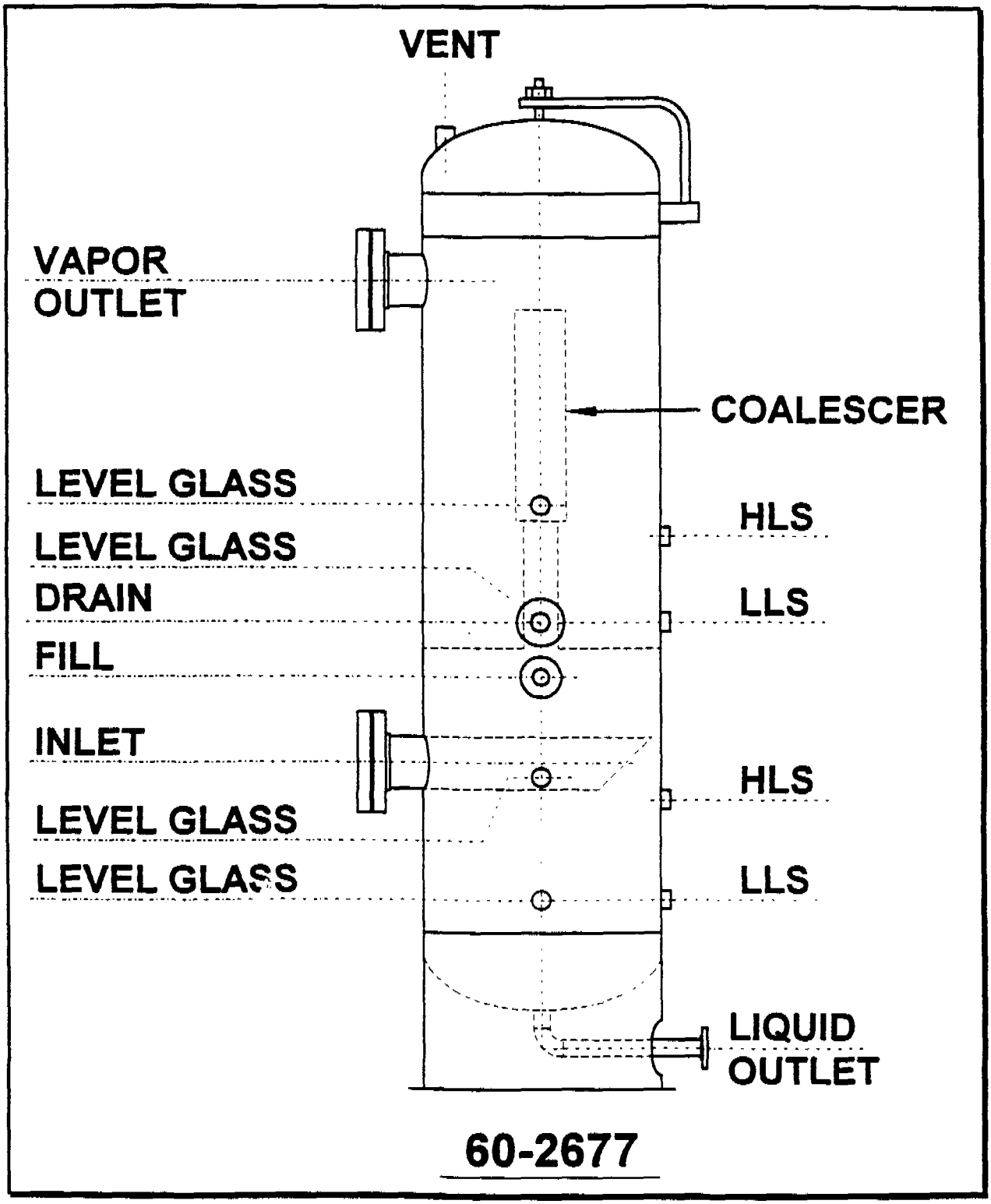


Figure 3.b.2 - Oil Coalescer

SL 085524

the suction port. The pump level is correct when the pressure at the service liquid inlet is at a vacuum. Addition of service liquid increases the pressure to 0 psig. If too much is added, that area will become pressurized as the area is sealed and the volume is fixed. If too little service liquid is added, the area will remain under a vacuum.

(2) EDC/Oil Separator (60-2677)

The EDC vapor and the vacuum pump seal oil are separated in the EDC/Oil Separator. This separator is equipped with a coalescer for oil recovery. Oil is knocked out in the separator and returned to the vacuum pump. The EDC vapor and back-purge nitrogen gas flow through the coalescer and enter the vapor condensing and storage system.

The oil coalescer removes greater than 99% of any oil droplets that could be carried over in the vapor stream leaving the knock-out section of the EDC/Oil Separator. See Figure 3.b.2.

(3) Oil Cooler (71-2640)

An oil cooler removes the heat of compression generated in the vacuum pump. This air-cooled exchanger is controlled by bypass so that the operating temperature of the vacuum pump is above the temperature of condensation for EDC and below the temperature of EDC fractionation. An RTD (TE-1568) is located downstream

of the oil-cooler bypass valve and ahead of the liquid supply port on the vacuum pump. This RTD provides feedback to the bypass valve.

The oil cooler is carbon steel. A 3 HP motor drives the cooling fan.

(4) Oil Circulation Pump (55-6049)

An oil circulation pump provides constant oil flow through the vacuum pump to maintain a liquid-ring seal required for compression in the liquid-ring vacuum pump. An oil filter is provided at the outlet of the pump to remove solid particles which might accumulate in the oil. The oil circulation pump is ductile iron. The filter at its outlet is carbon steel. The filtering material is polyester for 10 micron filtration.

c. Vapor Condensing and Storage System

The vapor condensing and storage system recovers the EDC from the adsorption regeneration system. The EDC is condensed in an air-cooled exchanger and the condensed EDC is stored in a recovery tank until it is pumped out by plant operating personnel. See Figure 3.c.

(1) EDC Recovery Cooler (71-2641)

The EDC recovery cooler is an air-cooled heat exchanger. A concentrated stream of EDC and nitrogen from the vacuum regeneration system enters the cooler where

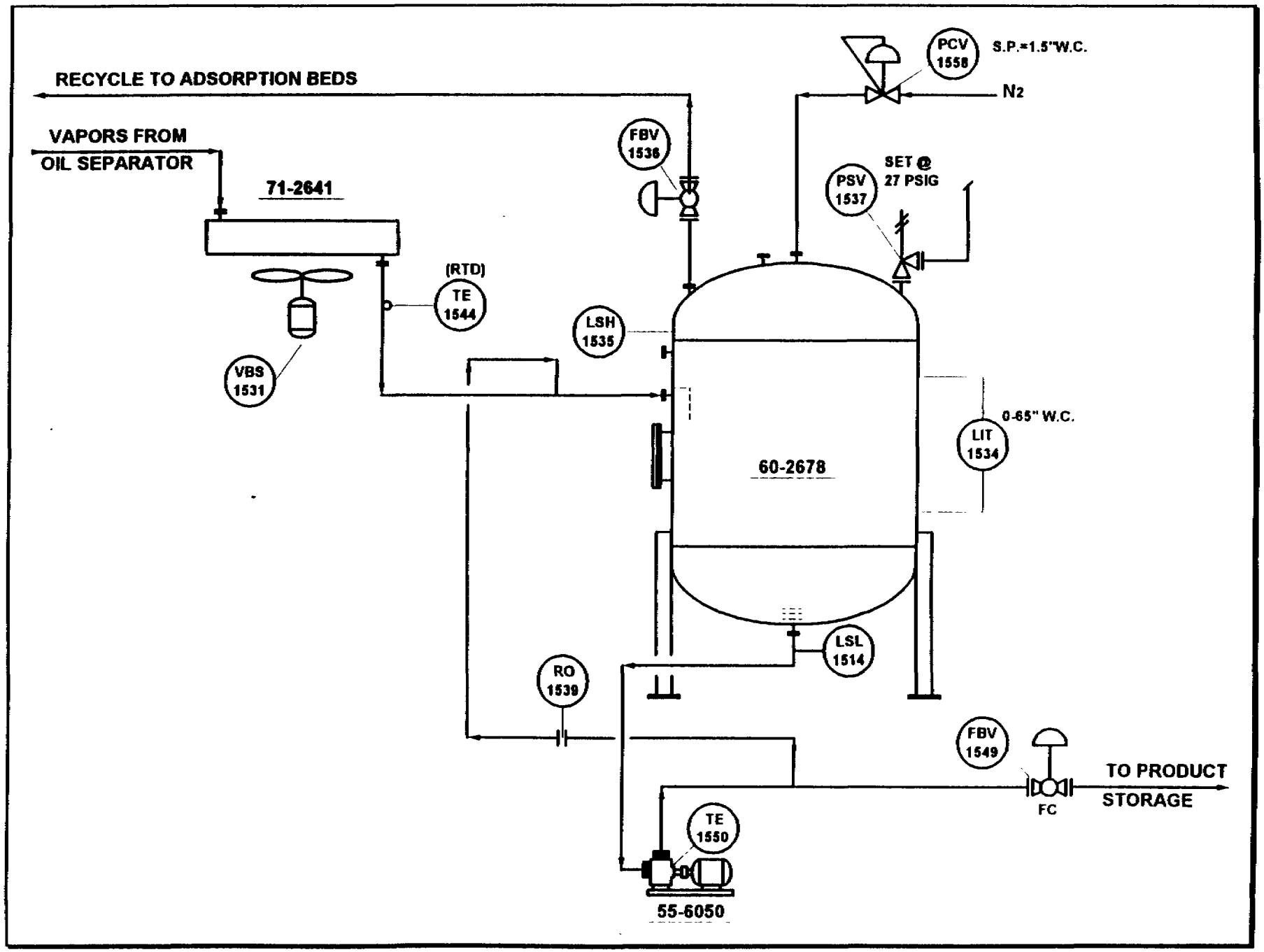


Figure 3.c - Vapor Condensing and Storag System

SL 085527

condensation of the EDC occurs. The two phase flow of liquid EDC and EDC-saturated nitrogen discharge from the condenser and flow to the EDC recovery tank. The EDC recovery cooler is carbon steel with a 7.5 HP motor.

(2) EDC Recovery Tank (60-2678)

Recovered EDC liquid is stored in the 1000 gallon EDC recovery tank. The vapor stream of EDC-saturated nitrogen leaves the EDC recovery tank and is returned to the on-line adsorber. Plant operators may pump-out the tank when vessel loading is not in progress. The tank is equipped with a level transmitter to measure level and alarm at 90% and shut down operation of the SVRU and barge unloading at 95%. A high level switch also indicates high high level in the tank and causes a shut-down. A low level sensor in the pump-out line at the bottom of the tank disables the EDC transfer pump to stop unloading operations and prevent the running of this pump.

(3) EDC Transfer Pump (55-6050)

A mag-drive EDC transfer pump is used for return of the recovered EDC liquid to an EDC storage facility located in the dock area. Also, this pump will be used to pump the EDC to a truck if the EDC is contaminated. This pump is operated by the tankerman when product discharge is desired. A recycle line on the outlet of the pump returns a fraction of the EDC liquid to the EDC recovery tank so that the recovered EDC may be sampled. The pump is

shut off when the level in the recovery tank is reduced to less than the low low level alarm. Additionally, the pump is equipped with a temperature sensor (TE-1550) to shut off the pump if it is run dry.

4. Electrical

a. Power and control for the following SVRU motors are provided via MCC 34000 which is located in the Control Room:

MCC Ckt	Equipment #	Equipment Name
34002	50-7752	EDC Recovery Tank Pump Driver
34026	50-7754	EDC Recovery Cooler Driver
34027	50-7752	Oil Circulation Pump Driver
34028	50-7753	Oil Cooler Driver
34029	50-7751	Vacuum Pump Driver

The starter for MCC Ckt 34002 is located in the Telemacanique section of MCC 34000. Starters for circuits 34026 through 34029 are located in the General Electric 8000 line section of MCC 34002.

b. Self Regulating heat tracing wiring is provided for freeze protection of the Knock-Out Pot 60-2698.

c. Lighting for the SVRU and Analyzer building area is individually photocell controlled.

d. Panel LBA (100A main, 120/208V, 3 phase) is located in the Analyzer Building. It provides power for the camera receivers, heat tracing system and local area lighting.

5. Utilities and Tie-ins

a. Nitrogen

The following use Nitrogen from the 80# plant header when loading (the 80 psi N_2 is let-down to the needed pressures):

- Nitrogen is supplied to control at 8% oxygen in the vapor loading line.
- Nitrogen is used in the SVRU for purging the adsorption bed after it cycles. (This is intermittent during the period that the SVRU is on line.)
- During loading, if nitrogen is not used for inerting, a small purge is maintained through FT-1016.
- When in the shutdown mode, a 4-inch water pressure is maintained on the vent recovery header and the adsorber beds through PCV-1017.
- Nitrogen is supplied to ST-1 and ST-2 as pad gas for the liquid displaced during loading.

The nitrogen supply from the plant's 6-inch main header line contains a 4-inch take-off which contains a new flow meter (FE-6003). The 4-inch line connects to an existing 4-inch line to the dock area. The 4-inch line contains a 2-inch take-off line that connects to an existing 2-inch line supplying the dock area. This nitrogen system has piping options (jumpovers) for equalization of the nitrogen system between the 4-inch and 2-inch headers. The new tie-ins are installed to supply the SVRU and inertion system in addition to the existing lines supplying ST-1 and ST-2 and other small vessels. Refer to drawings 27A-10043, 11A-10029, and 11A-10030 in Appendix A.

b. Instrument Air

Instrument air is used for operation of automated control valves and purging of junction boxes.

Instrument air is supplied to the following control valves (not contained on the SVRU skid): FV-1051, SDV-1006, SDV-1050, SDV-1028, and FV-1016. A 1.5-inch instrument air line supplies control valves on the SVRU skid. If the instrument air supply is lost, barge/ship loading will stop and the SVRU will be shutdown.

c. Water

Potable water is used for safety showers and eye washes. This is also used for hose connections.

d. Steam

Steam is not used at "A" Dock.

e. Electricity

Electricity is used for motor drivers, lighting, heat tracing, and electrical instrumentation. See Section IV.B.4 for a detailed description of electrical users.

SL 085532

C. Startup Procedures

The SVRU and loading and vapor handling pre-startup procedures consists of the following:

- Loading and vapor collection pre-startup which consists of testing shutdown valves, oxygen analyzers, and Coast Guard required alarms. Testing must be completed within 24 hours of startup.

- Marine vessel inspection and piping alignment.

- Warm-up of the SVRU.

- Cycling of the SVRU.

The TEST MODE, which includes oxygen analyzer calibration and instrument testing, must be done before warmup of the SVRU. Instruments that are not calibrated and/or tested during the TEST MODE will be subject to periodic calibration and testing. The schedule for this testing/calibration shall be one year for valves and six months for transmitters, gages and other instruments. The oxygen analyzers must be calibrated within 24 hours of startup. Warmup and cycling of the SVRU will follow the TEST MODE. The SVRU must cycle at least one time prior to loading the barge. The following sections describe the pre-startup and startup procedures in detail.

1. SORBATHENE Vapor Recovery Unit

The SVRU has been designed for an automated start-up. The SVRU Program will perform shutdowns related to process control or the SVRU can be shut-down on request of the tankerman as part of the

normal operating sequence or in response to an emergency. The automated start-up will consist of several steps initiated by the tankerman. The program will then run through the sequences required to complete each step and then continue on the next step. Should the step be unsuccessful, the program will inform the tankerman of the problem and shut-down. See Appendix G for a complete SVRU operational procedure and system detail.

2. Pre-loading, Hookup, and Alignment Procedures

The following steps shall be performed by the Certified Tankerman or by the Tankerman under the direction of the Certified Tankerman.

Certified Tankerman/Tankerman:

a. Within 24 hours prior to each barge/ship loading, system tests are to be conducted as follows:

(1) The following steps must be taken to test the liquid loading shutdown valve (SDV-1050), the vapor recovery shutdown valve (SDV-1006), and critical shutdown alarms as mandated by Coast Guard regulations:

(a) Fully close the manual valve on the dock (MV-1052) located upstream of SDV-1050. This valve is equipped with open and closed limit switches and must be fully closed in order to begin the TEST MODE sequence. To run the TEST MODE, the LOADING MODE switch (HS-1034) must be in the LOAD MODE. Also, the SHIPPING MODE switch (HS-1021) must be in the barge mode. The

electrical level switch to the barge must be disconnected to run the TEST MODE. HS-1022A and HS-1022B must be reset to run the TEST MODE. The SVRU must not be in operation to run the TEST MODE.

(b) Place the TEST MODE keylock switch in the control room (HS-1035) in the ON position. This will automatically close the EDC liquid flow control valve (FV-1051). At the same time, a high high level shutdown alarm (LAHH-1001) will be generated and the green strobe light at the dock will turn on.

NOTE: In order for this alarm to be generated, the level switch plug cannot be attached to the receptacle on a barge. That is, there must be an open circuit for this alarm to be generated.

The alarm can be acknowledged from the CRT screen. This will silence the horn located at the dock, but the strobe light will remain ON until the TEST MODE keylock switch is placed in the OFF position.

(c) Press the START EDC LOADING pushbutton (HS-1022C) located in the control room. SDV-1006 and then SDV-1050 will be automatically opened in sequence.

(d) A watchdog timer will generate an alarm if positive indication of opened status (ZSO) is not received within 10 seconds.

(e) If the shutdown valves opened successfully, the test solenoids at PIT-1004 will then be automatically positioned to simulate a high high pressure alarm.

(f) It will be verified that a high high alarm was received and that the valves SDV-1050 and SDV-1006 closed completely within 10 seconds.

(g) The following shutdown alarms will then be consecutively tested in similar fashion:

PALL-1004	Low low dock vapor line pressure
PAHH-1005	High high dock vapor line pressure
PALL-1005	Low low dock vapor line pressure
LAHH-1013	High high knockout pot level

If at any time the alarm cannot be successfully generated, an alarm message will appear on the CRT. The TEST MODE sequence will proceed to the next alarm. However, actual loading will not be allowed until a successful completion of the TEST MODE sequence is made.

(h) After successful completion of the TEST MODE sequence, the TEST MODE keylock switch (HS-1035) should be placed into the OFF position. The

manual valve on the dock (HV-1052) must be fully opened before loading can begin, after the loading hose is connected.

(2) The oxygen analyzer will be automatically calibrated in the TEST MODE. The flashing light indicates the duration of the automatic calibration. Failure of the analyzer system to calibrate properly is indicated by failure lights (steadily off) and an alarm at the CRT and prevents startup until corrected. The light will stay steadily lit if the calibration is successful.

NOTE: When the STOP EDC OPERATION switch (HS-1022A or HS-1022B) is pressed, this signals the end of the loading operation. If loading must be restarted after either HS-1022A or HS-1002B are pressed, the TEST MODE must be rerun. Normally, HS-1022A or HS-1022B should not be pressed until loading has been completed and hoses are purged. During loading, HS-1022A or HS-1002B should only be used for emergency stop.

b. Spot the barge that is to be loaded or unloaded (normally this is performed by contract tug).

c. Obtain the shore tank number from the Shift or Day Foreman. Check with the Shipping Shift Foreman if a surveyor is needed to sample the EDC from the tank prior to filling a ship or customer barge.

NOTE: Samples are not normally required for PPG terminal destinations; sampling of shore tanks, when necessary, is usually done before arrival of the barge or ship.

d. Determine the vessel pressure allowable, vessel PSV setting, and vessel vapor piping pressure drop for the intended flows. Confirm the corresponding vapor recovery control and PSV set points based on applicable charts and log sheets (see attached). The loading rate must be limited to no more than the rate which results in a pressure at the vessel of 80% of the lowest pressure relief valve setting.

e. Place the gangplank on the barge and secure.

f. Complete preloading conference with person in charge (PIC) of ship.

g. Complete preloading inspection of barge (refer to 46 CFR 151.45-5). Close the sea cock valve and pump stern rake if necessary. Call the VC-II Vinyl Storage Operator to obtain tank availability and for sample clearance; then tag the appropriate valves.

h. Complete the Declaration of Inspection form for barges. In the case of ships, complete the Declaration of Inspection with the PIC before hooking up.

i. For barges, check and apply all warning signs and signals (see 46 CFR 151.45-2 and 151.45-9). Using the Certificate of Inspection found in the document tube on the barge, determine

PRELOADING SETTING OF ALLOWABLE FACILITY VAPOR CONNECTION PRESSURE

(REF 33 CFR 154.814(c))

EXAMPLE WORK SHEET:

	VALUE (EXAMPLE)	DATA SOURCE
MAXIMUM ALLOWABLE LOADING RATE FOR VESSEL, TPH	600	(1)
VESSEL PSV SETTING, PSIG	1.50	(1)
PRESSURE SHUTDOWN SWITCH CALCULATION:		
(A) VESSEL PSV SETTING X 80%, PSIG	1.20	
(B) VESSEL VAPOR PIPING PRESSURE DROP, PSI	0.08	(2)
(C) VAPOR HOSE & CONNECTIONS PRESSURE DROP UP TO SHUTDOWN PRESSURE SWITCH, PSI	0.02	(3)
NET VALUE OF (A) LESS (B) LESS (C), PSIG	1.10	

CONFIRM THAT NET VALUE IS GREATER THAN SHUTDOWN SET POINT OF 0.7 PSIG; OTHERWISE, LOADING CANNOT PROCEED UNTIL SUPERVISION IS NOTIFIED & SHUTDOWN SET POINT IS RESET LOWER.

DATA SOURCES:

(1) FROM VESSEL INFORMATION FROM PRELOADING CONFERENCE. EXAMPLE VALUES ARE FOR TYPICAL BARGES.

(2) FROM PRESSURE DROP VS FLOW GRAPH OR EQUIVALENT DATA FROM VESSEL INFORMATION FROM PRELOADING CONFERENCE. EXAMPLE DATA IS FROM ATTACHED GRAPH.

(3) FROM ATTACHED GRAPH OF PRESSURE DROP VS FLOW FOR VAPOR HOSE & CONNECTIONS UP TO PRESSURE SWITCH.

PRELOADING SETTING OF ALLOWABLE FACILITY VAPOR CONNECTION PRESSURE

(REF 33 CFR 154.814(c))

WORK SHEET:

	VALUE	DATA SOURCE
MAXIMUM ALLOWABLE LOADING RATE FOR VESSEL, TPH	_____	(1)
VESSEL PSV SETTING, PSIG	_____	(1)
PRESSURE SHUTDOWN SWITCH CALCULATION:		
(A) VESSEL PSV SETTING X 80%, PSIG	_____	
(B) VESSEL VAPOR PIPING PRESSURE DROP, PSI	_____	(2)
(C) VAPOR HOSE & CONNECTIONS PRESSURE DROP UP TO SHUTDOWN PRESSURE SWITCH, PSI	_____	(3)
NET VALUE OF (A) LESS (B) LESS (C), PSIG	_____	

CONFIRM THAT NET VALUE IS GREATER THAN SHUTDOWN SET POINT OF 0.7 PSIG; OTHERWISE, LOADING CANNOT PROCEED UNTIL SUPERVISION IS NOTIFIED & SHUTDOWN SET POINT IS RESET LOWER.

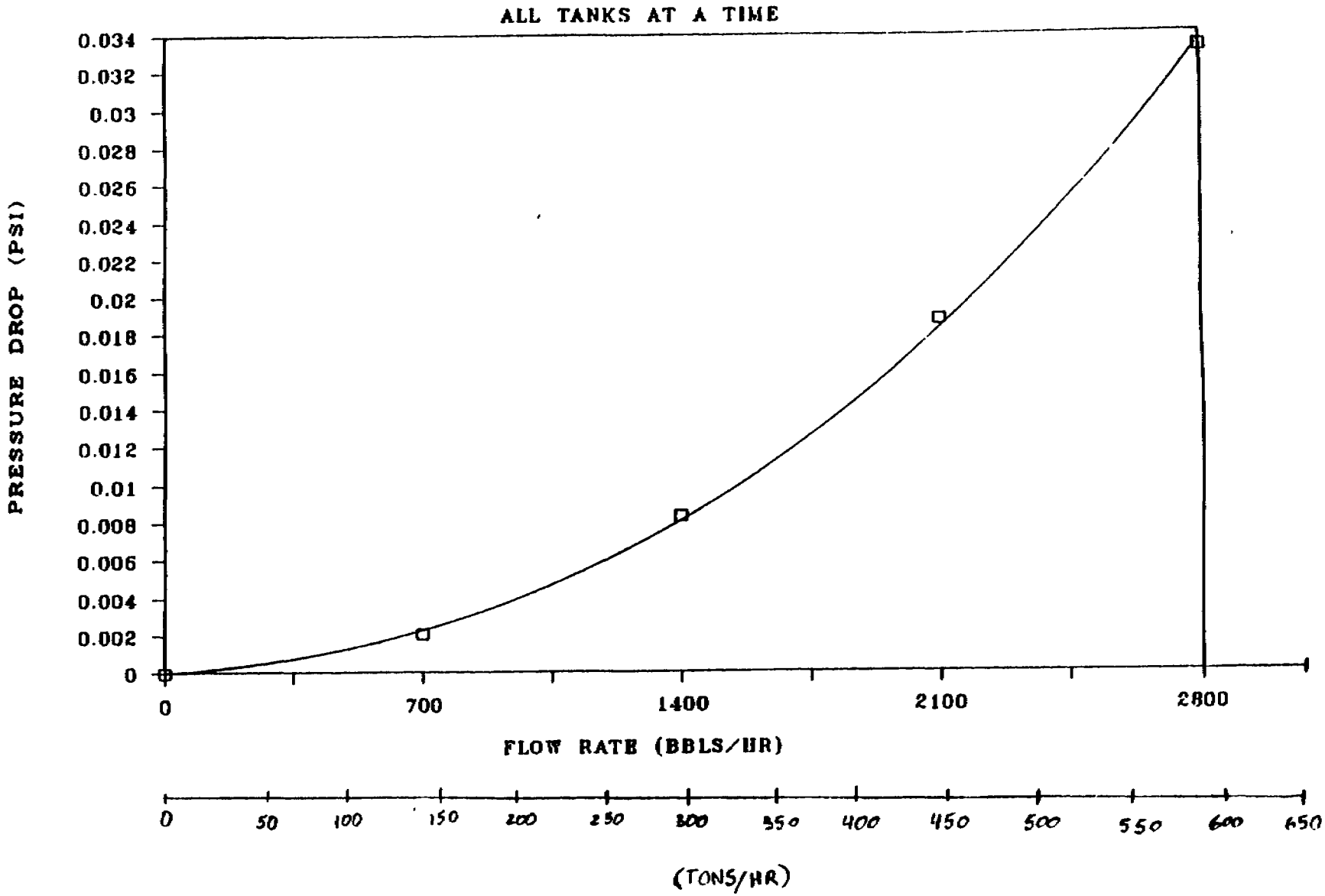
DATA SOURCES:

(1) FROM VESSEL INFORMATION FROM PRELOADING CONFERENCE.

(2) FROM PRESSURE DROP VS FLOW GRAPH OR EQUIVALENT DATA FROM VESSEL INFORMATION FROM PRELOADING CONFERENCE.

(3) FROM ATTACHED GRAPH OF PRESSURE DROP VS FLOW FOR VAPOR HOSE & CONNECTIONS UP TO PRESSURE SWITCH.

LIQUID TRANSFER RATE VS. PRESSURE DROP



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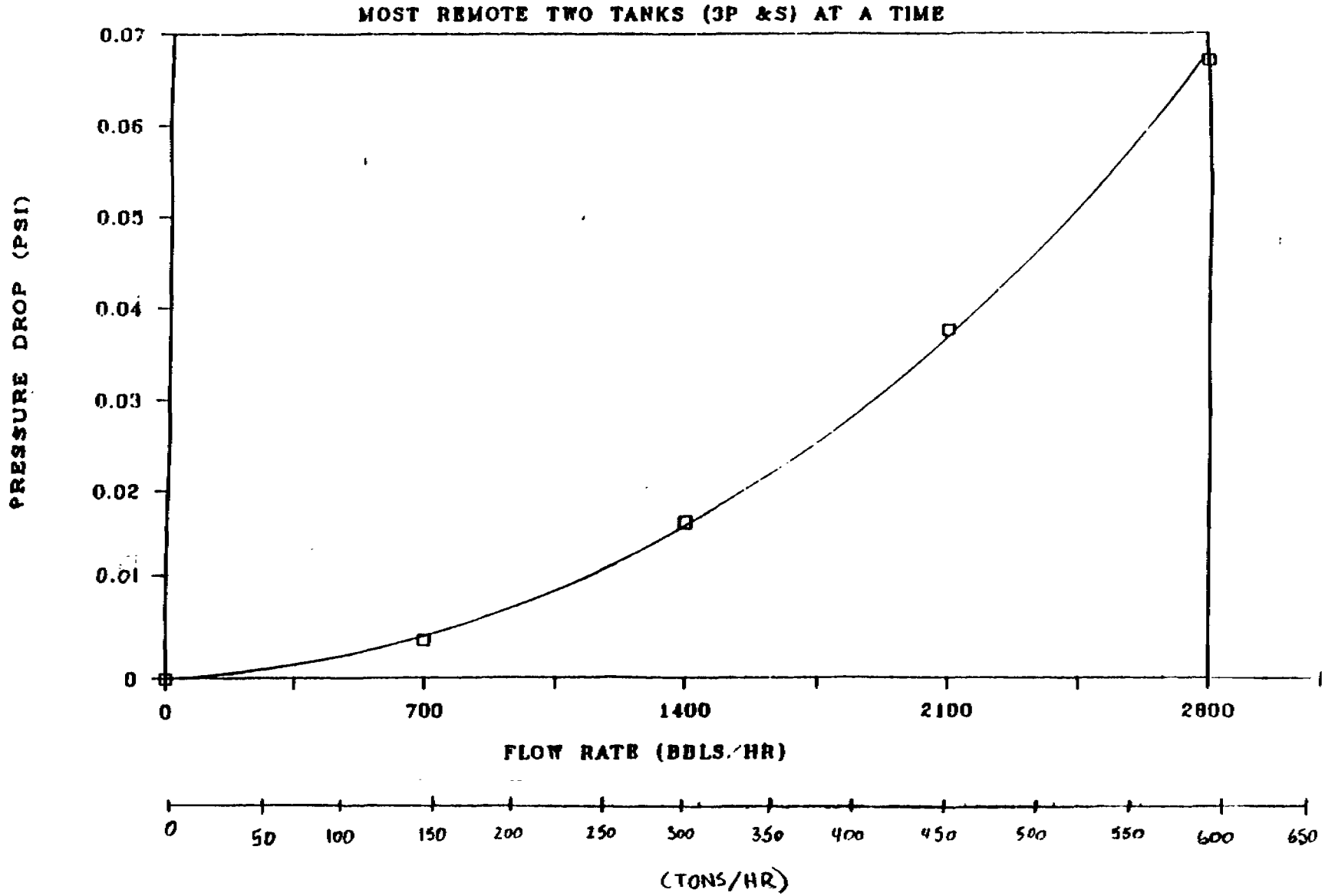
LIQUID TRANSFER RATE VS. PRESSURE DROP



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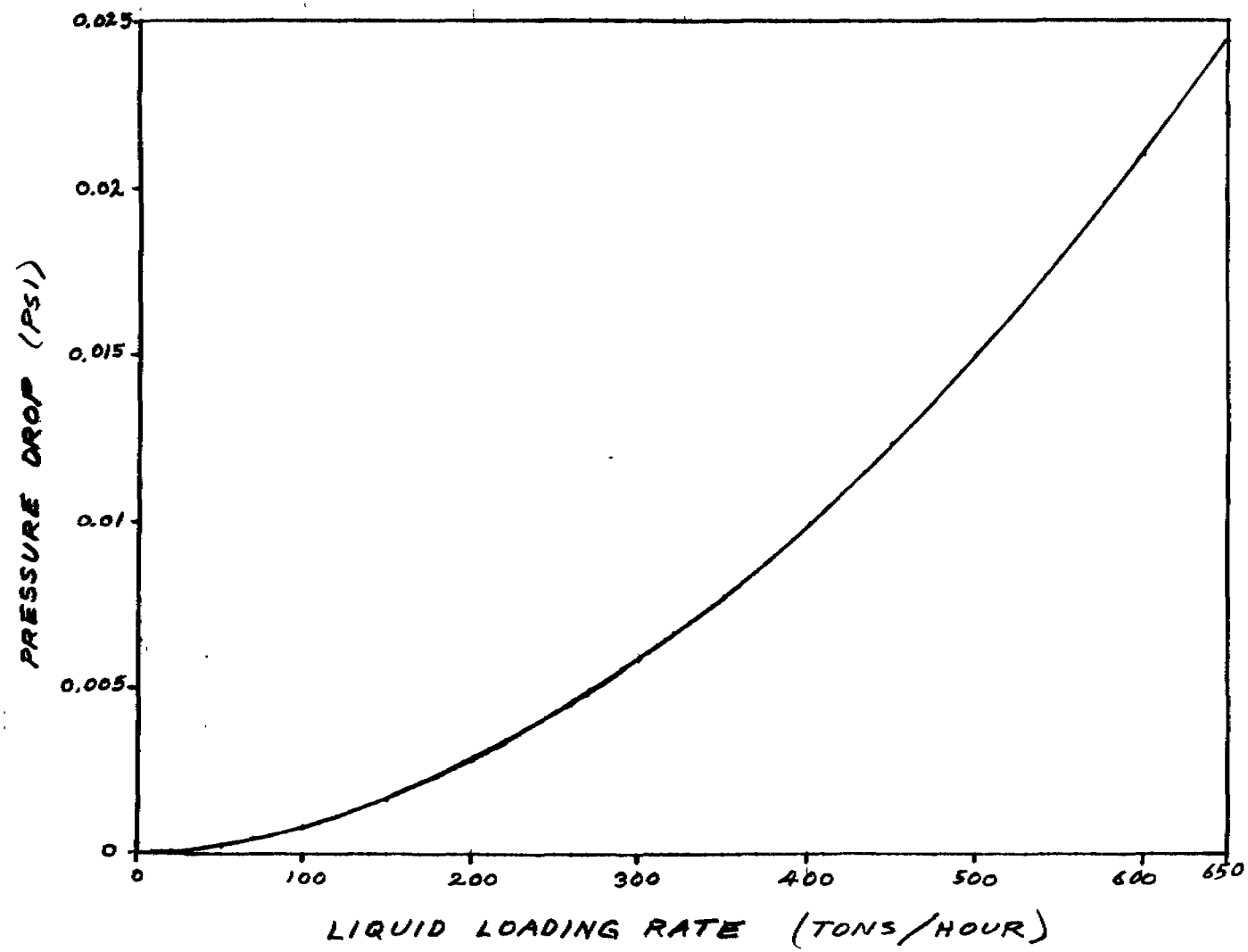
Note: This graph was used in the hydraulic calculations.

LIQUID TRANSFER RATE VS. VAPOR PRESSURE DROP IN HOSE AND PIPE CONNECTIONS



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EDC LOADING – VAPOR LINE HYDRAULICS:

SEGMENT----------		10–11 BARGE	11–12 CONNECT	12–13 HOSE	13–14 PIPE	14–15 PIPE
--FLUID DATA-GAS/VAPOR-		VAPOR>>>>>>>>>>>>>>>>>>>>				VAP+N2
FLOW RATE	1000lb/hr	2.03	2.03	2.03	2.03	3.70
TEMPERATURE	deg F	90	90	90	90	90
MOLECULAR WEIGHT		38.66	38.66	38.66	38.66	33.01
VISCOSITY @TP	cp	0.01687	0.01687	0.01687	0.01687	0.01687
K, Cp/Cv @T		1.4	1.4	1.4	1.4	1.4
Z,COMPRESSIBILITY		1.0	1.0	1.0	1.0	1.0
----SYSTEM DATA---						
COMPRESSOR DP (NOT APPLICABLE)	psi					
CONTROL VALVE DP	psi					
EQUIPMENT DP	psi					0.01
HOSE LENGTH	feet			40		
FACTOR TO PIPE				1.0		
PIPE LENGTH	feet		2	40	21	91
PIPE I.D.	inches		7.981	6.00	7.981	7.981
e, ROUGHNESS	feet		0.00015	0.00015	0.00015	0.00015
FITTINGS						
FLO THRU TEE	no.					1
BRANCH TEE	no.					1
45' ELBOW	no.			1		
90' ELBOW	no.				2	6
	L/D		0	0	0	0
GATE VALVE	no.		1		1	
GLOBE VALVE	no.					
CHECK VALVE	L/D					
OTHER, (SUM)	L/D					
REDUCTION,I.D.	inches		6.00			
ENLARGEMENT,I.D.	inches			7.981		
ENTRANCE,K	value					
EXITS,K	value					
OTHER,SUM K	value					
---CALCULATIONS---						
SPEC GRAV (vs air)			1.33	1.33	1.33	1.14
FLOW RATE	mmscfd		0.47847	0.47847	0.47847	1.02031
DENSITY @ TP	lb/ft3		0.10	0.10	0.10	0.08
VELOCITY	ft/sec		16.3	28.9	16.4	34.9
MACH NUMBER			0.02	0.03	0.02	0.03
REYNOLDS NUMBER			95162	126581	95162	173269
(FACTOR 1)			0.09205	0.08989	0.09205	0.08750
(FACTOR 2)			0.14454	0.14202	0.14454	0.13717
FRICTION FACTOR			0.01914	0.01870	0.01914	0.01751
(L/D SUMMATION)			8.00	16.00	48.00	200.00
(K SUMMATION)			0.57	0.19	0.00	0.00
EQUIVALENT LENGTH	feet		27	53	53	224
PIPING DELTA P ***	psi	0.080	0.002	0.018	0.004	0.066
SEGMENT DELTA P	psi	0.080	0.002	0.018	0.004	0.076
PIPING PRESSURE:						
UPSTREAM	PSIA	15.24	15.16	15.16	15.14	15.14
DOWNSTREAM	PSIA	15.16	15.16	15.14	15.14	15.06

MIN @ RECOVERY UNIT = 10" W.C. = 15.06 PSIA
MAX @ BARGE = 1.0(MIN)*80% = 0.8 PSIG = 15.50 PSIA > 15.24 PSIA
SHUTDOWN SET PT = 0.8 PSIG – (DP,10–14) = 0.70 PSIG
NOTE: DELTA P IS FOR REMOTE BARGE PIPING PER TYPICAL BARGE DATA.

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the number and type of fire extinguishers to be used on the barge.

(1) Ensure that the barge is certified to carry EDC per the Certificate of Inspection.

(a) Verify the U. S. Coast Guard (USCG) expiration date on the certificate. The barge cannot be loaded if the expiration date has passed.

(b) In the case of ships, the ship's PIC is responsible for vessel compliance.

j. General procedure for barge hose connects is below. A full face Comfo II or Airline mask must be worn while installing and removing hoses.

(1) Remove blind flanges off the ends of both the liquid and vapor hoses.

(2) Hook up both hoses to the barge. Verify that the insulating flanges are not shorted.

k. Before a barge's overfill system is connected to the shore system, the total connected inductance and capacitance of the barge overfill system must be determined. In many cases, these values will be marked on the fixed male connector for the barge's overfill system. If these values are not marked, they must be determined by measurement. Once the barge overfill system inductance and capacitance are known, they should be compared to the maximum allowable values marked on the high

level system junction box located on the dock (EJB-0657). This junction box will have a nameplate indicating the maximum allowable inductance and capacitance for the barge's overfill system. If the actual vessel values exceed the allowable values marked on the nameplate, the barge's overfill system should not be connected and loading should not proceed. If the vessel values are less than the allowable, proceed to hook up the electrical cable for the tank high level switches on the barge. (This is not required for ships.)

NOTE: Per Coast Guard Regulation 154.810(g), no ground cable hookup is to be made.

l. The high level switch in each barge vessel compartment must be tested after the electrical cable is connected. To do this, the Certified Tankerman must pull up the rod on each switch until an alarm and shutdown is obtained. The Tankerman will acknowledge the alarms. If any level switch does not work, barge loading cannot begin.

m. Locate the STOP EDC LOADING OPERATION pushbutton (HS-1022B) on the handrail of the walkway between the dock and shore. Make sure the "mushroom" type pushbutton is pulled out.

NOTE: An additional STOP EDC LOADING OPERATION pushbutton (HS-1022A) is located in the control room.

n. Line up the barge piping. The PIC on the ship will line up the ship's piping.

o. Make sure the dock loading valve and vents on the loading hoses and piping are closed.

p. Line up the shore tank piping from the dock to the tank for both ships and barges. Check to be sure the tank has been gauged; then record the tank temperature. When loading a barge, be sure the stern rake is pumped out before transfer begins, if applicable.

NOTE: There may be input into ST-1 or ST-2 during loading.

3. Procedures for EDC Loading

In general, the Certified Tankerman should remain on the barge or dock during EDC loading. The Tankerman should proceed with off-barge control activities at the direction of the Certified Tankerman.

Certified Tankerman/Tankerman:

a. Confirm that there is an oil level in the EDC/Oil Separator and Seal Oil Pots and that EDC Recovery Tank is at an acceptably low level.

b. Turn the SVRU motor hand switches to AUTO.

c. To start the recovery unit, first push the vapor recovery unit START PERMISSIVE pushbutton (HS-1009) in the control room.

d. Put the SHIPPING MODE switch (HS-1021) in the control room in either the "BARGE" or "SHIP" mode, depending on which is to be loaded. For loading barges or ships, place the LOADING

MODE switch (HS-1034) in the control room the "LOADING" mode. The "UNLOADING" mode is to be used only when a ship barge or ship is to be unloaded back into the plant. Place the EDC STORAGE TANK SELECT switch (HS-1019) on the tank being pumped from.

NOTE: Before pushing the master control switch (HS-1570) the oil must be drained from the vacuum pump case. This must be done to insure that the oil level is not high in the pump before start up.

e. Go to the SVRU and turn the master control switch (HS-1570) ON. This will align the valves for warm-up of the unit and will start the vacuum pump motor, oil recirculation pump, EDC recovery cooler fan, and oil cooler fan. The nitrogen blanketing valve (SDV-1028) will close and nitrogen flow control valve (FV-1016) will begin fixed flow control of 25 cfm. This will also start the analyzer sample pumps. Make certain that the sample line temperatures are at 150° F. These line heaters are to be left on at all times.

f. When the oil temperature has heated up to the control point of 210° F, the vapor recovery beds will begin cycling.

g. When the vapor recovery unit has regenerated each bed at least once (about 20-30 minutes) and TV monitoring of dock is confirmed, barge loading is ready to start.

NOTE: To monitor the loading dock area, there are two identical Panasonic camera surveillance systems. The

systems are independent of each other. Each system comprises of the following major components:

B/W Camera	(model #WV-BL204)
Receiver	(model #WV-RC150)
Controller	(model #WV-CU101)
B/W Monitor	(model # TR-930B)

Monitors and controllers for both systems are housed in Control Panel CP-100 which is located in the South Terminal control building. The controller enables remote control of pan and tilt, zoom lens and receiver functions.

Tankerman:

(1) Before beginning loading, gauge and record the shore tank level.

Certified Tankerman:

(2) Verify all valve positions in the vapor line from the vessel tanks to facility vapor collection system (per 33 CFR 154.850 [c]) to assure a clear vapor path. Open header valve on barge and manual valve at loading hose. Make sure the liquid manual valve (MV-1052) is closed.

(3) Check pressure of barge and vapor hose/line at vapor line gauge PI-1003 at the dock. If less than -0.1 psig (vacuum) is measured, a nitrogen hose is to be hooked up to the barge at the nitrogen header (through PCV on

barge) and pressure raised to approximately 0 psig before proceeding. Barge loading cannot begin if less than -0.1 psig is measured. If more than the allowable positive pressure (approximately 0.75 psig) is measured, supervision is to be notified to arrange for manual venting to an acceptable range. Manual venting will be by a special procedure through the SVRU.

NOTE: Refer to Section 2.d for determination of flow limits.

Tankerman:

(4) Proceed to the control room and set the mass flow meter to deliver the required total amount of EDC to the barge/ship.

(5) Push the START EDC LOADING button (HS-1022C) located in the control room. The following will occur:

(a) The valve in the vapor line to the vapor recovery unit (SDV-1006) will automatically open subject to the following limitation: if pressure in the vapor line is greater than 0.1 psig, SDV-1006 will open to a throttle limit until pressure is bled down below 0.1 psig. At that point, the valve will open fully.

(b) The valve for the EDC liquid to the barge or ship (SDV-1050) will automatically open. This occurs only after the valve in the vapor line (SDV-1006) is fully open.

(c) The nitrogen flow control valve (FV-1016) will automatically switch from "FIXED FLOW CONTROL" to "FLOW CONTROL" cascaded with oxygen concentration.

NOTE: Normally, this results in a minimum controlled flow of nitrogen to the barge vapor line since the barges typically will have less than set point oxygen in them; if oxygen is greater than set point, nitrogen will be flow-controlled to reduce it to set point. The minimum controlled nitrogen flow is intended to be maintained even if the liquid EDC flow to the barge goes to zero, in order to keep a positive flow to vapor recovery.

(6) Set the flow controller (FIC-1051) on the liquid EDC at the target loading rates.

(a) Do not lower the loading rate set point below 250 tons per hour (TPH) with two pumps or 125 TPH with one pump in operation due to the pumping turndown limits.

(b) Do not set the loading rates above 600 TPH; there is a high flow alarm at 650 TPH.

Tankerman:

e. Proceed to the EDC loading pump and open the discharge valve.

Certified Tankerman:

f. Open the liquid manual valve (MV-1052) on the dock. Check the hose and dock area for leaks. Radio the Tankerman when the gravity flow is established and when it is time to turn on the pump.

Tankerman:

g. Start the EDC loading pump at the storage tank. If 125 tph is not achieved within 30 seconds, the pump will shut down. After the pump start, then check the pump for leaks and walk the pipeline checking for leaks. If leaks are detected, take appropriate shutdown action and notify supervision. The EDC loading pump can only be turned on at the pump.

h. Return to the control room and monitor the loading operation.

(1) Record the required operating data from the vapor recovery unit.

(2) Inspect the EDC storage tank pump system hourly for pump leaks, gauge and record the tank level, and record the tank temperature.

(3) Inspect the SVRU skid hourly for the following: knock-out pot level; EDC/oil separator oil level; seal oil pot oil

levels; and EDC Recovery Tank level. Note any excess noise from either of the fans or the vacuum pump.

Certified Tankerman:

i. Control flow to the tanks on the barge with on-board valves to keep the barge level. The person in charge (PIC) on board the ship is responsible for monitoring and controlling fill levels in ship tanks.

j. Adjust mooring lines on the barge during loading as needed. Continue checking dry (double hull) compartments for leaks throughout product transfer.

k. When the loading nears completion, instruct the Tankerman to reduce the flow to the barge/ship to minimum flow or stop the pump. The pump can be turned off either at the pump or in the control room by pressing HS-1030..

l. Top off the barge tanks evenly, using reduced flow and on-board valves.

m. Instruct the Tankerman to turn off the pump (if not already off). Close MV-1052.

Certified Tankerman and Tankerman:

n. Hook up the nitrogen hose to the liquid loading line (connection between SDV-1050 and MV-1052) and blow the EDC liquid line into the barge or ship. Close the flow control valve (FV-1051) by putting the controller (FIC-1051) on "MANUAL" from the

CRT in the control room, then close the liquid valve on the barge/ship and then close the valve on the end of the hose.

o. Close the barge/ship vapor valve. Hook up a nitrogen hose to the vapor line and purge the vapor line with nitrogen to the vapor recovery unit. Close the 6-inch valve on the end of the hose.

p. After clearing both lines, press the **STOP EDC LOADING OPERATION** button at the dock (**HS-1022B**). The **STOP EDC LOADING OPERATION** button (**HS-1022A**) in the control room may also be used. The stop button at the dock (**HS-10222A**) should be pulled out, while the control room stop button (**HS 1022B**) should be left pushed in

(1) This action will close the valve in the liquid line (**SDV-1050**) to the barge or ship and the vapor line (**SDV-1006**) to the vapor recovery unit.

(2) The nitrogen controller (**FIC-1016**) will be automatically converted back to a fixed flow controller, and nitrogen flow to the vapor recovery unit will be controlled at a fixed set point.

q. Disconnect the loading and vapor recovery hoses from the barge. Install blinds on the ends of each of the hoses. Disconnect electrical cables to barge level elements from barge.

r. When loading is complete, open MV-1052 and add a small amount of nitrogen to the liquid line upstream of SDV-1050 for liquid expansion purposes.

s. Close the discharge valve on the pump. Gauge and record barge tank levels.

t. Ensure that all barge cargo hatches, ullage hatches and dry compartment hatches are closed and secured for shipment.

u. Remove the gangway.

Tankerman:

v. Cycle the vapor recovery unit at least once to regenerate the beds after each barge loading . This should take approximately 30 minutes. For loading ships, it may be necessary to cycle the beds two more times to regenerate them. This will be determined experimentally after operations begin.

w. Shut off the vapor recovery unit by pressing the VAPOR RECOVERY SYSTEM SHUTDOWN button (HS-1024) in the control room or the master control switch (HS-1570) at the skid. This action will:

(1) Automatically shut off the nitrogen flow and turn off the four motors on the vapor recovery unit.

(2) Automatically open a nitrogen valve (SDV-1028), keeping 4 inches water pressure on the pipeline to the vapor recovery unit and on the vapor recovery unit itself.

(3) Automatically position the valves to the absorbers to be open and the vent valves from the absorbers to be closed.

(4) Automatically stop the three analyzer sample pumps.

x. Before leaving the dock area, gauge the shore tank and record the levels. Turn off all strobe lights on the dock by activating idle button on computer. Complete the Solvent Barge Loading and Inspection Report. Send the top copy to the laboratory and the remaining two copies to the Plant A Shipping Office. Send the Declaration of Inspection form to the Plant A Shipping Office.

y. Secure the boom line to the dock, police the dock and lock the gate.

D. Shutdown Procedures

1. SD-1, Loading and Vapor Collection Shutdown

A stop load button is located on the handrail on the NW side of the dock (HS-1022B) and in the control room (HS-1022A). Manual shutdowns executed with the stop load button and automatic shutdowns triggered by high and low vapor line pressure, high oxygen content, and high barge level initiate the same shut down procedure.

Either manual or automatic shutdown of loading will: (1) stop the loading pump (P-204/205), (2) close the liquid valve on the EDC line (SDV-1050), and (3) close the valve on the vapor line to the vapor recovery unit (SDV-1006). This action also puts the nitrogen flow control valve (FV-1016) on fixed flow control, and the vapor recovery unit continues cycling to clear EDC and remain ready to receive vapor, so that loading can restart without a vapor recovery unit warmup.

NOTE: There are two horn-strobe light systems on the dock with two acknowledge push buttons at the dock and a horn acknowledge for both systems at the computer terminal. One system only works for the barge level alarms and the other system works with all other system alarms and shutdowns including the barge levels.

The barge high levels will activate a horn in the control room and two horns on the dock (LA-1001A and UA-1037A). A red strobe light (LA-1001B) and an amber strobe light on the dock (UA-1037B) will be lit. Both

horns will have to be acknowledged. The barge high high levels will activate a horn in the control room and two horns on the dock (LA-1001A and UA-1037A). A red strobe light (LA-1001B) and a red strobe light on the dock (UA-1037C) will be lit. The barge high high level will shutdown barge loading.

All non-shutdown alarms on the system including the SVRU will activate the amber strobe light (UA-1037B) and a horn (UA-1037A) at the dock. Any shutdown systems (SD-1, SD-2 or SD-3) will activate the red strobe light (UA-1037C) and the horn (UA-1037A) at the dock.

The green strobe light at the dock will be on when the START EDC LOADING button (HS-1022C) is pushed and will go off when the STOP EDC LOADING OPERATION button (HS-1022A in the control room or HS-1022B at the dock) is pushed or when EDC loading is shutdown by system interlocks.

The red strobe lights (LA-1001B and/or UA-1037C) must be turned off using the computer when the loading personnel leave the dock area.

2. <u>SD-2, Loading and Normal Vapor Recovery Unit Shutdown</u>

If operating deviations within the vapor recovery unit cause a shutdown of the vapor recovery unit, shutdown of the loading operations will also be triggered as described above. In this case, the nitrogen flow control valve is closed and a nitrogen blanket is maintained in the vapor line through a bypass valve (PCV 1017). A

total restart of both the vapor recovery unit (including warmup) and loading is also required.

3. SD-3, Loading and Emergency Vapor Recovery Unit Shutdown

An SD-3 level shutdown assumes that there is a possible fire in the adsorber beds. Shutdown of the vapor recovery unit and the loading operations will be triggered as described above. In this case, the automated block valves (FBV-1502, FBV-1511) to the adsorber beds will both close and the vent valves (FBV-1518, FBV-1519) will both open. FBV-1547 and FBV-1548 will open and introduce nitrogen to the beds. All other valves on the SVRU will return to their fail positions.

4. Re-Start After Shutdown

a. SD-1

Recheck valve alignment and mass flow meter setting. Re-enter the start-up procedure at Section C.3.f.(5).

b. SD-2

Re-enter the start-up procedure at Section C.3.

c. SD-3

A re-start after an SD-3 shutdown will be only with the approval and under the direction of supervision.

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E. Shutdown Criteria and Response

There are three (3) levels of shutdown for the EDC Closed Dome Loading system:

1. A level SD-1 shutdown shuts down the barge/ship loading operation, but keeps the SVRU in operation.

2. A level SD-2 shutdown shuts down loading operations and shuts off the SVRU.

3. A level SD-3 shutdown shuts down loading, shuts off the SVRU, and purges nitrogen through the adsorber beds with the vent valves open.

The following section details the shutdown sequences and the alarms/events that cause these shutdown sequences:

1. Level SD-1 - Shutdown of Loading, Isolation of Vessel, SVRU Continues Cycling

A level SD-1 shutdown will terminate loading operations and isolate the vessel. The SVRU and the analyzer sample pumps will remain in operation. The following events will occur as a result of an SD-1 shutdown:

- EDC Vapor Line Shutdown Valve (SDV-1006) will close.

- EDC Liquid Line Shutdown Valve (SDV-1050) will close.

EDC loading pumps (P-204 and P-205) will be turned off.

- The control of nitrogen to the vapor line (FIC-1016) will switch from cascade control based on oxygen concentration to fixed flow control of 25 scfm.

The following alarms will cause an SD-1 shutdown to occur:

PAH-102	EDC Storage Tank ST-1 high pressure (set point 3 inches W.C.)
PAL-102	EDC Storage Tank ST-1 low pressure (set point 1 inch W.C.)
PAH-175	EDC Storage Tank ST-2 high pressure (set point 2 psig)
PAL-175	EDC Storage Tank ST-2 low pressure (set point 1 psig)
LAL-101	EDC Storage Tank ST-1 low level (set point 3 feet)
LAL-111	EDC Storage Tank ST-2 low level (set point 3 feet)
LAHH-1001	High high barge tank level
PALL-1004	Low low vapor line pressure (set point -0.1 psig)
PALL-1005	Low low vapor line pressure (set point -0.1 psig)
PAHH-1004	High high vapor line pressure (set point 0.75 psig)
PAHH-1005	High high vapor line pressure (set point 0.75 psig)

AAHH-1011A	High high oxygen concentration on vapor line (set point 11.2%)
AAHH-1011B	High high oxygen concentration on vapor line (set point 11.2%)
FSL-1011A	Low sample flow on oxygen analyzer AT-1011A*
FSL-1011B	Low sample flow on oxygen analyzer AT-1011B*
AAX-1011A	Loss of signal from oxygen analyzer AT-1011A*
AAX-1011B	Loss of signal from oxygen analyzer AT-1011B*
XA-1011A	Malfunction alarm on oxygen analyzer AT-1011A*
XA-1011B	Malfunction alarm on oxygen analyzer AT-1011B*
LAHH-1013	High high knockout pot level (set point 95%)
FAHH-1501	High high vapor flow on recovery unit (set point 750 acfm)
TAL-1027	Low sample temperature for EDC recovery tank oxygen analyzer (set point 135°F)
TAL-1029	Low sample temperature for vapor recovery line oxygen analyzers (set point 110°F)
FQAH-1051	High mass flow meter totalized reading

PAL-1002	Low nitrogen pressure (set point 75 psig)
XA-1013	Knock-out pot level transmitter loss of signal
FSL-1031	Low sample flow on EDC recovery tank oxygen analyzer
TALL-1524	Low low oil temperature (set point 200°F)

* These alarms will only result in an SD-1 shutdown provided that the redundant oxygen analyzer has already malfunctioned. For example, low sample flow on oxygen analyzer AT-1011A (FSL-1011A) would only result in an SD-1 shutdown if oxygen analyzer AT-1011B had already produced a failure alarm (FSL-1011B, XA-1011B, or AAX-1011B). Also note that both analyzers must be functioning properly without any alarms in order to begin loading.

In addition to the alarms listed above, an SD-1 shutdown can be initiated by operating personnel in response to an emergency or as part of the normal loading sequence. There are two pushbuttons, one on the control panel in the control room (HS-1022A) and one at the dock (HS-1022B), either of which may be used to shutdown loading. If the SD-1 shutdown pushbutton on the dock (HS-1022B) is used, there will be an indication (HL-1022A) on the CRT in the control room. This will alert the tankerman in the control room that the SD-1 shutdown occurred as a result of operator action instead of a process alarm.

2. <u>Level SD-2 - Shutdown of Loading, Isolation of Vessel, SVRU Shut Down and Valved in under Nitrogen Blanket</u>

An SD-2 level shutdown will result in a simultaneous shutdown of the SVRU and loading operations. The following events will occur as a result of an SD-2 shutdown:

- EDC Vapor Line Shutdown Valve (SDV-1006) will close.
- EDC Liquid Line Shutdown Valve (SDV-1050) will close.
- EDC loading pumps (P-204 and P-205) will be turned off.
- Nitrogen Inerting Flow Control Valve (FV-1016) will close.
- Nitrogen Blanketing Shutdown Valve (SDV-1028) will open. This will place a nitrogen blanket of 4 inches of water all the way through to the adsorbers. This nitrogen pad is to prevent air from getting into the system during shutdown.
- All motors on the skid will be turned off.
- Analyzer sample pumps will be turned off.
- All valves on the SVRU will return to their fail positions.

The following alarms will cause an SD-2 shutdown occur:

PAL-1533	Low instrument air pressure (set point 60 psig)
VAH-1527	High fan vibration on oil cooler
VAH-1531	High fan vibration on EDC recovery cooler

PDAHH-1546	High high differential pressure on EDC/oil separator (set point 5 psid)
LSL-1562	Low oil level - EDC/oil separator
LSH-1561	High oil level - EDC/oil separator
FAHH-1016	High high inerting nitrogen flow (set point 450 scfm)
PALL-1527	Low low oil pressure (set point 13.7 psia, 10 sec. delay)
PAHH-1527	High high oil pressure (set point 15.7 psia, 10 sec. delay)
TAHH-1524	High high oil temperature (set point 250°F)
TAHH-1544	High high vapor temperature (set point 140°F)
LAHH-1535	High high EDC recovery tank level
LAHH-1534	High high EDC recovery tank level (set point 95%)
AAHH-1031	High high oxygen content in the EDC recovery tank (set point 11.2%)
AAX-1031	Loss of signal from EDC recovery tank oxygen analyzer

XA-1031	Malfunction alarm on EDC recovery tank oxygen analyzer
PAH-1503	High adsorber (60-2676) pressure (set point 18.0 psia)
PAH-1507	High adsorber (60-2675) pressure (set point 18.0 psia)

An SD-2 level shutdown will also occur when any valve fails to move into the position commanded by the sequence or when any of the following four motors stops running:

- Vacuum pump motor (50-7751)
- Oil circulation pump motor (50-7752)
- Oil cooler fan motor (50-7753)
- EDC recovery cooler fan motor (50-7754)

In addition to the alarms and events listed above, an SD-2 level shutdown can be initiated by operating personnel in response to an emergency or as part of the normal operating sequence. A master stop pushbutton at the SVRU (HS-1570) and one on the control panel in the control room (HS-1024) may be used to shutdown the SVRU.

3. Level SD-3 - Shutdown of Loading, Isolation of Vessel, SVRU Shut Down and Purged (Emergency in Recovery Unit)

An SD-3 level shutdown assumes that there is a fire in the adsorber beds. The following actions will be taken as a result:

- EDC Vapor Line Shutdown Valve (SDV-1006) will close.
- EDC Liquid Line Shutdown Valve (SDV-1050) will close.
- EDC loading pumps (P-204 and P-205) will shutdown.
- Nitrogen Inerting Flow Control Valve (FV-1016) will close.
- Nitrogen Blanketing Shutdown Valve (SDV-1028) will open. This will place a nitrogen blanket of 4 inches of water all the way through to the adsorbers. This nitrogen pad is to prevent air from getting into the system during shutdown.
- All motors on the skid will be turned off.
- Analyzer sample pumps will be turned off.
- FBV-1502 and FBV-1511, automated block valves to the adsorber beds, will both close.
- FBV-1518 and FBV-1519, vent valves from the adsorber beds, will both open.
- FBV-1547 and FBV-1548 will open and introduce nitrogen to the beds.
- All other valves on the SVRU will return to their fail positions.

The following alarms will result in an SD-3 level shutdown:

TAHH-1504	High high temperature in Adsorber 60-2676 (set point 150°F)
TAHH-1505	High high temperature in Adsorber 60-2676 (set point 150°F)
TAHH-1506	High high temperature in Adsorber 60-2676 (set point 150°F)
TAHH-1508	High high temperature in Adsorber 60-2675 (set point 150°F)
TAHH-1509	High high temperature in Adsorber 60-2675 (set point 150°F)
TAHH-1510	High high temperature in Adsorber 60-2675 (set point 150°F)
SVRU	Shutdown of SVRU for any reason

NOTE: To restart the SVRU after a SD-3 shutdown, the vapor recovery system shutdown button (HS-1024) must be pushed.

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F. Marine Vapor Recovery (MVR) Bypass

1. Operation Without Marine Vapor Recovery

There are 2 modes for EDC barge/ship loading operations. The modes of operation are as follows:

- Normal Operation - This mode of operation is with the vapor recovery unit in operation. This mode of operation should be used essentially all of the time. PPG will be required by regulation to run the vapor recovery unit so EDC vapors will not be emitted to the atmosphere. Operation in this mode is as described in Section C of this manual.

- Non Routine Operation - This mode of operation will be without the vapor recovery unit in operation, and the EDC vapors will be emitted to the atmosphere. This mode of operation cannot commence without the approval of the shift superintendent. The shift superintendent will request from the environmental representative who in turn will request from the Louisiana Department of Environmental Quality (LDEQ) a variance to emit the vapors. It would be a violation of applicable air permits and LDEQ regulations to emit vapors without an approved variance.

Since the vapor recovery unit needs to operate only during EDC loading, there should be ample time to repair the unit between barge/ship loadings. If the vapor recovery unit malfunctions, resulting in shutdown of the loading process, the unit must be repaired before loading is completed. In the event of a major disruption of loading operations due to the vapor recovery unit being

out of service and if there are compelling reasons to proceed with loading, it may be possible to obtain a variance and load a barge/ship without the vapor recovery unit in operation. The following discussion explains how the system is to operate if this is done.

The shift superintendent is to authorize the shipping shift supervisor to go to the south terminal control room and put the EDC barge loading control system in the non-routine operating mode. This can only be done with a security access code. This will allow loading of a barge/ship without the vapor recovery unit in operation. Once in the non-routine loading mode, all the shutdown interlock functions associated with the vapor recovery system will be bypassed. All the interlocks associated with the liquid loading system will still be activated.

The procedure for preloading and inspection and procedures for EDC loading are to be followed with the following comments/exceptions:

- The TEST MODE switch (HS-1035) must be in the OFF position. The TEST MODE sequence does not have to be followed. The oxygen analyzers do not have to be calibrated.

- The vapor hose should not be attached to the barge/ship. Make certain that there is a barge/ship vent valve open for vapor displacement out of the tanks.

- The electrical cable for the tank high level switches on the barge must be attached. The barge high high levels (LAHH-1001) will stop loading. The high level switch in dock barg vessel compartment must be tested after the electrical cable is

connected. To do this, the Certified Tankerman must pull up the rod on each switch until an alarm is obtained. The tankerman will acknowledge the alarms. If any level switch does not work, barge loading cannot begin.

- All the checks on the vapor recovery unit will not be required.

The following steps are similar to those for normal loading with Marine Vapor Recovery:

- The SHIPPING MODE switch (HS-1021) in the control room must be in either the barge or ship mode, depending on which is to be loaded.

- The LOADING MODE switch (HS-1034) must be in the loading mode for loading barges or ships.

- Place the EDC STORAGE TANK SELECT switch (HS-1019) on the tank being pumped from.

- The dock camera system must be in operation.

- The flow meter (FQ-1051) in the control room must be set to deliver the required total amount of EDC to the barge/ship.

- When barge/ship loading is to commence, the START EDC LOADING switch (HS-1022C) in the control room must be pushed. This will open SDV-1050.

- To stop loading, push the STOP EDC LOADING OPERATION button in the control room (HS-1022A) or at the dock (HS-

1022B). This will stop the pumps (P-204 and/or P-205) and close SDV-1050.

NOTE: Pushing the STOP EDC LOADING OPERATION button in the control room or at the dock will take the system out of the Marine Vapor Bypass Mode.

The permissives to start barge/ship loading when the vapor recovery unit is not used are:

- The barge vapor valve SDV-1006 must be closed (ZSC-1006 must be satisfied) for loading to begin.

- The ST-1 or ST-2 (depending on which tank is being pumped from) level and pressure must be in the proper operating range. The interlocks for ST-1 are LALL-0101, PAH-0102, and PAL-0102. The interlocks for ST-2 are LALL-0111, PAH-0175, and PAL-0175.

- The barge must not have a high high level (LAHH-1001).

The shutdown of the barge/ship loading will be done by stopping the EDC ship loading pumps (P-204, P-205) and closing the liquid EDC fill valve to the barge (SDV-1050). The interlocks that will stop barge/ship loading when the vapor recovery unit is not used are as follows:

- High or low storage tank pressure on the EDC storage tank being pumped from (ST-1 or ST-2). The interlocks for ST-1 are PAH-0102 and PAL-0102. The interlocks for ST-2 are PAH-0175 and PAL-0175.

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- A low low liquid level in the EDC storage tank (ST-1 and ST-2). The interlock for ST-1 is LALL-0101, and for ST-2 is LALL-0111.

- High high barge tank levels (LAHH-1001)

- The STOP EDC LOADING OPERATION button in the control room (HS-1022A) or at the dock (HS-1022B).

- High mass flow meter totalized reading (FQAH-1051).

2. Pre-loading, Hookup, and Alignment Procedures without Marine Vapor Recovery

The following steps shall be performed by the Certified Tankerman or by the Tankerman under the direction of the Certified Tankerman.

Certified Tankerman/Tankerman:

a. Spot the barge that is to be loaded or unloaded (normally this is performed by contract tug).

b. Obtain the shore tank number from the Shift or Day Foreman. Check with the Shipping Shift Foreman if a surveyor is needed to sample the EDC from the tank prior to filling a ship or customer barge.

NOTE: Samples are not normally required for PPG terminal destinations; sampling is usually done before arrival of the barge or ship.

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c. Place the gangplank on the barge and secure.

d. Complete preloading conference with person in charge (PIC) of ship.

e. Complete preloading inspection of barge (refer to 46 CFR 151.45-5). Close the sea cock valve and pump stern rake if necessary. Call the VC-II Vinyl Storage Operator to obtain tank availability and for sample clearance; then tag the appropriate valves.

f. Complete the Declaration of Inspection form for barges. In the case of ships, complete the Declaration of Inspection with the PIC before hooking up.

g. For barges, check and apply all warning signs and signals (see 46 CFR 151.45-2 and 151.45-9). Using the Certificate of Inspection found in the document tube on the barge, determine the number and type of fire extinguishers to be used on the barge.

(1) Ensure that the barge is certified to carry EDC per the Certificate of Inspection.

(a) Verify the U. S. Coast Guard (USCG) expiration date on the certificate. The barge cannot be loaded if the expiration date has passed.

(b) In the case of ships, the ship's PIC is responsible for vessel compliance.

h. General procedure for making the hose connection is below. A full face Comfo II or Airline mask must be worn while installing and removing the hose.

(1) Make sure liquid loading valve (HV 1052) is closed. Remove the blind flange off the end of the liquid hose.

(2) Hook up the liquid fill hose to the barge or ship using the appropriate gaskets.

i. Hook up the electrical cable for the tank high level switches on the barge. (This is not required for ships.)

NOTE: Per Coast Guard Regulation 154.810(g), no ground cable hookup is to be made.

j. Locate the STOP EDC LOADING OPERATION pushbutton (HS-1022B) on the handrail of the walkway between the dock and shore. Make sure pushbutton is pulled out.

NOTE: An additional STOP EDC LOADING OPERATION pushbutton (HS-1022A) is located in the control room.

k. Line up the barge piping. The PIC on the ship will line up the ship's piping.

l. Make sure the vents on the loading line are closed.

m. Line up the shore tank piping from the dock to the tank for both ships and barges. Check to be sure the tank has been gauged; then record the tank temperature. When loading a barge, be

sure the stern rake is pumped out before transfer begins, if applicable.

NOTE: There may be input into ST-1 or ST-2 during loading.

3. Procedures for EDC Loading without Marine Vapor Recovery

In general, the Certified Tankerman should remain on the barge or dock during EDC loading. The Tankerman should proceed with off-barge control activities at the direction of the Certified Tankerman.

Certified Tankerman/Tankerman:

a. Put the SHIPPING MODE switch (HS-1021) in the control room in either the "BARGE" or "SHIP" mode, depending on which is to be loaded. For loading barges or ships, place the LOADING MODE switch (HS-1034) in the control room in the "LOADING" mode. The "UNLOADING" mode is to be used only when a barge or ship is to be unloaded back into the plant. Place the EDC STORAGE TANK SELECT Switch (HS-1019) on the tank being pumped from.

b. When TV monitoring of dock is confirmed, barge loading is ready to start.

NOTE: To monitor the loading dock area, there are two identical Panasonic camera surveillance systems. The systems are independent of each other. Each system comprises of the following major components:

B/W Camera (model #WV-BL204)

Receiver	(model #WV-RC150)
Controller	(model #WV-CU101)
B/W Monitor	(model # TR-930B)

Monitors and controllers for both systems are housed in Control Panel CP-100 which is located in the South Terminal control building. The controller enables remote control of pan and tilt, zoom lens and receiver functions.

Tankerman:

(1) Before beginning loading, gauge and record the shore tank level.

Certified Tankerman:

(2) Open header valve on barge and manual valve at loading hose. Make certain that the barge tank vent line is open.

Tankerman:

(3) Proceed to the control room and set the mass flow meter to deliver the required total amount of EDC to the barge/ship.

(4) Push the START EDC LOADING button (HS-1022C) located in the control room. The following will occur:

(a) The valve for the EDC liquid to the barge or ship (SDV-1050) will automatically open.

(5) Set the flow controller (FIC-1051) on the liquid EDC at the target loading rates.

(a) Do not lower the loading rate set point below 250 tons per hour (TPH) with two pumps or 125 TPH with one pump in operation due to the pumping turndown limits.

(b) Do not set the loading rates above 600 TPH; there is a high flow alarm at 650 TPH.

Tankerman:

c. Proceed to the EDC loading pump and open the discharge valve.

Certified Tankerman:

d. Open manual liquid loading valve (HV 1052) and check for leaks at the hose and dock area. Radio the Tankerman when the gravity flow is established and when it is time to turn on the pump.

Tankerman:

e. Start the EDC loading pump at the storage tank. Then check the pump for leaks and walk the pipeline checking for leaks. If leaks are detected, take appropriate shutdown action and notify supervision. The EDC loading pump can only be turned on at the pump.

f. Return to the control room and monitor the loading operation.

(1) Inspect the EDC storage tank pump system hourly for pump leaks, gauge and record the tank level, and record the tank temperature.

Certified Tankerman:

g. Control flow to the tanks on the barge with on-board valves to keep the barge level. The person in charge (PIC) on board the ship is responsible for monitoring and controlling fill levels in ship tanks.

h. Adjust mooring lines on the barge during loading as needed. Continue checking dry (double hull) compartments for leaks throughout product transfer.

i. When the loading nears completion, instruct the Tankerman to reduce the flow to the barge/ship to minimum flow or stop the pump. The pump can be turned off either at the pump or in the control room.

j. Top off the barge tanks evenly, using reduced flow and on-board valves.

k. Instruct the Tankerman to turn off the pump (if not already off). Close MV-1052.

Certified Tankerman and Tankerman:

l. Hook up the nitrogen hose to the liquid loading line and blow the EDC liquid line into the barge or ship. Close the flow control valve (FV-1051) by putting the controller (FIC-1051) on "MANUAL" from the CRT in the control room, then close the liquid valve on the barge/ship and then close the valve on the end of the hose.

m. After clearing the liquid hose, press the STOP EDC LOADING OPERATION button at the dock (HS-1022B). There will also be a STOP EDC LOADING OPERATION button (HS-1022A) in the control room that may be used.

(1) This action will close the valve in the liquid line (SDV-1050) to the barge or ship.

n. Disconnect the loading hose from the barge. Install a blind on the end of the hose.

o. When loading is complete, open MV-1052 and add a small amount of nitrogen to the liquid line upstream of SDV-1050 for liquid expansion purposes.

p. Close the discharge valve on the pump. Gauge and record barge tank levels.

q. Ensure that all barge cargo hatches, ullage hatches and dry compartment hatches are closed and secured for shipment.

r. Remove all fire extinguishers from the barge and remove the gangway.

Tankerman:

s. Before leaving the dock area, gauge the shore tank and record the levels. Complete the Solvent Barge Loading and Inspection Report. Send the top copy to the laboratory and the remaining two copies to the Plant A Shipping Office. Send the Declaration of Inspection form to the Plant A Shipping Office.

t. Secure the boom line to the dock, police the dock and lock the gate.

G. Recovered EDC

Liquid EDC recovered from the barge vapors by the SVRU is intermediately stored in EDC Recovery Tank 60-2678. Off-spec EDC is normally transferred to the EDC plant in a vacuum truck. In-spec recovered EDC can be pumped to the EDC storage tanks through the loading line.

NOTE: ST-1 can only be filled to a level of 38 feet and ST-2 can only be filled to a level of 42 feet.

1. EDC Recovery Tank Pumpout to Vacuum Truck

Tankerman

- Recognize that the level in the EDC Recovery Tank is sufficient for transfer.
- Circulate the recovered EDC using pump 55-6050.
- Take a sample of the EDC. Send the sample to the main laboratory for analysis. If the EDC quality is not acceptable for shipment, notify the Shipping Shift Foreman that a vacuum truck is needed.

Tankerman and Vacuum Truck Operator:

- A clean, dry, empty, nitrogen purged, one compartment truck is to be ordered. Check the truck vapors with an oxygen meter. The oxygen concentration must be less than 10% to proceed.

- Before proceeding with the EDC transfer, be sure that the SVRU is cycling, but not while vessel loading is in progress. This allows the displaced truck vapors to be processed to recover any EDC. It is not necessary to run the TEST MODE to pump out the tank.

- Make a hose hookup of the EDC Recovery Tank Pump discharge connections to the vacuum truck. Also, hook up a vapor return line from the truck to the EDC Recovery Tank.

- The Vacuum Truck Operator will align truck values. The Truck Operator will not use the vacuum pump on the truck during this EDC transfer.

- The Tankerman will open the liquid valve to the vacuum truck by using the switch at the skid. This valve can be closed by using the manual switch or by an automatic shutdown. He will also open the valve in the vapor return line. The recirculation line valve to the tank can be closed or pinched back if necessary to divert sufficient flow to the truck.

- Allow the EDC to be pumped into the vacuum truck using pump 55-6050. The vapors displaced in the vacuum truck will return to the EDC Recovery Tank through the vapor return hose.

- When the tank is emptied sufficiently, as indicated by low level alarm, the Tankerman will shut down pump 55-6050. It should take approximately 30 minutes to pump out the tank. The Tankerman will notify the Truck Operator.

- The Tankerman will purge the liquid contents of the transfer hose into the truck using nitrogen.

- The Tankerman and Truck Operator will close the appropriate valves and disconnect the liquid loading line and vapor return line.

- The SVRU can then be shut down according to normal procedure.

- The Vacuum Truck Operator will transport the EDC to the EDC Plant or the Waste Treatment Unit.

The interlocks that will shutdown the EDC recovery tank pump and liquid transfer valve (FBV-1549) are as follows:

a. Low low EDC recovery tank level (LALL-1534). (set point 5%)

b. Low EDC recovery tank level (LSL-1514).

c. High EDC transfer pump temperature (TAH-1550). (set point 200°F)

2. <u>EDC Recovery Tank Pumpout to ST-1 or ST-2</u>

<u>Tankerman:</u>

- Recognize that the level in the EDC Recovery Tank is sufficient for transfer.

- Circulate the recovered EDC using pump 55-6050.

- Take a sample of the EDC. Send the sample to the main laboratory for analysis. If the EDC quality is acceptable, then proceed to pump the liquid to either ST-1 or ST-2.

  NOTE: Since the VC-II plant is responsible for the product quality in the EDC storage tanks, they must be involved with the transfer of liquids back into the tanks. Notify the VC-II operator to come down so a transfer back to the storage tanks can be done.

- The VC-II operator will align the valves at the storage tanks that he wants the EDC to be transferred back into.

- Align the valves to pump the liquid back into the line to the storage tanks. Turn on the switch to open FBV-1549.

  NOTE: The SVRU does not need to be in operation for this transfer operation. The EDC Recovery Tank pressure will be maintained during the pumpout by the pressure regulator control system on the tank. The EDC Loading Pumps (P-204 and P-205) must not be in operation during this transfer. When P-204 and P-205 are in operation, the liquid transfer valve (FBV-1549) will not open.

- When the tank is sufficiently empty, as indicated by a low level alarm, the Tankerman will close FBV-1549 and turn off the EDC Recovery Tank pump.

H. Marine Vessel Unloading (Vessel to Shore)

Unloading of barges or ships back to the shore storage tank system will be very infrequent. This unloading must be coordinated with VC-II operations. The SVRU will not be in operation during this procedure. A nitrogen line will have to be connected to the vessel. The new control system is designed to accommodate this event. Supervision will provide specific instructions of how this is to be done. In addition, the vessel contains cargo transfer procedures.

Information specific to our new on-shore facilities are as follows:

The LOADING MODE switch (HS-1034) in the South Terminal Control Room will be put in the UNLOAD MODE when a vessel is to be unloaded. The EDC STORAGE TANK SELECT switch (HS-1019) should be placed in the proper tank position. In the unload position, the interlocks that will close the automatic liquid valve (SDV-1050) are as follows:

1. High or low storage tank pressure on the EDC tank being pumped into (PAL-0102 and PAH-0102 on ST-1; PAL-0175 and PAH-0175 on ST-2).

2. High high EDC storage tank level on the tank being pumped into (LAHH-0101 on ST-1 or LAHH-0111 on ST-2).

In the UNLOAD MODE, SDV-1050 will be opened by pressing the START EDC LOADING switch (HS-1022C) in the control room. Also, in the UNLOAD MODE, pressing the STOP EDC LOADING OPERATION button (HS-1022A or HS-1022B) will close SDV-1050. The EDC storage tank level and pressure should be closely monitored during unloading to make certain the tank is not overfilled or overpressured. The unloading rate will

be controlled at a rate not to increase the pressure in ST-1 or ST-2. The unloading flow rate will also be controlled with FIC-1051 in the control room. There are high level alarms on ST-1 and ST-2.

I. Routine Operating Procedures

1. Sampling Procedures

The EDC Recovery Tank sample is caught using a sample bomb obtained from the laboratory. This sample is taken prior to unloading the tank.

Samples containing EDC are taken under pressure using pressure rated steel bombs that allow safe handling of the material. The sample collection procedure is as follows:

a. The sample bomb is to be connected to the sampling connections on the EDC Recovery Tank recirculation line. Open the needle valves on the sample bomb and check for leaks.

b. Let the sample flow through the bomb for about five minutes.

c. Close the needle valves on the sample bomb and remove it from the line.

d. Send the sample to the main laboratory.

2. Filter Replacement Criteria, Data, and Procedure

The dust filter (72-821) on the SVRU contains a bag type filter using a 100 micron polypropylene bag. A differential pressure is measured across the filter by PDT-1500 and will alarm at 0.5-inch W.C.

When a differential pressure of 0.5-inch W.C. has been reached, the filter bag must be removed and replaced. After the pressure differential alarm is obtained, barge or ship loading can proceed as long as the differential pressure does not exceed 2 inches W.C. To remove and replace the bag, perform the following steps:

- Close the inlet and outlet valves to the dust filter.
- Apply a small nitrogen purge to the top of the dust filter using a hose. The filter should already be full of nitrogen.
- Open the 1.5-inch drain valve on the bottom of the dust filter.
- Collect any liquid in a drip pan. (The drip pan will be emptied using a vacuum truck). Normally, there should be no liquid or EDC vapors.
- Close the nitrogen purge valve.
- Once the dust filter has been cleared, lock the filter for maintenance.
- Maintenance personnel or a tankerman can remove and replace the bag. A Comfo-II must be worn while the dust filter is opened.
- Maintenance personnel will contact the RCRA drum coordinator to have the filter bag put in a blue RCRA drum with the proper label. The waste code will be F025/D001.

SL 085589

- Once the filter bag is replaced and the dust filter is buttoned up, the tankerman can unlock the dust filter and realign the valves.

3. SVRU Sump Pumpout Procedure

The SVRU contains collection sumps in the southwest corner of the skid and beneath the knockout pot. The exit valves from the sumps are car-sealed-closed (CSC) to prevent uncontrolled drainage from the sump.

The tankerman is to inspect the sumps and proceed to have them emptied when they are nearly full. If an oil sheen is observed on the water, the Tankerman should contact the Shipping Shift Foreman who will contact the oiler to remove the oil from the water. The oil will be removed by pumping and/or soaking the oil in oil pads. These oil pads will be put in roll off box number 525.25 in the South Terminal area.

The tankerman must fill out a Dike Water Handling Log Sheet (in Environment SOPs) and take two samples of the water from each sump and send them to the main laboratory for analysis.

If the lab does not clear the samples, the tankerman will have the Shipping Shift Foreman call for the vacuum truck service who will empty the sump and transport the contaminated material to the Waste Treatment Unit. If the lab clears the sample, the CSC sump valve must be administratively approved for opening so that the sump can be drained to the surface run-off ditch.

The tankerman must enter all appropriate data on the log sheet, including analysis. The log sheets must be sent to the Plant B Environmental Coordinator.

APPENDICES

APPENDIX A

P&ID'S

Liquid Loading and Vapor Handling

SL 085595

SORBATHENE Unit

SL 085599

DUST FILTER
72-821
SIZE 16'-0 x 4'-11 ½ OAH
DESIGN 150 PSIG @ 150°F
CAPACITY 350 ACFM @ 5" W.C. PRESS.
PRESSURE DROP 0.1" H_2O CLEAN

ADSORBER
60-2676
SIZE 7'-0" I.D. x 7'-0" S/S
DESIGN FULL VAC/150 PSIG @ 200°F
MATERIAL CARBON STEEL

ADSORBER
60-2675
SIZE 7'-0" I.D. x 7'-0" S/S
DESIGN FULL VAC/150 PSIG @ 200°F
MATERIAL CARBON STEEL

REVISIONS

80 PSIG INSTR AIR FROM DWG. 11A-10030

V-6"-150-AC

RECYCLE VAPOR FROM 60-2678 11A-10036

V-2"-112-AC

V-6"-110A-AC

V-6"-110B-AC

V-4"-113A-AC

V-4"-113B-AC

EDC/N_2 FROM BARGE FROM DWG. 11A-10030

8"-11A-029001-PL49

V-6"-100-AC

N_2 PURGE CONNECTION

ELEV 107'-6 ½"

V-6"-101-AC

72-821

60-2676

60-2675

V-1 ½"-902A-AC

V-1 ½"-902B-AC

V-1 ½"-903A-AC

V-6"-102-AC

V-1 ½"-903B-AC

V-6"-102A-AC

V-6"-102B-AC

V-6"-117A-AC

V-6"-117B-AC

80 PSIG N_2 FROM HEADER DWG. 27A-10043

V-1 ½"-900-AC

BY OTHERS

ON MODULE

EDC VAPORS/N_2 TO 56-599 TO DWG. 11A-10036

V-1 ½"-901-AC

80 PSIG N_2 FROM HEADER TO 60-2678 TO DWG. 11A-10036

NOTES

1) VALVE ALL LOW POINT DRAINS
2) PLUG ALL HIGH POINT VENTS
3) WELL TO EXTEND 2'-4" INTO BED. LOCATE ALL THREE WELLS AT 120° INCREMENTS AROUND SHELL.

COMPUTER GENERATED DRAWING
BY LAKE CHARLES CHEMICALS
CAD REVISE ONLY

A 100 | C 103

PPG CHEMICALS
LAKE CHARLES, LOUISIANA

DOCK AREA-SOUTH P & ID
PPG CLOSED DOME LOADING-EDC
ADSORBERS
SORBATHENE UNIT

DRAWN BY AWD DATE 4-22-93 SCALE NONE
CHECKED BY - DATE - CHANGE RES-2609
APPROVED BY - DATE - SUB -
P.M. - DWG. 11A-10035.0

AWD TECHNOLOGIES, INC.
JOB NUMBER: 6A01
DRAWING NUMBER: 6A01-F-101

SL 085600

REVISIONS

JUM PUMP 56-599
400 ACFM
27 PSIG
100 HP 460V, 3PH, 1800 RPM
MATERIAL: CARBON STEEL
DRIVER TAG: 50-7751

SEAL OIL POT V-125A/B
SIZE 6'Φ x 1'-6" S/S
DESIGN 150 PSIG @ 200°F
MATERIAL: CARBON STEEL

EDC/OIL SEPARATOR 60-2677
SIZE 28" O.D. x 11'-5¾" OAH
DESIGN FV/150 PSIG @ 300°F
MATERIAL: CARBON STEEL

OIL COOLER 71-2640
DUTY 145,000 BTU/HR
SIZE 4'-1"H x 3'-5¾"L
MATERIAL: CARBON STEEL
DRIVER 3 HP, 460V, 3 PH, 60Hz, 1750 RPM
DRIVER TAG: 50-7753

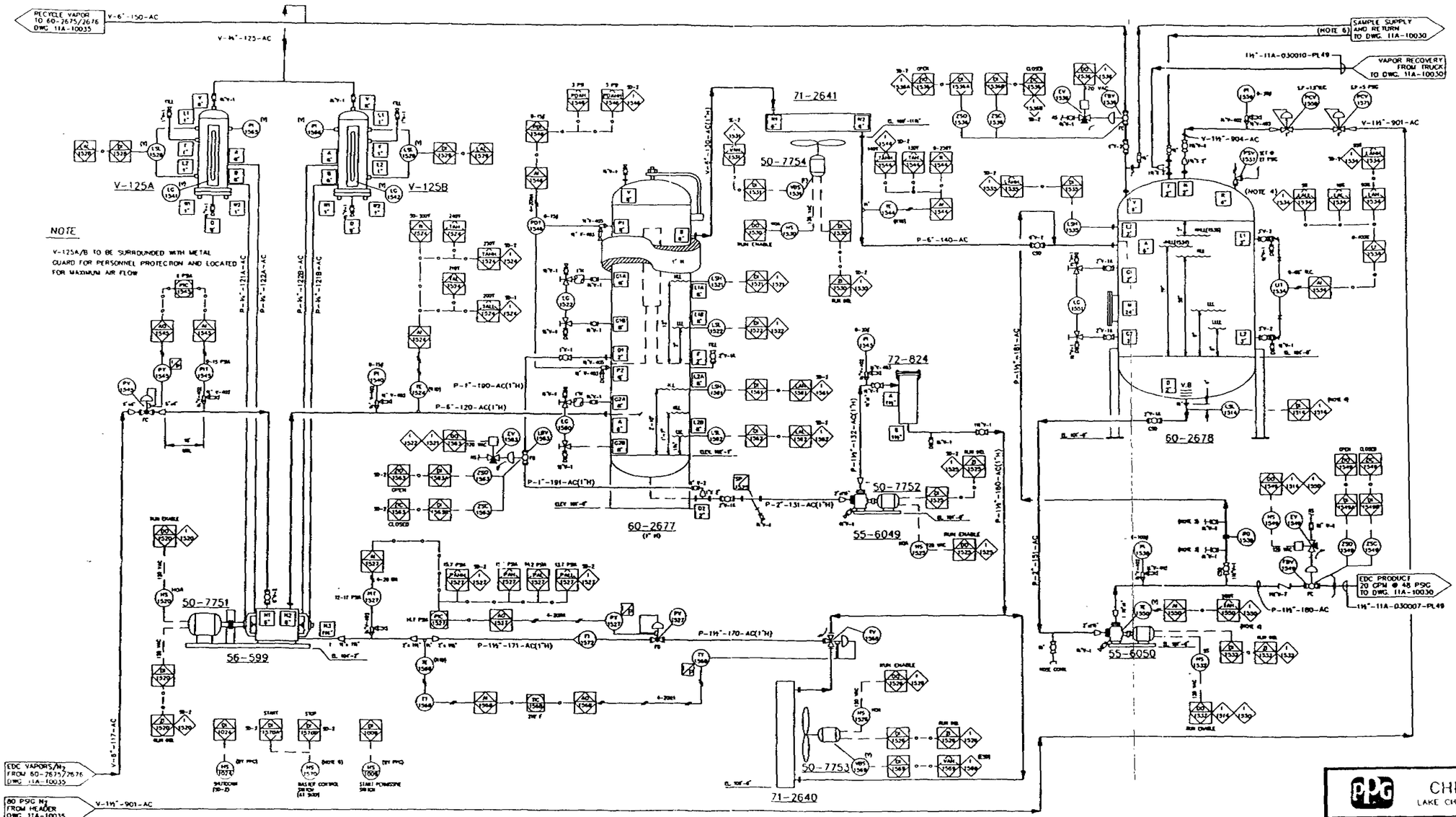
RECIRCULATION OIL FILTER 72-824
DESIGN 300 PSIG @ 450°F
MATERIAL: CARBON STEEL
BAG: POLYESTER (10 MICRON)
PRESSURE DROP: 0.4 PSI @ 26 GPM

OIL CIRCULATION PUMP 55-6049
FLOW 76 GPM @ 32.8 FT H_2O
DESIGN 270 PSIG @ 250°F
MATERIAL: DUCTILE IRON
NPSHR 1 FT
SHUTOFF 35 FT H_2O
DRIVER 7.5HP/5.6kW/7.5PH, 60Hz, 1800RPM

EDC RECOVERY COOLER 71-2641
DUTY 818,000 BTU/HR
SIZE 6'W x 8'L
DESIGN 150 PSIG @ 300°F
MATERIAL: CARBON STEEL
DRIVER 7.5 HP, 460V, 3PH, 60Hz, 1750RPM
DRIVER TAG: 50-7754

EDC RECOVERY TANK PUMP 55-6050
FLOW 20 GPM @ 110 FT H_2O
DESIGN 250 PSIG @ 150°F
MATERIAL: 316 SS
NPSHR 3 FT H_2O
SHUTOFF 118 FT H_2O
DRIVER 5 HP, 460V, 3PH, 60Hz, 3600RPM

EDC RECOVERY TANK 60-2678
SIZE 5'-0"DIA x 5'-0"S/S
DESIGN FV/27 PSIG @ 250°F
MATERIAL: CARBON STEEL



NOTES:
1) VALVE ALL LOW POINT DRAINS
2) PLUG ALL HIGH POINT VENTS
3) SAMPLE BOMB CONNECTIONS
4) DISABLE OPERATION OF 55-5060.
5) SWITCH HS-1009 MUST BE SET BEFORE HS-1570. (HS-1570 STARTS/STOPS PLC PROGRAM)
6) FOR A DETAILED P & ID OF THE SAMPLE SYSTEM, REFER TO DRAWING 11A-10027.

COMPUTER GENERATED DRAWING BY LAKE CHARLES CHEMICALS
CAD REVISE ONLY

AWD TECHNOLOGIES, INC.
JOB NUMBER: 6A01
DRAWING NUMBER: 6A01-F-102

A 100 C 103

PPG CHEMICALS
LAKE CHARLES, LOUISIANA

DOCK AREA-SOUTH — P & ID
PPG CLOSED DOME LOADING-EDC
VACUUM PUMP AND CONDENSER
SORBATHENE UNIT

DRAWN BY AWD DATE 4-26-93 SCALE NONE
CHECKED BY — DATE — CHANGE RES-2609
APPROVED BY — DATE — SUB —
B.M. — DWG. 11A-10036.0

SL 085601

NORMAL OPERATING SEQUENCE

(SHUTDOWNS NOT SHOWN)

STEP NO.	TIME MIN SEC	VALVE POSITIONS											CONTROL LOOPS						ALARMS ENABLED	REQUIREMENT TO ADVANCE	NOTES
													TIC-1568		PIC-1527		PIC-1545				
		FBV-1502	FBV-1511	FBV-1512	FBV-1523	FBV-1515	FBV-1516	FBV-1518	FBV-1519	FBV-1536	FBV-1547	FBV-1548	STATUS	SET-POINT	STATUS	SET-POINT	STATUS	SET-POINT			
1 WAIT	------	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	DISABLE	------	DISABLE	------	DISABLE	------	LAL-1534, LALL-1534, TAH-1550	OPERATOR REQUEST TO START	1
2 WARM-UP	------	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	DISABLE	------	TAH-1524, TAHH-1524, TAH-1544, TAHH-1544 TAH-1506, PAL-1533, PDAH-1546, PDAHH-1546, VAH-1569, PAHH-1527, PAH-1527, PAL-1527, PALL-1527, LAL-1528, LALL-1528, TAHH-1508, TAHH-1509, TAHH-1510, TAHH-1504, TAHH-1505, TAHH-1506, TAH-1517, PAH-1507, PDAH-1500, TAH-1508, TAH-1509, TAH-1510, TAH-1504, TAH-1505, PAH-1503, LAL-1562, VAH-1531 FAH-1501H, FAHH-1501H .	TE-1568 = 210 F	2
3 ISOLATE 60-2675	------	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	DISABLE	------	TAL-1524, TALL-1524, LAH-1534, LAHH-1534, LAHH-1535, LAH-1561	FBV-1511 & FBV-1519 = CLOSED	3
3 DESORB 60-2675	------	OPEN	CLOSED	CLOSED	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	6 PSIA		PI-1545 = 1.8 PSIA	3, 4
3 SWEEP 60-2675	10 00	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	6 PSIA		10 MINUTE TIME-OUT	3
3 ISOLATE 60-2675	------	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1523 = CLOSED	
3 EQUALIZE 60-2675	------	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	OPEN (NOTE 7)	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1548 = CLOSED	
3 OPEN 60-2675	------	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1511 & FBV-1519 = OPEN	
3 ISOLATE 60-2676	------	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1502 & FBV-1518 = CLOSED	
3 DESORB 60-2676	------	CLOSED	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	6 PSIA		PI-1545 = 1.8 PSIA	4
3 SWEEP 60-2676	10 00	CLOSED	OPEN	OPEN	CLOSED	OPEN	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	6 PSIA		10 MINUTE TIME-OUT	
3 ISOLATE 60-2676	------	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1512 = CLOSED	
3 EQUALIZE 60-2676	------	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN (NOTE 8)	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1547 = CLOSED	
3 OPEN 60-2676	------	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1502 & FBV-1518 = OPEN	
3 ISOLATE 60-2675	------	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1511 & FBV-1519 = CLOSED	
4 CONTINUE RUN CYCLE																					5

NOTES

1. ALL AUTOMATED PUMPS AND VALVES, EXCEPT FBV-1549, DISABLED.
   EDC RECOVERY PUMP 55-6050 ENABLED TO START, WITH LOW LEVEL PERMISSIVE.
   EDC RECOVERY PUMP 55-6050 BLOCK VALVE, FBV-1549, ENABLED TO OPEN ON STARTING OF PUMP
   TO EXIT THIS STEP OPERATOR MUST FIRST SWITCH HS-1009, IN THE CONTROL ROOM AND
   THEN SWITCH HS-1570, AT THE SKID SWITCHING HS-1570 INITIATES THE PROGRAM.
2. ENABLED MOTORS - 50-7734, 50-7731, 50-7752, AND 50-7753.
   ENABLE EDC/OIL SEPARATOR 60-2677 LEVEL SWITCHES LSL-1522, LSH-1521
   AND BLOCK VALVE LBV-1563
3. ON INITIAL START-UP THESE STEPS WILL BE A N2 PURGE FROM BARGE.
4. IF PI-1545 DOES NOT REACH 1.8 PSIA WITHIN 3 MINUTES SYSTEM WILL SHUTDOWN
5. CYCLE SHALL CONTINUE FOR DURATION OF BARGE UNLOADING OR UNTIL FORCED TO SHUTDOWN BY EMERGENCY, AT WHICH POINT THE PROGRAM SHALL RESET TO STEP 1.
6. FOR SHUTDOWNS, SEE OPERATIONS MANUAL.
7. FBV-1548 WILL REMAIN OPEN UNTIL PI-1507 = 14.7 PSIA, THEN CLOSE (IF NOT EQUALIZED IN ONE MINUTE, THEN ALARM IS ENABLED)
8. FBV-1547 WILL REMAIN OPEN UNTIL PI-1503 = 14.7 PSIA, THEN CLOSE (IF NOT EQUALIZED IN ONE MINUTE, THEN ALARM IS ENABLED)

REVISIONS

{36A 15-8.PC (3)}

A 100 | C 707

COMPUTER GENERATED DRAWING
BY LAKE CHARLES CHEMICALS
CAD REVISE ONLY

AWD TECHNOLOGIES, INC.

JOB NUMBER: 6A01

DRAWING NUMBER: 6A01-I-101

PPG CHEMICALS
LAKE CHARLES, LOUISIANA

DOCK AREA-SOUTH ELECT. INSTRUMENTATION
PPG CLOSED DOME LOADING-EDC
PROCESS CONTROL VALVE SEQUENCE LOGIC
SORBATHENE UNIT

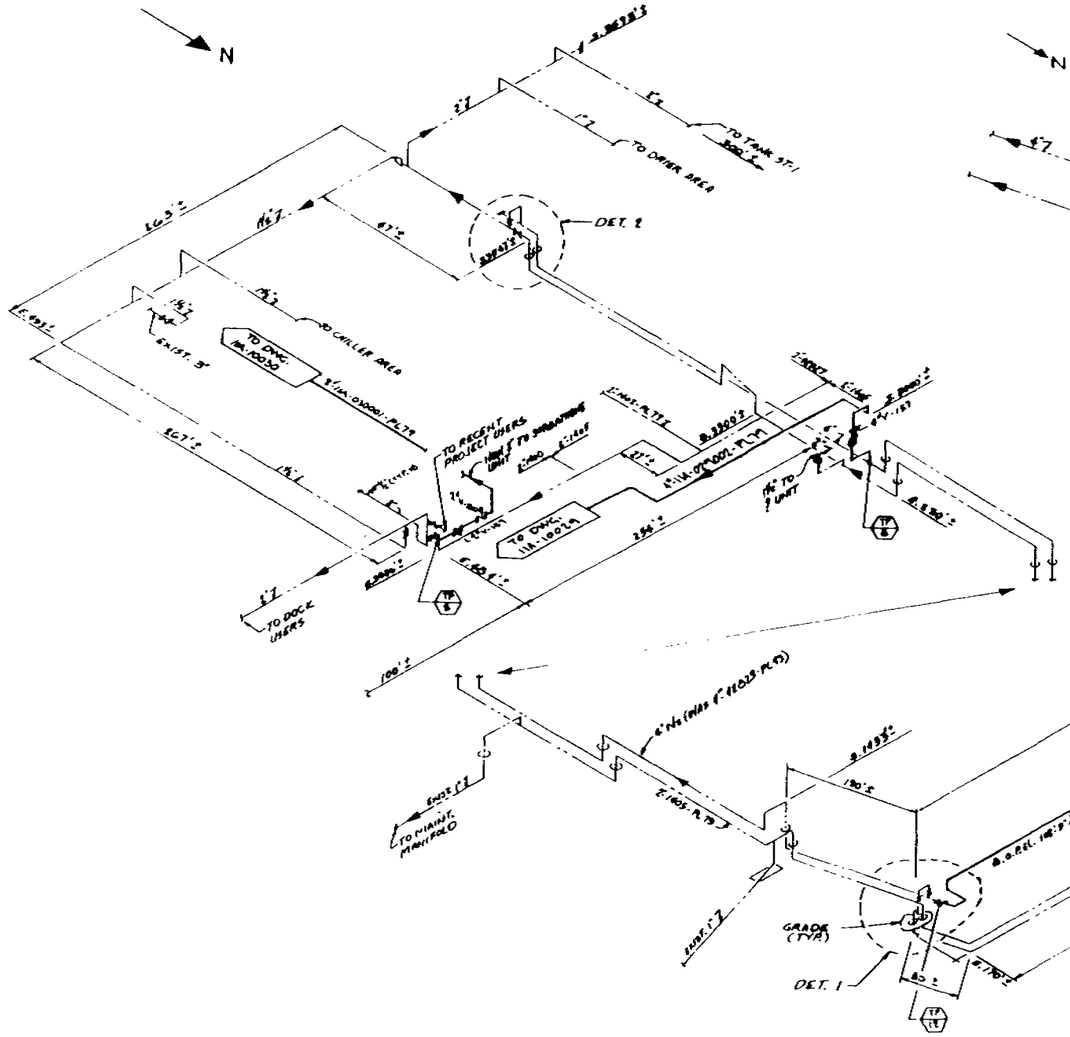
DRAWN BY AWD DATE 4-29-93 SCALE NONE
CHECKED BY - DATE - CHANGE RCS-2609
APPROVED BY - DATE - SUB -
E.N. - DWG. 11A-76039.0

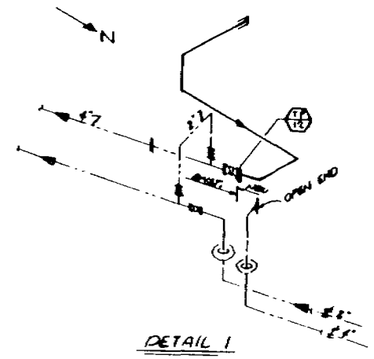
Nitrogen System

SL 085602

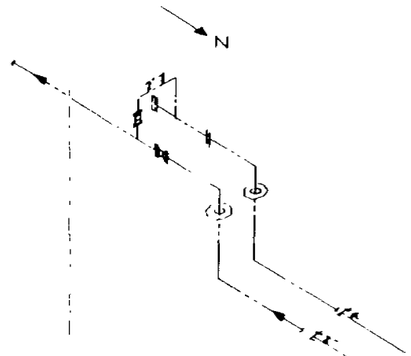
SL 085603

REVISIONS

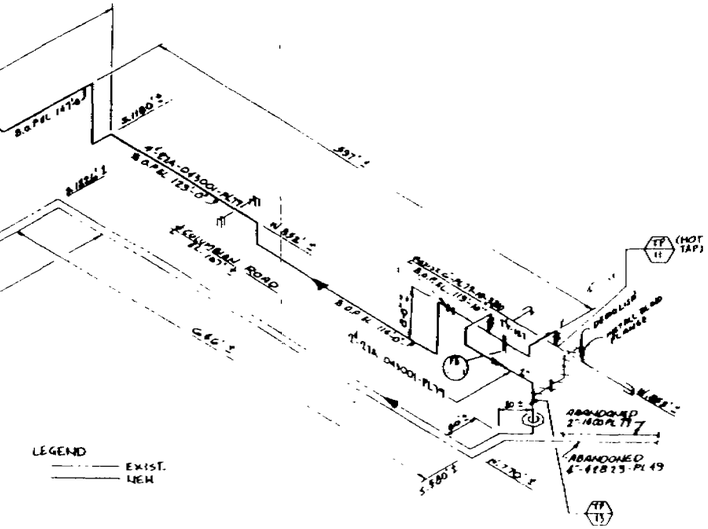




DETAIL 1



DETAIL 2



A150 C103

PPG CHEMICALS
LAKE CHARLES LOUISIANA

UTILITY P&ID
SOUTH TERMINAL
NITROGEN SYSTEM

RELEASED FOR CONSTRUCTION
REVISION NO. 0
DATE 12/11/92

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE
JOB NO. 5166.20 WORK ORDER NO. 51-017

DRAWN BY N.K. DATE 8-28-91 SCALE NONE
CHECKED BY E. DATE 11-9-92 CHANGE
APPROVED BY E. DATE 11-9-92 SUB
FILE DWG. 27A-10043-

ST-1 and ST-2

(EDC Storage Tanks)

SL 085605

REVISIONS

12 REPRODUCED ON XEROX 2080 ERADICATING PREVIOUS REVISIONS

13 GENERAL REVISIONS
CHG: RES-2609
BY: DHH
DATE: 6-2-92
APP'D: -

14 HOLD-PROPOSED EDC FILTER
CHG: W.O. 195958
BY: RDC
DATE: 8-19-92
APP'D: -

15 REVISED FOR EDC CLOSED DOME LOADING
CHG: RES-2609
BY:
DATE:
APP'D:

16 ADDED MARKUPS NOT PICKED UP ON PREVIOUS REVISION.
CHG: RES-2609
BY: R. REEVES
DATE: 6-11-93
APP'D: D. JOHNSON

17 ADDED LAH-0101 AND LAHH-0101
CHG: RES-2609
BY: R. REEVES
DATE: 6-11-93
APP'D: D. JOHNSON

PEMEX UNLOADING LINE
6"-2006-PL49
AND DISCH (T-1)
10"-PL49-P117-1199
27A-1011
6"-1502-PL126
11A-10030
HOLD PROPOSED ADDITION SEE REV. 14
SOUTH TERMINAL CONTROL ROOM
EDC SHIP LOADING PUMP P-205
EDC SHIP LOADING PUMP P-204
TRANSFER FILTER 60A-72-294
SOUTH TRANSFER DRIER 60A-73-194
NORTH TRANSFER DRIER 60A-73-195
EDC TRANSFER PUMP 60A-55-1816
EDC TRANSFER PUMP 60A-55-1817
TO INCINERATOR VIA VENT HEADER
GROUPED PRESSURE SWITCHES
SEALPOT
½"V-275(TYP.)
2"X 1½"
1½"-42802-PL-79-(NITROGEN)
EXISTING 2" NITROGEN
3"-42814-PL-139-(AIR)
3"-42818-PL-49-(WELL WATER)
PAINT NITROGEN DROP BLUE
SPEAKMAN S-200 SHOWER WITH QUICK OPENING VALVE AND CHAIN (PPG SPEC PL-8-5)
WATER UTILITY STATION (PPG SPEC PL-8-5)
UTILITY STATION
ST-1 EDC STORAGE TANK 30A-60-1213
VARIAC GROUND READING GAUGE 60A-80-8337
COMPRESSOR NO.1
COMPRESSOR NO.2
COOLER
K.O. POT
TO TANK T-3 68A-10003 2"-2008-PL49
TO VCM II 56A-10093 4"-PL-49-17-374
TO PUMP P-44 20A-1211 4"-42825-PL49
60A-10025 6"-001002-PL49
27A-10003 3"-2103-PL49
TO VCM II INCINERATOR S/D (27A-1010)

NOTES.
1. SEE DRAWING 27A-71026 FOR SHUTDOWN OF VENT COMPRESSOR
2. THIS ALARM WILL SHUTDOWN EDC LOADING OPERATIONS.
3. A LEVEL SD1, SD2 OR SD3 SHUTDOWN OF EDC CLOSED DOME LOADING OPERATIONS WILL SHUT OFF THE EDC LOADING PUMPS P-204 AND P-205

COMPUTER GENERATED DRAWING BY LAKE CHARLES CHEMICALS CAD REVISE ONLY

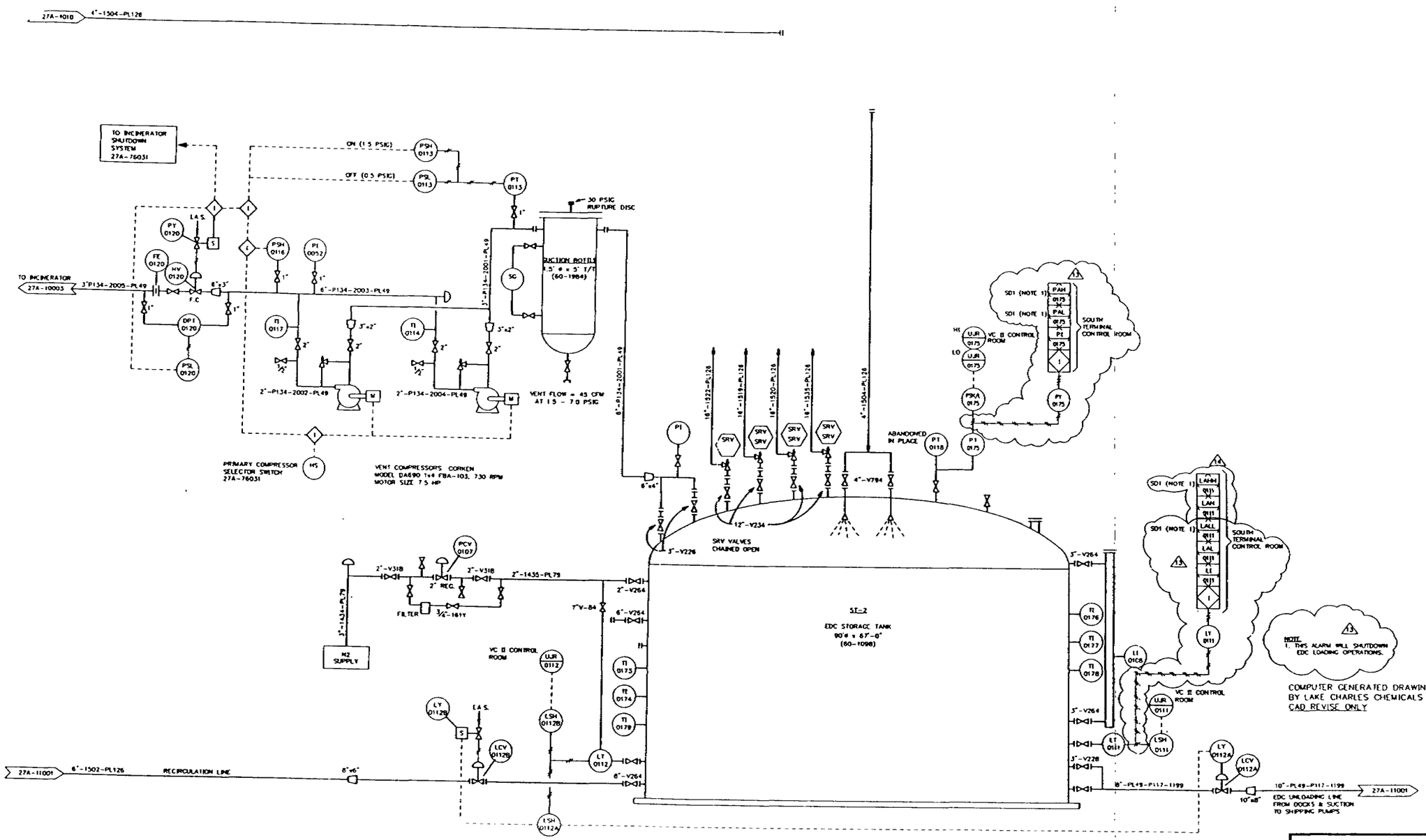
PPG CHEMICALS
LAKE CHARLES, LOUISIANA

SOUTH TERMINAL FACILITIES P&ID
EDC STORAGE TANK ST-1
MECHANICAL FLOWSHEET

DRAWN BY O. HAYNES DATE 05/26/82 SCALE NONE
CHECKED BY - DATE - CHARGE -
APPROVED BY - DATE - SUB -
BM - DWG. 27A-11001:17

6-MET-01-20-93-C 13748 20137485017

SL 085606



REVISIONS

8 REDRAWN & ADDED VENT COMPR. CHG NO- 47790 C. F. BROWN 5/15/89 CK'D: VJM

9 PSH/L-175 AND ADDED UJR-111 AND UJR-1178 INPUTS CHG NO- 159202 C. F. BROWN 6/6/89 CK'D: VJM

10 REV. "AS BUILT" CHG 1800-00-62223 C. F. BROWN 7/27/89 CK'D:

11 REVISED AS BUILT CHG: RES-2609 BY D HAYNES 6/2/92 CHK: APP:

12 REVISED AS BUILT CHG: RES-2609 BY D BLANCHARD DATE 8-26-92

13 REVISED FOR EDC CLOSED DOME LOADING CHG: RES-2609 BY DATE

14 ADDED LAH-0111 AND LAHH-0111 CHG: RES-2609 BY R REEVES DATE 8-10-93 APPR'D D JOHNSON

(27A 15-BM 121)

REFERENCE DWG.
27A-10038 - OPERATIONS FLOW DIAGRAM SOUTH TERMINAL - EDC STORAGE

PPG CHEMICALS
LAKE CHARLES LOUISIANA

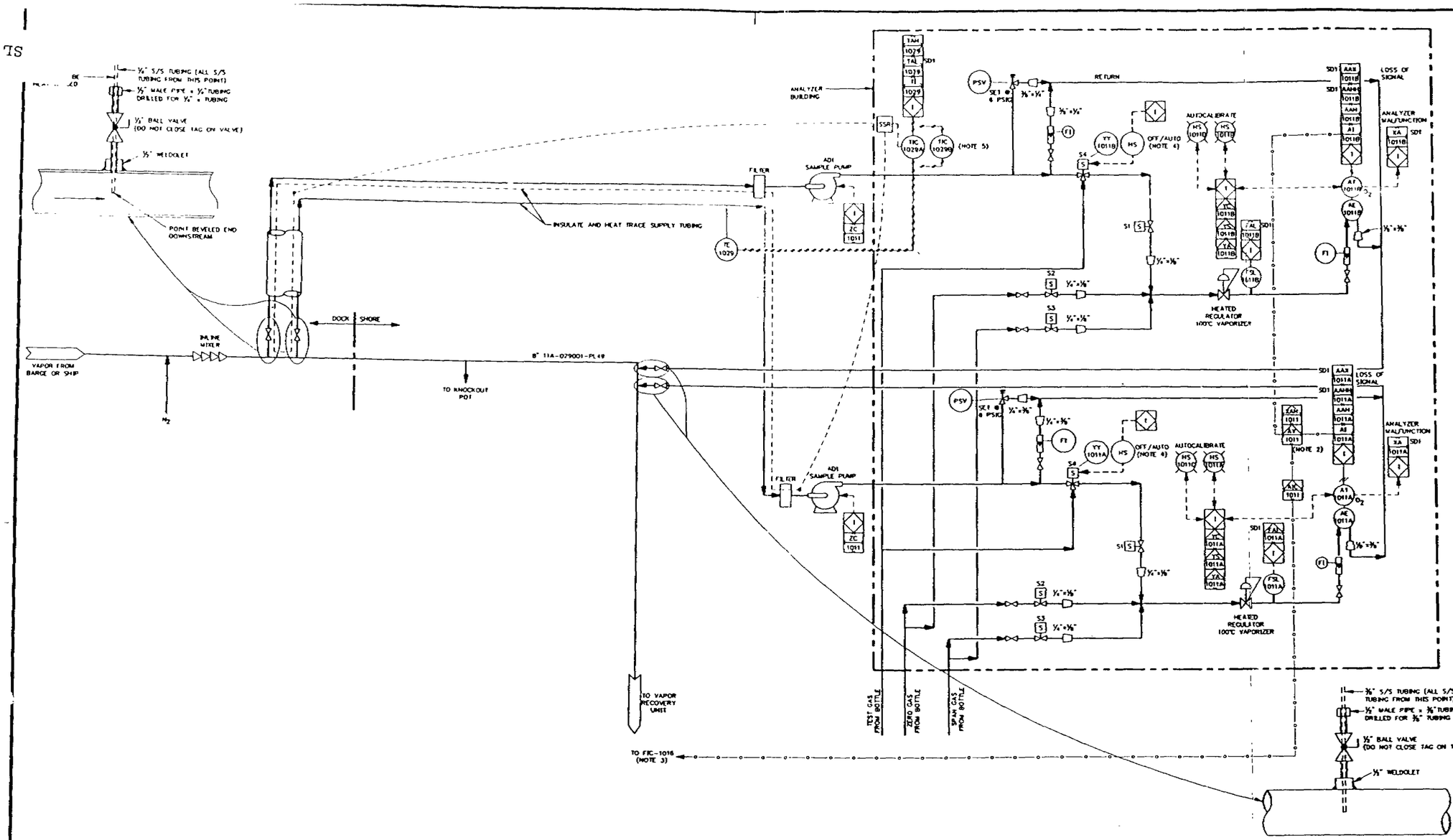
SOUTH TERMINAL FACILITIES — P&ID
SOUTH TERMINAL FACILITIES
MECHANICAL FLOW SHEET

DRAWN BY C. F. BROWN DATE 5/4/89 SCALE NONE
CHECKED BY Y. J. MORGAN DATE 5/16/89 CHANGE NO-47750
APPROVED BY VJM DATE 5/16/89 ZIP -
BM - DWG. 27A-01011.14

A-RET-01/20/93-C\13766.20\3766016

Detailed Analyzer Systems

SL 085608



REVISIONS

1 ADD AND CHANGE INSTRUMENT NUMBERS
CHG. BY: J.W.
DATE: 02/24/93
APP'D:

2 KEY TO RELOCATE SAMPLE PUMPS OUTSIDE OF ANALYZER BUILDING.
CHG. RES-2609
BY R. REEVES
DATE 8-8-93
APP'D DAVE JOHNSON

A 100 C 103

5 SAMPLE LINES FOR OXYGEN ANALYZERS 1011A AND 1011B ARE ROUTED TOGETHER IN THE SAME ELECTRICALLY HEAT TRACED BUNDLE. A SEPARATE TEMPERATURE CONTROL PANEL WILL MONITOR AND CONTROL THE TEMPERATURE OF THE SAMPLE LINES. THE CONTROL PANEL IS EQUIPPED WITH REDUNDANT CONTROLLERS.

NOTES.
1 INSULATE FROM ADI SAMPLE PUMP TO ANALYZER.
2 SIGNAL SELECTION BASED ON HIGH SIGNAL OR NON-MALFUNCTIONING ANALYZER
3 CONTROLLER FIC-1016 IS SHOWN ON DWG. 11A-10029.
4 OFF-AUTO HAND SWITCH IS USED TO DISCONNECT TEST GAS SOLENOID (S4) FROM PLC CONTROL FOR MAINTENANCE PURPOSES.

RELEASED FOR CONSTRUCTION
REVISION NO 0 & 1
BY M. WILLEN DATE 1/21/93

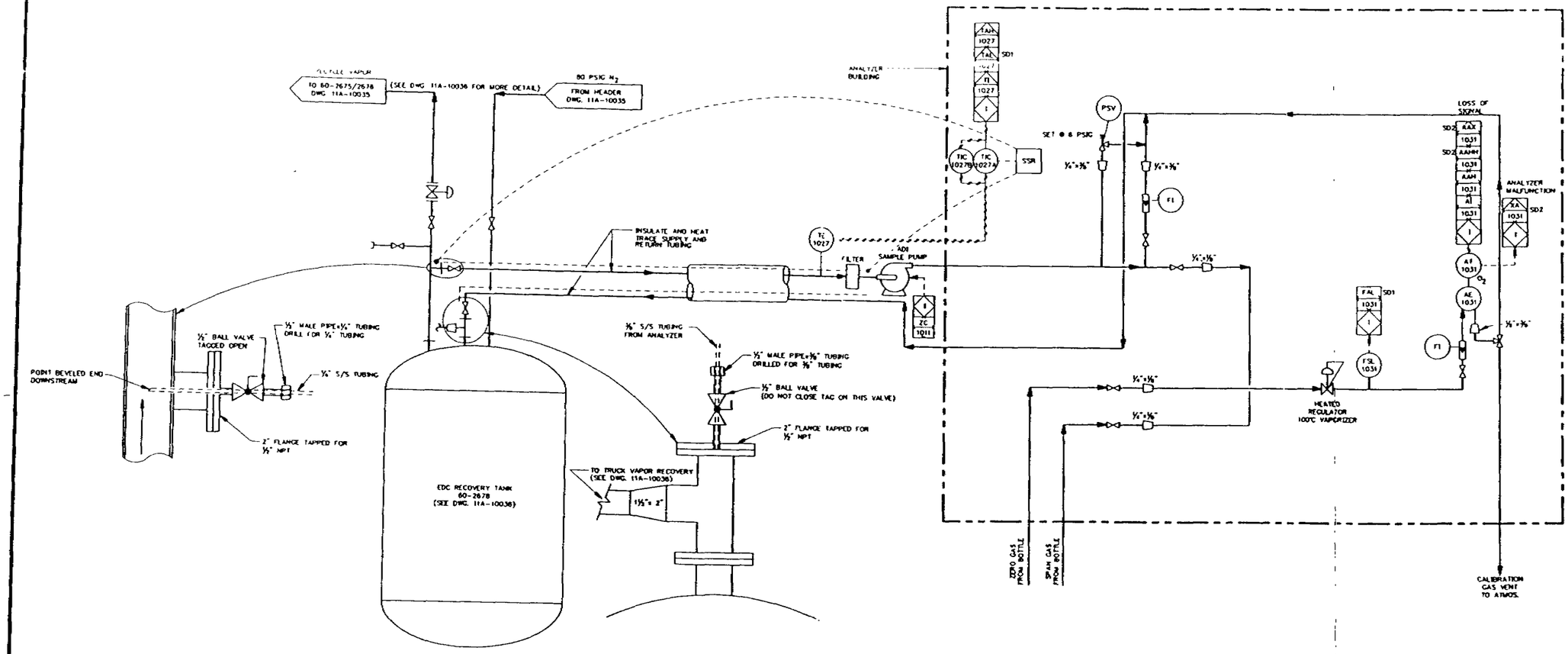
WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE
JOB NO 5766.20 WH&A DWG NO 57-013

PPG CHEMICALS
LAKE CHARLES, LOUISIANA

DOCK AREA — P & ID
CLOSED DOME LOADING
VAPOR RECOVERY
OXYGEN ANALYZER

DRAWN BY J.W. DATE 12/09/92 SCALE NONE
CHECKED BY B.B. & R. DATE 12/09/92 CHARGE RES# 2609
APPROVED BY G.J.B. DATE 1/21/93 SUB
B.M. DWG. 11A-10026.2

SL 085609



REVISIONS

1. CHANGE INSTRUMENT NUMBERS
CHG: JW
BY: 02/24/93
DATE:
APP'D:

2. REV. 10 RELOCATE SAMPLE PUMP OUTSIDE OF ANALYZER BUILDING AND TO CHANGE DETAIL OF SAMPLE RETURN TUBING CONNECTION
CHG: RES-2609
BY: R. REEVES
DATE: 5-8-93
APP'D: DAVE JOHNSON

NOTE

1. INSULATE TUBING FROM ADI SAMPLE PUMP TO ANALYZER.
2. SAMPLE AND RETURN LINES ARE ROUTED TOGETHER IN THE SAME ELECTRICALLY HEAT TRACED BUNDLE. A SEPARATE CONTROL PANEL WILL MONITOR AND CONTROL THE TEMPERATURE OF THE SAMPLE AND RETURN LINES. THE CONTROL PANEL IS EQUIPPED WITH REDUNDANT CONTROLLERS.

RELEASED FOR CONSTRUCTION
REVISION NO. 0 & 1
BY W. WELCH DATE 1/21/93

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE
JOB NO 3766.70 WHA DWG. NO 57-014

A 100 | C 103

PPG CHEMICALS
LAKE CHARLES, LOUISIANA

DOCK AREA P & 10
CLOSED DOME LOADING
EDC RECOVERY TANK
OXYGEN ANALYZER

DRAWN BY J.K. DATE 12/09/92 SCALE NONE
CHECKED BY B.B. & R.R. DATE 12/09/92 CHARGE RES# 2609
APPROVED BY G.J.B. DATE 1/23/93 SUB
BLDG DWG. 11A-10027.2

B

SL 085610

APPENDIX B

SAFETY AND EMERGENCY PLOT PLAN

60'

45'

15'

60'

5.5'

19 PILE CLUSTER (TYP.)

120'

MATC.

19

19

19

19

7.5'

7.5'

"A" DOCK

6

16'

63'

SHELTER

5

4

3

CORNER OF DOCK
E 3383.14
E 618.29

FIRE EXTINGUISHING EQUIPMENT LOCATION

NUMBER	TYPE
1	STANG MONITOR WATER NOZZLE
2	350# WHEEL MOUNTED DRY CHEMICAL
3	30# DRY CHEMICAL
4	350# WHEEL MOUNTED DRY CHEMICAL
5	30# DRY CHEMICAL
6	30# DRY CHEMICAL

(RADIAL)
S 84°27'11" W

E 500

12'

SHELTER

2

1

SL 085612

APPENDIX C

FACILITY PLOT PLAN

MATCH LINE FOR CONT SEE DWG. 20A-15016

VCM STORAGE TANK

VENT

EDC STORAGE TANK

"EDC" STORAGE PROCESS PAD SEE 20A-15047

50 FT. DIRECT BURIAL CABLE

CAUSTIC BY PRODUCT TERMINAL & PROCESS PAD SEE 20A-15045

ETHYLENE VAPORIZER PAD

ETHYLENE BOOSTER PUMP

ETHYLENE TANK

GATE

MATCH LINE W-330'

OLD RIVER SHIP CHANNEL

NOTE:

1. CROSS HATCHING INDICATES DIVISION II AREA. FOR BOUNDRIES OF DIVISION I & DIVISION II AREAS SEE DETAILS FOR DIVISION I AREAS WITHIN PROCESS AREAS SEE LARGE SCALE DRAWINGS AS REFERENCED AT THE INDIVIDUAL PROCESS PAD LOCATION.
2. ALL PITS, TRENCHES, PITCHES AND SEWER OPENINGS IN THIS AREA ARE DIVISION I. (SEE "TYPICAL DETAIL C-1" DWG. 20A-15062)

FOR ENLARGED PLANS OF E.D.C. & CAUSTIC PROCESS PADS & E.D.C. CONTROL ROOM SEE 20A-15046

FOR MASTER INDEX SEE 20A-15000

DETAIL NO.
DRAWING DETAIL IS FOUND ON

REVISIONS

1. ADDED VENTS TO VCM STORAGE TANKS. REMOVED WELD NOTE & CLOUD. CHG-32A. DRN BY: DVC 11-6-84
2. REVISED PER AS-BUILT WALK-UP TO SHOW TELEPHONE CABLING. M. HAYDEL 6-26-84 CHK 5200 APP'D
3. ADDED ETHYLENE VAPORIZER AREA PPG REQ 30718 FB10 01091 BY: CJFS 8-29-91 CKD: AP 11/4/91 APP: APM 11/07/91
4. REVISED FOR CLOSED LOOP VAPOR RECOVERY SYSTEM PPG REQ 24409 BY: JHC 11-03-92 CHKD: JPB 11-19-92 APP: [illegible] 4-8-93

RELEASED FOR CONSTRUCTION
REVISION NO. 4 (DWG)
BY [illegible] DATE 5-8-93

WALK, HAYDEL & ASSOC., INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE
JOB NO. VWLA DWG NO.

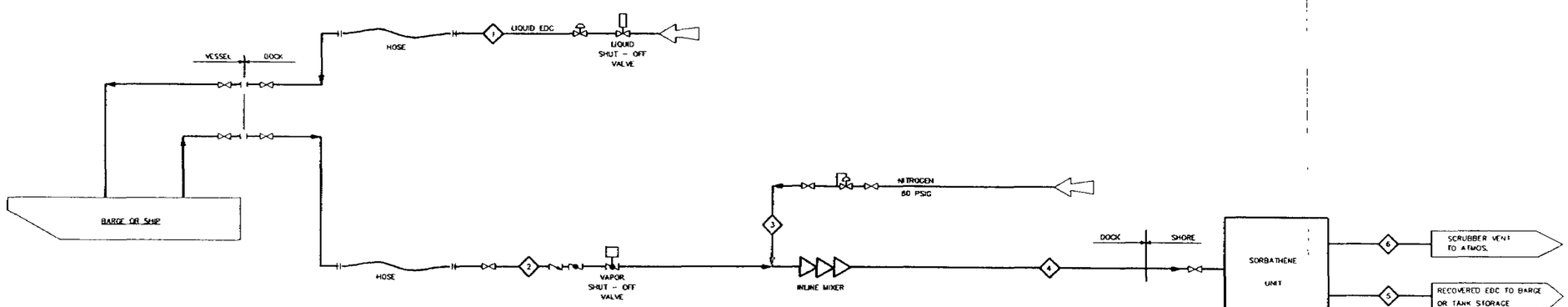
PPG INDUSTRIES
INDUSTRIAL CHEMICAL DIVISION
LOUISIANA
ELECTRICAL CLASSIFIED LOCATION PLAN
SL 085615
DWG 20A-15014

D

SL 085616

APPENDIX D

MATERIAL BALANCE



DATA \ STREAM	1	2	3	4	5	8
TOTAL FLOW - LB/HR	1300000	2031	1857	3698	780	2936
- LBMOL/HR	13137	52.5	59.5	112.0	7.7	104.4
- ACFH	16822	21028	23831	44859	9.8	41780
TEMPERATURE - F	90.0	90.0	90.0	88.97	88.97	88.97
PRESSURE - PSIG	0	0	0	0	0	0
DENSITY - LB/CUFT	77.28	0.0966	0.0699	0.0825	77.33	0.0703
AVG MOL WT	98.96	38.66	28.01	33.01	98.98	28.15
COMPONENTS - LB/HR						
EDC	1300000	761	0.0	761	760	0.2
NITROGEN	0.0	945	1867	2812	0.0	2812
OXYGEN	0.0	287	0.0	287	0.0	287
H2O	0.0	39	0.0	39	0.0	39
COMPONENTS - LBMOL/HR						
EDC	13137	7.7	0.0	7.7	7.7	0.0
NITROGEN	0.0	33.7	59.5	93.2	0.0	93.2
OXYGEN	0.0	9.0	0.0	9.0	0.0	9.0
H2O	0.0	2.1	0.0	2.1	0.0	2.1
COMPONENTS - MOL FR						
EDC	1.0	0.146	0.0	0.069	1.0	0.0
NITROGEN	0.0	0.642	1.0	0.832	0.0	0.893
OXYGEN	0.0	0.171	0.0	0.080	0.0	0.086
H2O	0.0	0.041	0.0	0.019	0.0	0.021
COMPONENTS - ACFH						
EDC	16822	3076	0.0	3077	9.8	0.8
NITROGEN	0.0	13503	23831	37331	0.0	37328
OXYGEN	0.0	3589	0.0	3591	0.0	3591
H2O	0.0	860	0.0	860	0.0	860

REVISIONS

ALL PRINTS DATED BEFORE LAST REVISION ARE CANCELLED AND RECALLED

SL 085618

A 100 C 101

PPG CHEMICALS
LAKE CHARLES, LOUISIANA

DOCK AREA PFD
PPG CLOSED DOME LOADING
SOUTH TERMINAL - DOCKS & BARGES
SHEET 1 OF 1

RELEASED FOR CONSTRUCTION
REVISION NO 0
BY DATE

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE
JOB NO 5766.70 WH&A DWG NO 37-313

DRAWN BY JW DATE 12/09/92 SCALE NONE
CHECKED BY CK DATE 12/09/92 CHARGE RES# 2609
APPROVED BY DATE SHR
BW DWG. 11A-10028.0

E

ST 085619

APPENDIX E

APPLICABLE COAST GUARD REGULATIONS

federal register

Thursday
June 21, 1990

Part II

Department of Transportation

Coast Guard

33 CFR Part 154 et al.
46 CFR Part 30 et al.
Marine Vapor Control Systems; Final Rule

Assessment, it should be noted that the Coast Guard has also determined that regulations for the safe design, installation, and operation of vapor control systems, as described in this rulemaking, can only be effectively implemented at the national level. Once a state requires vapor control, the discretion available to that state to modify requirements concerning design, installation, and operation of vapor control systems, as they pertain to shoreside facilities, will be limited. For example, all flexible hoses used in vapor control systems and the last one meter (3.3 feet) of fixed piping leading to the facility vapor connection must be color coded with three bands painted red/yellow/red of specified width. The vapor connection flange is also of unique design to prevent improper cross-connection. These requirements, and others like them, could not be modified. Some standardization of equipment and operational procedures is necessary since affected vessels move from port to port in the national marketplace and excessive modification of the requirements would be burdensome and potentially unsafe.

List of Subjects

33 CFR Part 154

Incorporation by reference, Oil pollution, Reporting and recordkeeping requirements, Vapor control.

33 CFR Part 155

Oil pollution, Reporting and recordkeeping requirements.

33 CFR Part 156

Hazardous materials transportation, Oil pollution, Reporting and recordkeeping requirements, Water pollution control.

46 CFR Part 30

Cargo vessels, Foreign relations, Hazardous materials transportation, Penalties, Reporting and recordkeeping requirements.

46 CFR Part 32

Cargo vessels, Fire prevention, Marine safety, Navigation (water), Occupational safety and health, Reporting and recordkeeping requirements, Seamen.

46 CFR Part 35

Cargo vessels, Fire prevention, Marine safety, Navigation (water), Occupational safety and health, Reporting and recordkeeping requirements, Seamen.

46 CFR Part 39

Cargo vessels, Hazardous materials transportation, Incorporation by reference, Marine safety, Occupational safety and health, Reporting and recordkeeping requirements, Vapor control.

For the reasons set out in the preamble, the Coast Guard amends title 33, chapter I, Subchapter O, parts 154, 155, and 156, and title 46, chapter I, parts 30, 32, and 35, and adds a new part 39 to 46 CFR, Chapter I, as set forth below.

TITLE 33—[AMENDED]

PART 154—[AMENDED]

1. The authority citation for part 154 is revised to read as follows:

Authority: 33 U.S.C. 1231, 1321(j)(1)(C); sec. 2, E.O. 11735, 38 FR 21243, 3 CFR, 1971–1975 Comp., p. 793; 49 CFR 1.46.

2. Section 154.106 is revised to read as follows:

§ 154.106 Incorporation by reference.

(a) Certain materials are incorporated by reference into this part with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a). To enforce any edition other than the one listed in paragraph (b) of this section, notice of change must be published in the Federal Register and the material made available to the public. All approved material is on file at the Office of the Federal Register, 1100 L Street, NW., Washington, DC, and at the U.S. Coast Guard, Marine Technical and Hazardous Materials Division (G-MTH), 2100 Second Street, SW., Washington, DC, 20593-0001, and is available from the sources indicated in paragraph (b) of this section.

(b) The material approved for incorporation by reference in part, and the sections affected are:

American Petroleum Institute (API), 1220 L Street NW., Washington, DC 20005	
API Standard 2000, Venting Atmospheric and Low-Pressure Storage Tanks (Nonrefrigerated and Refrigerated), Third Edition, January 1982 (reaffirmed December 1987)	154.814
API Recommended Practice 550, Manual on Installation of Refinery Instruments and Control Systems, Part II—Process Stream Analyzers, Section 1—Analyzers, Fourth Edition, February 1985	154.824
American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018	
ANSI B16.5, Steel Pipe Flanges and Flanged Fittings, 1981	154.500; 154.808; 154.810
ANSI B16.24—Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300, 1979	154.500; 154.808
ANSI B31.3—Chemical Plant and Petroleum Refinery Piping, 1987 (including B31.3a–1988, B31.3b–1988, and B31.3c–1989 addenda)	154.510; 154.808
International Electrotechnical Commission (IEC), Bureau Central de la Commission Electrotechnique Internationale, 1, rue de Varembé, Geneva, Switzerland	
IEC 309-1—Plugs, Socket-Outlets and Couplers for Industrial Purposes: Part 1, General Requirements, 1979	154.812
IEC 309-2—Plugs, Socket-Outlets and Couplers for Industrial Purposes: Part 2, Dimensional Interchangeability Requirements for Pin and Contact-tube Accessories, 1981	154.812
National Electrical Manufacturers Association (NEMA), 2101 L St. NW., Washington, DC 20036	
ANSI/NEMA WD6—Wiring Devices, Dimensional Requirements, 1988	154.812
National Fire Protection Association (NFPA), Batterymarch Park, Quincy, MA 02269	
NFPA 70—National Electrical Code, 1987	154.735; 154.808; 154.812
Oil Companies International Marine Forum (OCIMF), 6th Floor, Portland House, Stag Place, London SW1E 5BH, England	
International Safety Guide for Oil Tankers and Terminals, Third Edition, 1988	154.735; 154.810

3. Section 154.310 is amended by redesignating existing paragraphs (b) and (c) as (c) and (d), respectively, adding new paragraph (b), and adding a parenthetical at the end of the section to read as follows:

§ 154.310 Operations manual: Contents.

* * * * *

(b) If a facility collects vapors emitted from vessel cargo tanks for recovery, destruction, or dispersion, the operations manual must contain a description of the vapor collection system at the facility which includes:

(1) A line diagram or simplified piping and instrumentation diagram (P&ID) of the facility's vapor control system piping, including the location of each valve, control device, pressure-vacuum

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relief valve, pressure indicator, flame arrester, and detonation arrester; and

(2) A description of the vapor control system's design and operation including the:

(i) Vapor line connection;

(ii) Startup and shutdown procedures;

(iii) Steady state operating procedures;

(iv) Provisions for dealing with pyrophoric sulfide (for facilities which handle inerted vapors of cargoes containing sulfur);

(v) Alarms and shutdown devices; and

(vi) Pre-transfer equipment inspection requirements.

* * * * *

(Approved by the Office of Management and Budget under control number 2115-0078)

4. Section 154.740 is amended by deleting the word "and" at the end of paragraph (e), by replacing the period at the end of paragraph (f) with a semicolon, adding new paragraphs (g), (h), and (i), and adding a parenthetical at the end of the section to read as follows:

§ 154.740 Records.

* * * * *

(g) A record of all repairs made within the last three years involving any component of the facility's vapor control system required by subpart E of this part;

(h) A record of all automatic shut downs of the facility's vapor control system within the last 3 years; and

(i) Plans, calculations, and specifications of the facility's vapor control system certified under § 154.804 of this part.

(Approved by the Office of Management and Budget under control number 2115-0098)

5. A new subpart E is added to part 154 to read as follows:

Subpart E—Vapor Control Systems

Subpart E—Vapor Control Systems

§ 154.800 Applicability.

(a) Except as specified by paragraph (c) of this section, this subpart applies to:

(1) Each facility which collects vapors of crude oil, gasoline blends, or benzene emitted from vessel cargo tanks;

(2) A vessel which is not a tank vessel that has a vapor processing unit located on board for recovery, destruction, or dispersion of crude oil, gasoline blends, or benzene vapors from a tank vessel; and

(3) Certifying entities which review, inspect, test, and certify facility vapor control systems.

(b) A facility which collects vapors of flammable or combustible cargoes other than crude oil, gasoline blends, or benzene, must meet the requirements prescribed by the Commandant (G-MTH).

(c) A facility with an existing Coast Guard approved vapor control system which was operating prior to July 23, 1990 is subject only to § 154.850 of this subpart as long as it receives cargo vapor only from the specific vessels for which it was approved.

(d) This subpart does not apply to the collection of vapors of liquefied flammable gases as defined in 46 CFR 30.10-39.

(e) When a facility vapor control system which receives cargo vapor from a vessel is connected to a facility vapor control system that serves tank storage areas and other refinery processes, the specific requirements of this subpart apply between the vessel vapor connection and the point where the vapor control system connects to the facility's main vapor control system.

§ 154.802 Definitions.

As used in this subpart:

Certifying entity means an individual or organization accepted by the Commandant (G-MTH) to review plans and calculations for vapor control system designs, and to conduct initial inspections and witness tests of vapor control system installations.

Existing vapor control system means a vapor control system which was operating prior to July 23, 1990.

Facility vapor connection means the point in e facility's vapor collection system where it connects to a vapor collection hose or the base of a vapor collection arm.

Inerted means the oxygen content of the vapor space in a tank vessel's cargo tank is reduced to 8 percent by volume or less in accordance with the inert gas requirements of 46 CFR 32.53 or 46 CFR 153.500.

Liquid knockout vessel means a device to separate liquid from vapor.

Maximum allowable transfer rate means the maximum volumetric rate at which a vessel may receive cargo or ballast.

New vapor control system means a vapor control system which is not an existing vapor control system.

Vapor balancing means the transfer of vapor displaced by incoming cargo from the tank of a vessel receiving cargo into a tank of the vessel or facility delivering cargo via a vapor collection system.

Vapor collection system means an arrangement of piping and hoses used to collect vapor emitted from a vessel's cargo tanks and transport the vapor to a vapor processing unit.

Vapor control system means an arrangement of piping and equipment used to control vapor emissions collected from a vessel, and includes the vapor collection system and the vapor processing unit.

Vapor destruction unit means a vapor processing unit that destroys cargo vapor by a means such as incineration.

Vapor dispersion system means a vapor processing unit which releases cargo vapor to the atmosphere through a venting system not located on the vessel being loaded or ballasted.

Vapor processing unit means the components of a vapor control system that recovers, destroys, or disperses vapor collected from a vessel.

Vapor recovery unit means a vapor processing unit that recovers cargo vapor by a non-destructive means such as lean oil absorbtion, carbon bed adsorption, or refrigeration.

Vessel vapor connection means the point in a vessel's fixed vapor collection system where it connects to a vapor collection hose or arm.

§ 154.804 Review, certification, and initial inspection.

(a) A new vapor control system installation must be certified by a certifying entity as meeting the requirements of this subpart prior to operating.

(b) An existing vapor control system installation not exempted by § 154.800(c) of this subpart must be certified by a certifying entity by July 23, 1992. Plans, calculations, and specifications for the installation must be submitted to a certifying entity for review by January 23, 1991.

(c) An existing vapor control system installation that has been Coast Guard approved for operation with specific

vessels must be certified by a certifying entity prior to receiving vapors from other vessels.

(d) Plans and information submitted to the certifying entity must include a qualitative failure analysis. The analysis must demonstrate the following:

(1) The vapor control system is designed to permit the system to continuously operate safely when receiving cargo vapors from tankships and barges over the full range of transfer rates expected at the facility;

(2) The vapor control system is provided with the proper alarms and automatic control systems to prevent unsafe operation;

(3) The vapor control system is equipped with sufficient automatic or passive devices to minimize damage to personnel, property, and the environment if an accident were to occur; and

(4) If a quantitative failure analysis is also conducted, the level of safety attained is at least one order of magnitude greater than that calculated for operating without a vapor control system.

Note: The *American Institute of Chemical Engineers* publication, "Guidelines for Hazard Evaluation Procedures" may be used as guidance when preparing a qualitative failure analysis. Military Standard MIL-STD-882B may be used as guidance when preparing a quantitative failure analysis.

(e) The certifying entity must conduct all initial inspections and witness all tests required to demonstrate that the facility:

(1) Conforms to certified plans and specifications;

(2) Meets the requirements of this subpart; and

(3) Is operating properly.

(f) Upon receipt of written certification from the certifying entity that a facility's vapor control system complies with the requirements of this part the COTP shall endorse the letter of adequacy required by § 154.325 of this part to indicate that the facility is acceptable for collecting vapors of crude oil, gasoline blends, benzene, or any other vapors for which it is certified.

(g) Any design or configuration alteration involving a certified vapor control system must be reviewed by a certifying entity. After conducting any inspections and witnessing tests necessary to verify that the modified vapor control system meets the requirements of this subpart, the certifying entity must recertify the installation.

(h) Certifications issued in accordance with this section and a copy of the plans, calculations, and specifications for the vapor control system must be maintained at the facility.

(i) A certifying entity accepted under § 154.806 of this subpart may not certify a facility vapor control system if it was involved in the design or installation of the system.

(Approved by the Office of Management and Budget under control number 2115-0561)

§ 154.806 Application for acceptance as a certifying entity.

(a) An individual or organization seeking acceptance as a certifying entity must apply in writing to the Commandant (G-MTH). Each application must be signed and certified to be correct by the applicant or, if the applicant is an organization, by an authorized officer or official representative of the organization, and must include a letter of intent from a facility owner or operator to use the services of the individual or organization to certify a vapor control system installation. Any false statement or misrepresentation, or the knowing and willful concealment of a material fact may subject the applicant to prosecution under the provisions of 18 U.S.C. 1001, and denial or termination of acceptance as a certifying entity.

(b) The applicant must possess the following minimum qualifications, and be able to demonstrate these qualifications to the satisfaction of the Commandant (G-MTH):

(1) The ability to review and evaluate design drawings and failure analyses;

(2) A knowledge of the applicable regulations of this subpart, including the standards incorporated by reference in these regulations;

(3) The ability to monitor and evaluate test procedures and results;

(4) The ability to perform inspections and witness tests of bulk liquid cargo handling systems;

(5) That it is not controlled by an owner or operator of a vessel or facility engaged in controlling vapor emissions; and

(6) That it is not dependent upon Coast Guard acceptance under this section to remain in business.

(c) Each application for acceptance must contain the following:

(1) The name and address of the applicant, including subsidiaries and divisions if applicable;

(2) A statement that the applicant is not controlled by an owner or operator of a vessel or facility engaged in controlling vapor emissions, or a full disclosure of any ownership or controlling interest held by such owners or operators;

(3) A description of the experience and qualifications of the person(s) who would be reviewing or testing the systems;

(4) A statement that the person(s) who would be reviewing or testing the systems is/are familiar with the regulations in this subpart; and

(5) A statement that the Coast Guard may verify the information submitted in the application and may examine the person(s) who would be reviewing or testing the systems to determine their qualifications.

(d) The acceptance of a certifying entity may be terminated by the Commandant (G-MTH) if the entity fails to properly review, inspect, or test a system in accordance with this subpart.

Note: A list of entities accepted to certify facility vapor control system installations is available from the Commandant (G-MTH).

(Approved by the Office of Management and Budget under control number 2115-0561)

§ 154.808 Vapor control system, general.

(a) A vapor control system design and installation must eliminate potential overfill hazards, overpressure and vacuum hazards, and sources of ignition to the maximum practical extent. Each remaining hazard source which is not eliminated must be specifically addressed in the protection system design and operational requirements.

(b) Vapor collection system piping and fittings must be in accordance with ANSI B31.3 and designed for a maximum allowable working pressure of at least 150 psig. Valves and flanges must be in accordance with ANSI B16.5 or B16.24, 150 pound class.

(c) All electrical equipment used in a vapor control system must comply with NFPA 70.

(d) Any pressure, flow, or concentration indication required by this part must provide a remote indicator on the facility where the cargo transfer and vapor control systems are controlled.

(e) Any alarm condition specified in this part must activate an audible and visible alarm where the cargo transfer and vapor control systems are controlled.

(f) The vapor control system must be separated or insulated from external heat sources to limit vapor control system piping surface temperature to not more than 177 °C. (350 °F.) during normal operation.

(g) A means must be provided to eliminate any liquid condensate from the vapor collection system which carries over from the vessel or condenses as a result of an enrichment process.

(h) If a liquid knockout vessel is installed it must have:

(1) A means to indicate the level of liquid in the device;

(2) A high liquid level sensor that activates an alarm; and

(3) A high high level sensor that closes the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart and shuts down any compressors or blowers prior to liquid carrying over from the vessel to the compressor or blower.

(i) Vapor collection piping must be electrically grounded and electrically continuous.

(j) If the facility handles inerted vapors of cargoes containing sulfur, provisions must be made to control heating from pyrophoric iron sulfide deposits in the vapor collection line.

§ 154.810 Vapor line connections.

(a) A remotely operated cargo vapor shutoff valve must be installed in the vapor collection line between the facility vapor connection and the nearest point where any inerting, enriching, or diluting gas is introduced into the vapor collection line or where a detonation arrester is fitted. The valve must:

(1) Close within thirty (30) seconds after detection of a shutdown condition by a component required by this subpart;

(2) Close automatically if the control signal is lost;

(3) Activate an alarm when a signal to shut down is received;

(4) Be capable of manual operation or manual activation;

(5) Have a local valve position indicator or be designed so that the valve position can be readily determined from the valve handle or valve stem position; and

(6) If the valve seat is fitted with resilient material, not allow appreciable leakage when the resilient material is damaged or destroyed.

(b) Except when a vapor collection arm is used, the last 1.0 meter (3.3 feet) of vapor piping before the facility vapor connection must be:

(1) Painted red/yellow/red with:

(i) The red bands 0.1 meter (0.33 feet) wide, and

(ii) The middle yellow band 0.8 meter (2.64 feet) wide; and

(2) Labeled "VAPOR" in black letters at least 50 millimeters (2 inches) high.

(c) Each facility vapor connection flange must have a permanently attached 0.5 inch diameter stud at least 1.0 inch long projecting outward from the flange face. The stud must be located at the top of the flange, midway between bolt holes, and in line with the bolt hole pattern.

(d) Each hose used for transferring vapors must:

(1) Have a design burst pressure of at least 25 psig;

(2) Have a maximum allowable working pressure of at least 5 psig;

(3) Be capable of withstanding at least 2.0 psi vacuum without collapsing or constricting;

(4) Be electrically continuous with a maximum resistance of ten thousand (10,000) ohms;

(5) Have flanges with:

(i) A bolt hole arrangement complying with the requirements for 150 pound class ANSI B16.5 flanges, and

(ii) One or more 0.625 inch diameter holes in the flange located midway between bolt holes and in line with the bolt hole pattern;

(6) Be abrasion resistant and resistant to kinking; and

(7) Have the last 1.0 meter (3.3 feet) of each end of the vapor hose marked in accordance with paragraph (b) of this section.

(e) Vapor hose handling equipment must be provided with hose saddles which provide adequate support to prevent kinking or collapse of hoses.

(f) Fixed vapor collection arms must:

(1) Meet the requirements of paragraphs (d)(1) through (d)(5) of this section;

(2) Have the last 1.0 meter (3.3 feet) of the arm marked in accordance with paragraph (b) of this section.

(g) The facility vapor connection must be electrically insulated from the vessel vapor connection in accordance with section 6.10 of the OCIMF International Safety Guide for Oil Tankers and Terminals.

(h) A vapor collection system fitted with an enriching system that operates at a positive gauge pressure at the facility vapor connection must be fitted with:

(1) A manual isolation valve between each facility vapor connection and the remotely operated cargo vapor shutoff valve required by paragraph (a) of this section; and

(2) A means to prevent backflow of enriched vapor to the vessel's vapor collection system.

§ 154.812 Facility requirements for vessel liquid overfill protection.

(a) Each facility which receives cargo vapor from a tank barge which is fitted with overfill protection in accordance with 46 CFR 39.20-9(a) as its only means of overfill protection must provide a 120 volt, 20 amp explosion proof receptacle which meets:

(1) ANSI/NEMA WD6;

(2) NFPA 70, Articles 410-57 and 501-12; and

(3) 46 CFR 111.105-9.

(b) Each facility that receives cargo vapor from a tank barge fitted with an intrinsically safe cargo tank level sensor system complying with 46 CFR 39.20-9(b) as its only means of overfill protection must have an overfill control panel on the dock capable of powering and receiving an alarm and shutdown signal from the cargo tank level sensor system that:

(1) Closes the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart and activates the emergency shutdown system required by § 154.550 of this part when:

(i) A tank overfill signal is received from the barge, or

(ii) Electrical continuity of the cargo tank level sensor system is lost;

(2) Activates an alarm which is audible and visible to barge personnel and facility personnel when a tank overfill signal, or an optional high level signal corresponding to a liquid level lower than the tank overfill sensor setting, is received from the barge;

(3) Has a means to electrically and mechanically test the alarms and automatic shutdown systems prior to transferring cargo to or ballasting the tank barge;

(4) Has suitable means, such as approved intrinsic safety barriers able to accept passive devices, to ensure that the overfill and optional alarm circuits on the barge side of the overfill control panel, including cabling, normally closed switches, and pin and sleeve connectors, are intrinsically safe;

(5) Is labeled with the maximum allowable inductance and capacitance to be connected to the panel, as specified by the equipment manufacturer; and

(6) Has a female connecting plug for the tank barge level sensor system with a 5 wire, 16 amp connector body meeting IEC 309-1/309-2 which is:

(i) Configured with pins S2 and R1 for the tank overfill sensor circuit, pin G connected to the cabling shield, and pins N and T3 reserved for an optional high level alarm connection;

(ii) Labeled "Connector for Barge Overflow Control System"; and

(iii) Connected to the overfill control panel by a shielded flexible cable.

§ 154.814 Facility requirements for vessel vapor overpressure and vacuum protection.

(a) A facility's vapor collection system must have the capacity for collecting cargo vapor at a rate of not less than 1.25 times the facility's maximum liquid transfer rate for cargo for which vapor collection is required plus any inerting,

diluting, or enriching gas which may be added to the system, unless the vapor growth for turbulent loading of the most volatile liquid handled by the facility is less than 25 percent.

(b) A facility vapor collection system must maintain the pressure in a vessel's cargo tanks between 80 percent of the highest setting of any of the vessel's vacuum relief valves and 80 percent of the lowest setting of any of the vessel's pressure relief valves for a non-inerted tank vessel, and between 0.2 psig and 80 percent of the lowest setting of any of the vessel's pressure relief valves for an inerted tank vessel. The system must be capable of maintaining the pressure in the vessel's cargo tanks within this range at any cargo transfer rate less than or equal to the maximum transfer rate determined at the pre-transfer conference required by § 156.120(w) of this chapter.

(c) The pressure measured at the facility vapor connection must be corrected for pressure drops across the vessel's vapor collection system and the vapor collection hose or arm.

(d) A pressure sensing device must be provided which activates an alarm when the pressure at the facility vapor connection exceeds either the pressure corresponding to the upper pressure determined in paragraph (b) of this section or a lower pressure agreed upon at the pre-transfer conference required by § 156.120(w) of this chapter.

(e) A pressure sensing device must be provided which activates an alarm when the pressure at the facility vapor connection falls below either the pressure corresponding to the lower pressure determined in paragraph (b) of this section or a higher pressure agreed upon at the pre-transfer conference required by § 156.120(w) of this chapter.

(f) A pressure sensing device must be provided which activates the emergency shutdown system required by § 154.550 of this part and closes the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the pressure at the facility vapor connection exceeds 2.0 psi, or a lower pressure agreed upon at the pre-transfer conference required by § 156.120(w) of this chapter. The sensing device must be independent of the device used to activate the alarm required by paragraph (d) of this section.

(g) A pressure sensing device must be provided which closes the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the vacuum at the facility vapor connection is more than 1.0 psi, or a lesser vacuum set at the pre-transfer conference required by § 156.120(w) of this chapter. The sensing device must be independent of the device used to activate the alarm required by paragraph (e) of this section.

(h) The pressure sensing devices required by paragraphs (e) and (f) of this section must be located in the vapor collection line between the facility vapor connection and the manual isolation valve, if required by § 154.810(b) of this subpart, unless an interlock is provided which prevents operation of the system when the isolation valve is closed.

(i) A pressure indicating device must be provided which indicates the pressure in the vapor collection line.

(j) If a compressor, blower, or eductor capable of drawing more than 1.0 psi vacuum is used to draw vapor from the vessel, a vacuum relief valve must be installed in the vapor collection line between the compressor, blower, or eductor and the facility vapor connection, which:

(1) Relieves at a pressure such that the pressure in the vapor collection system at the facility vapor connection does not exceed 1.0 psi vacuum;

(2) Has a relieving capacity equal to or greater than the capacity of the compressor, blower, or eductor;

(3) Has a flame screen fitted at the vacuum relief opening; and

(4) Has been tested for relieving capacity in accordance with paragraph 1.5.1.3 of API 2000 with a flame screen fitted.

(k) When a facility collects cargo vapor through an undersea pipeline from a vessel moored offshore, the vacuum relief valve may be set at a vacuum greater than 1.0 psi vacuum provided the pressure controls take into account the pressure drop across the vessel's vapor collection system, any vapor collection hoses, and the undersea pipeline as a function of the actual transfer rate.

(l) If the pressure in the vapor collection system can exceed 2.0 psig due to a malfunction in an inerting, enriching, or diluting system a pressure relief valve must:

(1) Be installed between the point where inerting, enriching, or diluting gas is introduced into the vapor collection system and the facility vapor connection;

(2) Relieve at a pressure such that the pressure in the vapor collection system at the facility vapor connection does not exceed 2.0 psig;

(3) Have a relieving capacity equal to or greater than the maximum capacity of the facility inerting, enriching, or diluting gas source;

(4) If not designed to insure a minimum vapor discharge velocity of 30 meters (98.4 ft.) per second, have a flame screen fitted at the discharge opening; and

(5) Have been tested for relieving capacity in accordance with paragraph 1.5.1.3 of API 2000.

(m) The relieving capacity test required by paragraph (l)(5) must be carried out with a flame screen fitted at the discharge opening if the pressure relief valve is not designed to insure a minimum vapor discharge velocity of 30 meters (98.4 ft.) per second.

§ 154.820 Fire, explosion, and detonation protection.

(a) A vapor control system with a single facility vapor connection that receives vapor only from a vessel with inerted cargo tanks and processes vapor with a vapor recovery unit must:

(1) Be capable of inerting the vapor collection line in accordance with § 154.824(a) of this subpart prior to receiving vapors from the vessel;

(2) Have at least one oxygen analyzer that samples the vapor concentration continuously at a point not more than 6 meters (19.7 ft.) from the facility vapor connection; and

(3) Meet § 154.824 (f)(1), (f)(2), (g), (h)(2), and (h)(3) of this subpart.

(b) A vapor control system with a single facility vapor connection that receives vapor only from a vessel with inerted cargo tanks and processes vapor with a vapor destruction unit must:

(1) Have a detonation arrester located not more than 6 meters (19.7 ft.) from the facility vapor connection; or

(2) Have an inerting system that meets the requirements of § 154.824 of this subpart.

(c) A vapor control system with a single facility vapor connection that receives vapor from a vessel with cargo tanks that are not inerted and processes vapor with a vapor recovery unit must:

(1) Have a detonation arrester located not more than 6 meters (19.7 ft.) from the facility vapor connection; or

(2) Have an inerting, enriching, or diluting system that meets the requirements of § 154.824 of this subpart.

(d) A vapor control system with a single facility vapor connection that receives vapor from a vessel with cargo tanks that are not inerted and processes the vapor with a vapor destruction unit must:

(1) Have a detonation arrester located not more than 6 meters (19.7 ft.) from the facility vapor connection; and

(2) Have an inerting, enriching, or diluting system that meets the requirements of § 154.824 of this subpart.

(e) A vapor control system with multiple facility vapor connections that processes vapor with a vapor recovery unit must have a detonation arrester located not more than 6 meters (19.7 ft.) from each facility vapor connection.

(f) A vapor control system with multiple facility vapor connections that processes vapor with a vapor destruction unit must:

(1) Have a detonation arrester located not more than 6 meters (19.7 ft.) from each facility vapor connection; and

(2) Have an inerting, enriching, or diluting system that meets the requirements of § 154.824 of this subpart.

(g) A vapor control system that uses a vapor balancing system in which cargo vapor from a vessel is transferred through the facility vapor collection system to facility storage tanks must:

(1) Have a detonation arrester located not more than 6 meters (19.7 ft.) from each facility vapor connection;

(2) Have a detonation arrester located within the storage tank containment area as close as practical to the vapor return connection of each facility storage tank; and

(3) Have facility storage tank high level alarm systems and facility storage tank overfill control systems arranged to prevent cargo from entering the vapor return line.

(h) Except for a discharge vent from a vapor destruction unit, each outlet of a vapor control system that vents to atmosphere and is not isolated with a pressure-vacuum relief valve must have a flame arrester located at the outlet.

§ 154.822 Detonation arresters, flame arresters, and flame screens.

(a) Each detonation arrester required by this part must:

(1) Be capable of arresting a detonation from either side of the device; and

(2) Be acceptable to the Commandant (G–MTH). A detonation arrester designed, built, and tested in accordance with appendix A of this part will be acceptable to the Commandant (G–MTH).

(b) Each flame arrester required by this part must be acceptable to the Commandant (G–MTH). A flame arrester designed, built, and tested in accordance with appendix B of this part will be acceptable to the Commandant (G–MTH).

(c) Each flame screen required by this part must be either a single screen of corrosion resistant wire of at least 30 by 30 mesh, or two screens, both of corrosion resistant wire, of at least 20 by 20 mesh, spaced not less than 25 millimeters (1 in.) or more than 75 millimeters (3 in.) apart.

§ 154.824 Inerting, enriching, and diluting systems.

(a) A vapor control system which uses inerting, enriching or diluting gas must be capable of inerting, enriching, or diluting the vapor collection line and the vapor collection hose or arm prior to receiving cargo vapor.

(b) Except as permitted by § 154.820(a) of this subpart, a vapor control system which uses an inerting, enriching, or diluting system must be equipped with a gas injection and mixing arrangement located as close as practical but not more than 10 meters (32.8 ft.) from the facility vapor connection that ensures complete mixing of the gases within 20 pipe diameters of the injection point.

(c) A vapor control system that uses an inerting or enriching system may not be operated at a vacuum after the injection point unless:

(1) There are no sleeve-type pipe couplings, vacuum relief valves, or other devices which could allow air into the vapor collection system downstream of the injection point; or

(2) An additional analyzer is used to monitor the downstream vapor concentration and a means is provided to inject additional inerting or enriching gas.

(d) A vapor control system that uses analyzers to control the amount of inerting, enriching, or diluting gas injected into the vapor collection line must be equipped with at least 2 analyzers. The analyzers must be connected so that:

(1) When oxygen analyzers are used, the higher oxygen concentration reading controls the inerting or enriching system and activates the alarm and automatic shutdown system required by paragraph (h), (j) or (k)(2) of this section;

(2) When hydrocarbon analyzers are used, the lower hydrocarbon concentration reading controls the enriching system and activates the alarm and automatic shutdown system required by paragraph (i) or (k)(1) of this section; and

(3) When hydrocarbon analyzers are used, the higher hydrocarbon concentration reading controls the diluting system and activates the alarm and automatic shutdown system required by paragraph (l) of this section.

(e) A vapor control system that uses volumetric measurements to control the amount of inerting, enriching, or diluting gas injected into the vapor collection line must be equipped with at least one analyzer to activate the alarms and automatic shutdown systems required by this section.

(f) Each oxygen or hydrocarbon analyzer required by this section must:

(1) Be installed in accordance with API Recommended Practice 550;

(2) Have a response time of not more than 30 seconds from the time the vapor is sampled; and

(3) Sample the vapor concentration continuously not more than 30 pipe diameters from the gas injection point.

(g) Oxygen analyzers which operate at elevated temperatures (i.e. zirconia oxide or thermomagnetic) must not be used.

(h) An inerting system must:

(1) Supply sufficient inert gas to the vapor stream to ensure that the oxygen concentration throughout the vapor collection system is maintained below 8.0 percent by volume;

(2) Activate an alarm when the oxygen concentration in the vapor collection line exceeds 8.0 percent by volume;

(3) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this part when the oxygen concentration in the vapor collection line exceeds 9.0 percent by volume; and

(4) If a combustion device is used to produce the inert gas, have a hydraulic seal and non-return valve between the combustion device and the vapor collection line.

(i) An enriching system must:

(1) Supply sufficient compatible hydrocarbon vapor to the vapor stream to ensure that the hydrocarbon concentration throughout the vapor collection system is maintained above 170 percent by volume of the upper flammable limit;

(2) Activate an alarm when the hydrocarbon concentration in the vapor collection line falls below 170 percent by volume of the upper flammable limit; and

(3) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the hydrocarbon concentration in the vapor collection line falls below 150 percent by volume of the upper flammable limit.

(j) Oxygen analyzers may be used in lieu of hydrocarbon analyzers in an enriching system at a facility that receives cargo vapor only from a vessel with non-inerted cargo tanks, provided that the analyzers:

(1) Activate an alarm when the oxygen concentration in the vapor collection line exceeds 15.5 percent by volume; and

(2) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the

oxygen concentration in the vapor collection line exceeds 10.5 percent by volume.

(k) An enriching system may be used in a vapor collection system that receives cargo vapor from a vessel with inerted cargo tanks if:

(1) Hydrocarbon analyzers are used to comply with paragraph (i)(2) and (i)(3) of this section; or

(2) If oxygen analyzers are used, the analyzers activate an alarm when the oxygen concentration in the vapor collection line exceeds 8 percent by volume, and close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the oxygen concentration exceeds 9 percent by volume.

(l) An air dilution system must:

(1) Supply sufficient additional air to the vapor stream to ensure that the hydrocarbon concentration throughout the vapor collection system is maintained below 30 percent by volume of the lower flammable limit;

(2) Activate an alarm when the hydrocarbon concentration in the vapor collection line exceeds 30 percent by volume of the lower flammable limit; and

(3) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the hydrocarbon concentration in the vapor collection line exceeds 50 percent by volume of the lower flammable limit.

§ 154.826 Vapor compressors and blowers.

(a) Each inlet and outlet to a compressor or blower which handles vapor that has not been inerted, enriched, or diluted in accordance with § 154.824 of this subpart must be fitted with:

(1) A detonation arrester;

(2) A flame arrester; or

(3) An explosion suppression system acceptable to the Commandant (G-MTH).

(b) If a reciprocating or screw-type compressor handles vapor in the vapor collection system, it must be provided with indicators and audible and visible alarms to warn against the following conditions:

(1) Excessive discharge gas temperature at each compressor chamber or cylinder;

(2) Excessive cooling water temperature;

(3) Excessive vibration;

(4) Low lube oil level;

(5) Low lube oil pressure; and

(6) Excessive shaft bearing temperatures.

(c) If a liquid ring-type compressor handles vapor in the vapor collection system, it must be provided with indicators and audible and visible alarms to warn against the following conditions:

(1) Low level of liquid sealing medium;

(2) Lack of flow of liquid sealing medium;

(3) Excessive temperature of the liquid sealing medium;

(4) Low lube oil level;

(5) Low lube oil pressure, if pressurized lubricating system; and

(6) Excessive shaft bearing temperature.

(d) If a centrifugal compressor, fan, or lobe blower handles vapor in the vapor collection system, construction of the blades and/or housing must meet one of the following:

(1) Blades or housing of nonmetallic construction;

(2) Blades and housing of nonferrous material;

(3) Blades and housing of corrosion resistant steel;

(4) Ferrous blades and housing with one-half inch or more design tip clearance; or

(5) Blades of aluminum or magnesium alloy and a ferrous housing with a nonferrous insert sleeve at the periphery of the impeller.

§ 154.828 Vapor recovery and vapor destruction units.

(a) The inlet to a vapor recovery unit which receives cargo vapor that has not been inerted, enriched, or diluted in accordance with § 154.824 of this subpart must be fitted with one of the following:

(1) A detonation arrester;

(2) A flame arrester; or

(3) An explosion suppression system acceptable to the Commandant (G-MTH).

(b) The inlet to a vapor destruction unit must:

(1) Have a liquid seal; and

(2) Have two quick-closing stop valves installed in the vapor line.

(c) A vapor destruction unit must:

(1) Not be within 30 meters (98.8 ft.) of any tank vessel berth or mooring at the facility;

(2) Have a flame arrester or detonation arrester fitted in the vapor line; and

(3) Alarm and shut down when a flame is detected on the flame arrester or detonation arrester.

(d) When a vapor destruction unit shuts down or has a flame-out condition the vapor destruction unit control system must:

(1) Close the quick-closing stop valves required by paragraph (b)(2) of this section; and

(2) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart.

§ 154.840 Personnel training.

(a) A person in charge of a transfer operation utilizing a vapor control system must have completed a training program covering the particular system installed at the facility. Training must include drills or demonstrations using the installed vapor control system covering normal operations and emergency procedures.

(b) The training program required by paragraph (a) of this section must cover the following subjects:

(1) Purpose of a vapor control system;

(2) Principles of the vapor control system;

(3) Components of the vapor control system;

(4) Hazards associated with the vapor control system;

(5) Coast Guard regulations in this subpart;

(6) Operating procedures, including:

(i) Testing and inspection requirements,

(ii) Pre-transfer procedures,

(iii) Connection sequence,

(iv) Start-up procedures, and

(v) Normal operations; and

(7) Emergency procedures.

§ 154.850 Operational requirements.

(a) A facility must receive vapors only from a vessel which has its certificate of inspection or certificate of compliance endorsed in accordance with 46 CFR 39.10-13(e).

(b) The following must be performed not more than 24 hours prior to each transfer operation:

(1) All alarms and automatic shutdown systems required by this part must be tested; and

(2) The analyzers required by § 154.820(a), § 154.824 (d) and (e) of this subpart must be checked for calibration by use of a span gas.

(c) The position of all valves in the vapor line between the vessel's tank and the facility vapor collection system must be verified prior to the start of the transfer operation.

(d) A tank barge overfill control system that meets the requirements of 46 CFR 39.20-9(b) must not be connected to an overfill sensor circuit that exceeds the system's rated cable length, inductance, and capacitance.

(e) When vapor is being received from a vessel with inerted cargo tanks, the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart must not be opened until the pressure at the facility vapor connection

exceeds the pressure on the downstream side of the remotely operated cargo vapor shutoff valve.

(f) The initial cargo transfer rate must not exceed the rate agreed upon at the pre-transfer conference required by § 156.120(w) of this chapter and 46 CFR 39.30-1(h).

(g) The cargo transfer rate must not exceed the maximum allowable transfer rate as determined by the lesser of the following:

(1) A transfer rate corresponding to the maximum vapor processing rate for the vapor control system, as specified in the facility operations manual required by § 154.300 of this chapter; or

(2) The vessel's maximum transfer rate determined in accordance with 46 CFR 39.30-1(d).

(h) While transferring cargo to a vessel connected to a vapor control system, compressed air or gas may be used to clear cargo hoses and loading arms, but must not be used to clear cargo lines.

(i) If one of the two analyzers required by § 154.824(d) of this subpart becomes inoperable during a transfer operation, the operation may continue provided the remaining analyzer remains operational; however, no further transfer operations may be started until the inoperable analyzer is replaced or repaired.

(j) Whenever a condition results in a shutdown of the vapor control system, the person in charge shall immediately terminate cargo loading.

(k) If it is suspected that a flare in the vapor control system has had a flare-back, or if a flame is detected on the flame arrester required by § 154.828(c)(2) of this subpart, the transfer operation must be stopped and not be restarted until the flame arrester has been inspected and found to be in satisfactory condition.

5a. Appendices A and B are added to part 154 to read as follows:

Appendix A to Part 154—Guidelines for Detonation Flame Arresters

This appendix contains the draft ASTM standard for detonation flame arresters. Devices meeting this standard will be accepted by the Commandant (G-MTH).

1 *Scope*

1.1 This standard provides the minimum requirements for design, construction, performance and testing of detonation flame arresters.

2 *Intent*

2.1 This standard is intended for detonation flame arresters protecting systems containing vapors of flammable or combustible liquids where vapor temperatures do not exceed 60 °C. For all tests, the test media defined in 14.1.1 can be used except where detonation flame arresters protect systems handling vapors with a maximum experimental safe gap (MESG) below 0.9 millimeters. Detonation flame arresters protecting such systems must be tested with appropriate media (the same vapor or a media having a MESG no greater than the vapor). Various gases and their respective MESG are listed in attachment 1.

2.2 The tests in this standard are intended to qualify detonation flame arresters for all in-line applications independent of piping configuration provided the operating pressure is equal to or less than the maximum operating pressure limit specified in the manufacturer's certification and the diameter of the piping system in which the detonation arrester is to be installed is equal to or less than the piping diameter used in the testing.

Note: Detonation flame arresters meeting this standard as Type I devices, which are certified to be effective below 0 °C and which can sustain three stable detonations without being damaged or permanently deformed, also comply with the minimum requirements of the International Maritime Organization, Maritime Safety Committee Circular No. 373 (MSC/Circ. 373/Rev.1).

3. *Applicable Documents*

3.1 ASTM Standards (1)

A395 Ferritic Ductile Iron Pressure-Retaining Castings For Use At Elevated Temperatures.

F722 Welded Joints for Shipboard Piping Systems

F1155 Standard Practice for Selection and Application of Piping System Materials

3.2 ANSI Standards (2)

B16.5 Pipe Flanges and Flanged Fittings.

3.3 Other Documents

3.3.1 ASME Boiler and Pressure Vessel Code (2)

Section VIII, Division 1, Pressure Vessels

Section IX, Welding and Brazing Qualifications.

3.3.2 International Maritime Organization, Maritime Safety Committee (3)

MSC/Circ. 373/Rev. 1—Revised Standards for the Design, Testing and Locating of Devices to Prevent the Passage of Flame into Cargo Tanks in Tankers.

3.3.3 International Electrotechnical Commission (4)

Publication 79-1—Electrical Apparatus for Explosive Gas Atmospheres.

4. *Terminology*

4.1 $\Delta P/P_o$—The dimensionless ratio, for any deflagration and detonation test of 14.3, of the maximum pressure increase (the maximum pressure minus the initial pressure), as measured in the piping system on the side of the arrester where ignition begins by the device described in paragraph 14.3.3, to the initial absolute pressure in the piping system. The initial pressure should be greater than or equal to the maximum operating pressure specified in paragraph 11.1.7.

4.2 Deflagration—A combustion wave that propagates subsonically (as measured at the pressure and temperature of the flame front) by the transfer of heat and active chemical species to the unburned gas ahead of the flame front.

4.3 Detonation—A reaction in a combustion wave propagating at sonic or supersonic (as measured at the pressure and temperature of the flame front) velocity. A detonation is stable when it has a velocity equal to the speed of sound in the burnt gas or may be unstable (overdriven) with a higher velocity and pressure.

4.4 Detonation flame arrester—A device which prevents the transmission of a detonation and a deflagration.

4.5 Flame speed—The speed at which a flame propagates along a pipe or other system.

4.6 Flame Passage—The transmission of a flame through a device.

4.7 Gasoline Vapors—A non-leaded petroleum distillate consisting essentially of aliphatic hydrocarbon compounds with a boiling range approximating 65 °C/75 °C.

5. *Classification*

5.1 The two types of detonation flame arresters covered in this specification are classified as follows:

5.1.1 Type I—Detonation flame arresters acceptable for applications where stationary flames may rest on the device.

5.1.2 Type II—Detonation flame arresters acceptable for applications where stationary flames are unlikely to rest on the device, and further methods are provided to prevent flame passage when a stationary flame occurs. One example of "further methods" is a temperature monitor and an automatic shutoff valve.

6. *Ordering Information*

6.1 Orders for detonation flame arresters under this specification shall include the following information as applicable:

6.1.1 Type (I or II).

6.1.2 Nominal pipe size.

6.1.3 Each gas or vapor in the system and the corresponding MESG.

6.1.4 Inspection and tests other than specified by this standard.

6.1.5 Anticipated ambient air temperature range.

6.1.6 Purchaser's inspection requirements (see section 10.1).

6.1.7 Description of installation.

(1) Footnotes appear at the end of this article.

SL 085629

APPENDIX F

ROUTINE PAPERWORK

Logsheets

ATTACHMENT #1

DIKE WATER HANDLING LOG r v. 2/93

Send Completed Sheet to Environmental Foreman

The following information on the dikes listed below must be filled out each time these dikes are drained and kept for three years.

Date	Dike No.	Disch/Treat Area No.	Analyses of Water ClHC's	pH	Estimated Volume. Gal.

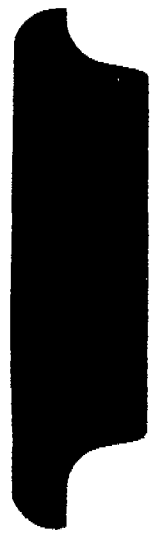
Dike No.	Description	Disch/Treat Area No.	Volume Gal/inch	Control Rm. Responsible
1.	EDC MMG Tank	1	11000	EDC
2.	EDC North Dock #1	2	4500	VC-2
3.	EDC North Dock #2	2	4500	VC-2
4.	EDC Blend ST-1	3	38000	WTU
5.	EDC ST-2	3	39000	VC-2
6A.	ST EDC Pels Beds Outfall	3	500	VC-2
6B.	ST EDC Pels Beds Pad (Transfer to WTU only)		500	VC-2
7.	VC-2 DH Bottoms Tanks	3	2000	VC-2
8.	VC-2 EDC Crude Tanks	3	5000	VC-2
9.	VC-2 Furnace Feed Tanks	3	7500	VC-2
10.	VC-2 DH Feed Tanks	3	1500	VC-2
11.	Per, Tri, MC North Dock	2	16000	P/T
12.	MC #3 North Dock Tank	2	15000	TE-2
13.	6301,6302,6303 Tanks	3	8000	WTU
14.	South Terminal Drum Stg. (N)	2	20	Envir Asst
15.	South Terminal Drum Stg. (S)	2	20	Envir Asst
16.	No. 2 Hazardous Drum Storage	4	50	Envir Asst
16.	South Terminal Marine Vapor Rec.	3		Shipping

Discharge/Treatment	Area No.
Sp rtsman Lake	1
Calcasieu River	2
PPG Canal	3
WTU	4

A GC is located at VC-2 to run all non-WTU water analyses. Bring your samples there.

ANY CONCENTRATION >1 ppm or a PH <6 or >9 must be transferred to treatm nt.

SL 085633



SL 085634

APPENDIX G

SVRU OPERATIONS MANUAL

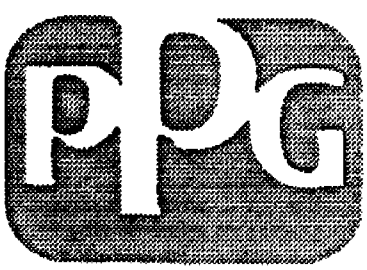
OPERATIONS MANUAL

EDC VAPOR ABATEMENT
BARGE LOADING

PREPARED BY:

AWD Technologies, Inc.

FOR:



PPG INDUSTRIES, INC.
Lake Charles, Louisiana

October 1992

AWD
TECHNOLOGIES

SL 085636

I. Introduction

The purpose of this project is to recover 1,2-dichloroethane (EDC) vapor during the loading of EDC barges at the PPG Industries, Inc. barge dock in Lake Charles, Louisiana A SORBATHENE* Solvent Vapor Recovery Unit, constructed by AWD Technologies, Inc. (AWD) removes the EDC vapor released by displacement during loading. The adsorbed EDC is regenerated under vacuum and condensed and collected.

The SORBATHENE unit described below reduces the inlet concentration of EDC from approximately 139,000 parts per million (ppm) to less than 20 ppm.

The patented SORBATHENE process was developed in 1988 by The Dow Chemical Company and in 1992 a license was granted to AWD Technologies, the environmental services subsidiary of Dow Chemical. Currently, seventeen SORBATHENE units are installed at operating sites to control vent emissions from process plants and distribution facilities.

* Trademark of The Dow Chemical Company

II. System Description

The PPG-Lake Charles barge loading SORBATHENE unit is a vapor abatement device to separate 1,2-dichloroethane (ethylene dichloride, EDC) vapor from the vent stream during barge loading of liquid EDC. The nitrogen atmosphere in the vapor space of the barge is displaced during the loading of EDC. This stream becomes increasingly saturated with EDC vapor as the liquid EDC is loaded and mixing of nitrogen and EDC vapor occurs.

The mixing of EDC with nitrogen is driven by two mechanisms: 1) Stirring of nitrogen gas due to displacement by liquid and 2) diffusion of EDC vapor into the displaced nitrogen vent stream. The concentration of EDC increases from 0% prior to loading to a saturated concentration once loading is well underway. This SORBATHENE unit is designed to recover the EDC in the vent stream and release less than 20 ppm EDC in the cleaned nitrogen effluent stream.

The displaced stream of nitrogen and EDC vapor from the barge enter either of two identical adsorption beds (60-2675 and 60-2676) after passing through an inlet filter and a series of control valves. The EDC selectively adsorbs on the surface of the solid adsorbent in the bed while the nitrogen passes through the bed and vents to atmosphere. The adsorption is exothermic and the heat released during adsorption accumulates in the adsorber. This accumulation of thermal energy raises the temperature in the adsorber by 5 to 15 °F in a 10 to 30 minute adsorption period. The temperature rise over the programmed period of adsorption is a function of the capacity of the adsorbent for the component, the heat of adsorption released by a specific component and the concentration of the component in the vent stream.

The temperature rise in the adsorber is a primary design parameter for the dimensions of the adsorber and the determination of cycle time. The adsorbers in a typical SORBATHENE unit are sized such that only 25 to 30% of the total adsorption capacity is consumed in ten minutes. At the end of the ten minute adsorption step, the bed is switched to a regeneration mode to restore adsorption capacity. In this unit, designed for a very low pressure drop, the adsorbers have been oversized in diameter to reduce the velocity of the stream being treated. Cycle time may be increased once the adsorption system is satifactorily demonstrated at shorter cycle times. Cycle time is often tuned and reset in the field after the thermal effects of common venting scenerios are determined.

While one bed is in the adsorption mode, the second bed is regenerated. Following each adsorption period, the adsorbers are regenerated by vacuum desorption of the EDC. A vacuum is drawn from the bottom of the bed while a small fraction of the clean nitrogen stream leaving the adsorber back-sweeps through the bed and purges the bed of the adsorbed EDC. The two beds are continously alternated during the entire period of product loading.

The EDC in the backpurge stream is drawn into the inlet of the liquid ring vacuum pump (56-599) During start-up of the SORBATHENE unit, the vacuum pump, which is sealed with a low vapor pressure oil, is heated to a temperature above the condensation temperature of EDC. In operation, as the EDC vapor flows through and is re-compressed in the hot oil-sealed vacuum pump, the EDC vapor does not condense. A two-phase outlet stream of the EDC saturated nitrogen and hot oil liquid is discharged from the vacuum pump. This two phase stream is separated in a liquid knock-out vessel equipped with an oil-coalescer for oil recovery.

The warm back-purge nitrogen and desorbed EDC vapor stream enters an air-cooled exchanger (71-2641) where the temperature of the stream is reduced and the EDC condenses. Liquid EDC is collected in the EDC recovery tank (60-2678). The EDC saturated non-condensable nitrogen stream is recycled to the inlet feed to the on-line adsorber.

The SORBATHENE unit recovers the EDC in the inlet stream regardless of its relative saturation. Since the stream is not nearly saturated in the beginning of a loading cycle, condensation may not begin immediately. During regeneration, the quantity of adsorbed EDC vapor is purged by a nitrogen stream of only 10%-20% of the inlet quantity of nitrogen. If condensation does not occur, the entire quantity of EDC adsorbed in the regenerating bed is returned to the on-line bed. Subsequent adsorption and regeneration steps gradually increase the concentration to a level necessary for condensation to occur.

The condensed EDC is stored in the recovery tank until it is pumped out by operating personnel.

There are three systems required to achieve the goals of EDC Vapor abatement.

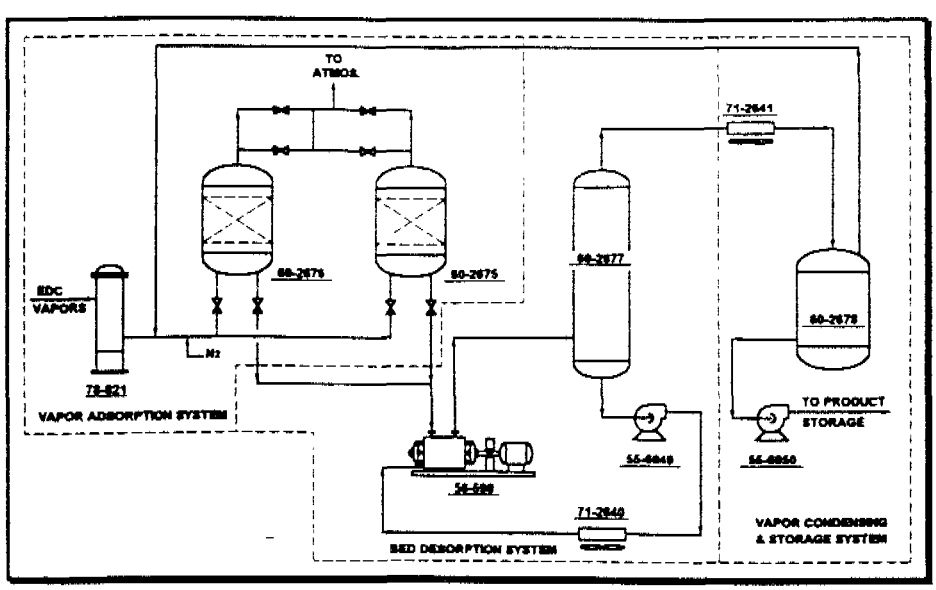


Figure II.1. - Sorbathene Unit

SL 085640

1. Vapor Adsorption System
    a. Dust Filter
        This operation assures no solids larger than 100 microns will enter into the Adsorbent Beds.
    b. Adsorbent Beds
        This operation adsorbs Organic vapors in the vent gas from the Barge.

2. Bed Desorption System
    a. Vacuum Pump
        This operation maintains a constant vacuum pressure on the Beds during desorption cycle.
    b. EDC/Oil Separator
        This operation separates the EDC vapors from the vacuum pump seal oil.
    c. Oil Cooler
        This operation prevents the vacuum pump seal oil from getting too hot.

3. Vapor Condensing and Storage System
    a. EDC Recovery Cooler
        This operation condenses the EDC vapors from the EDC/Oil Separator.
    b. EDC Recovery Tank
        This operation stores the condensed EDC vapors until it can be pumped elsewhere.

III. Equipment Description and Process Control

The following is a discussion of Equipment Descriptions and Process control of variables for each of the systems in the unit.

III.A Vapor Adsorption System

This system removes the EDC from the barge vents by adsorption.

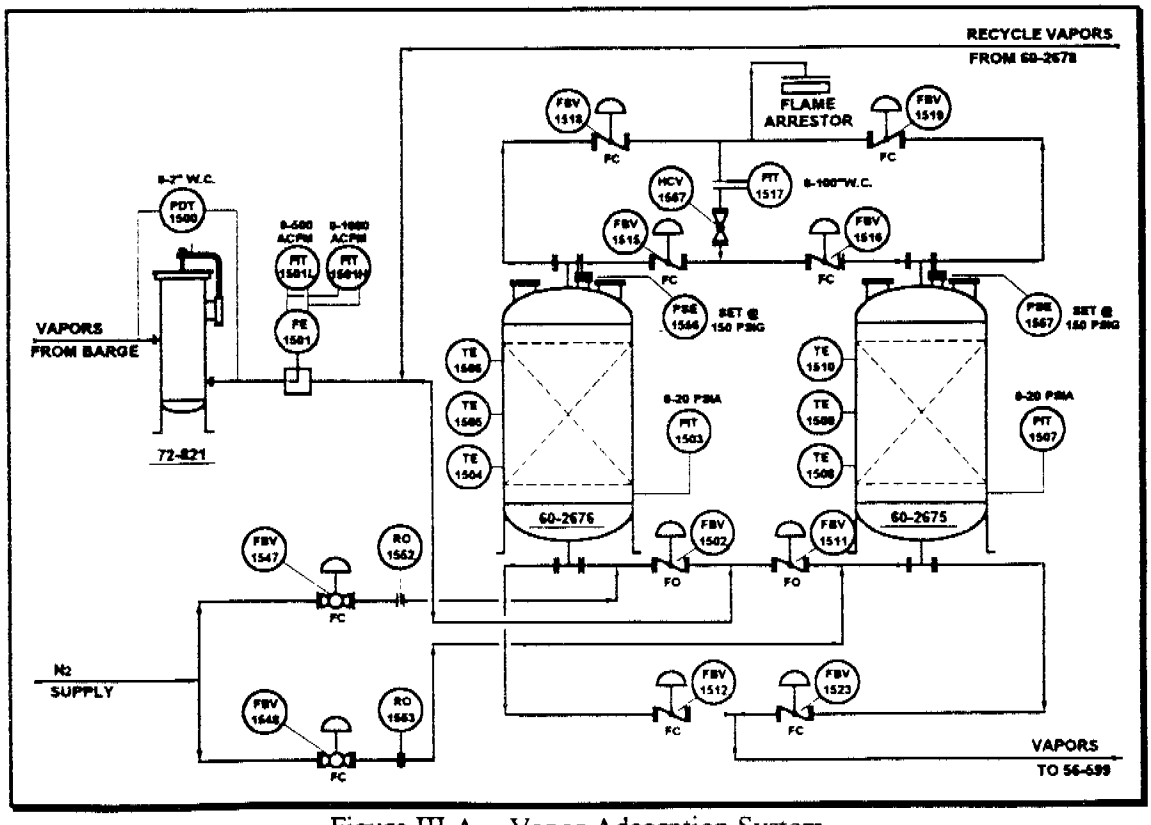


Figure III.A. - Vapor Adsorption System

III.A.1. Dust Filter (72-821)

This is a bag type filter using a 100 micron polypropylene bag.

A differential pressure is measured across the filters and will alarm at 0.5" WC.

III.A.2. Adsorbent Beds (60-2675 & 60-2676)

Two adsorbent beds are cycled in adsorption and regeneration. The adsorbent in this SORBATHENE unit is granular activated carbon. Each bed contains approximately 200 cubic feet of adsorbent. Wedgewire screens hold the adsorbent at top and bottom.

The adsorbers are made of carbon steel and rated for full-vacuum and 150 psig.

Three RTD's in each bed measure the temperature rise accompanying adsorption and will alarm at 130 F and result in an SD-3 level shutdown at 150 F. The adsorption system is controlled by time. Dual beds alternate in adsorption and desorption based on programmed time settings that limit the time each bed is in adsorption prior to regeneration. The adsorption takes place for a short enough time to assure that breakthrough of the adsorbent does not occur, heat is not appreciably lost to the surroundings or carried out of the bed in the clean stream, and the temperature rise in the adsorber is not too high. The cycle time is sufficiently long such that complete regeneration of the adsorbent in the off-line bed will occur while the on-line bed is adsorbing. The optimal cycle time is often tuned in the field over a range of 10 to 30 minutes. Larger beds are usually cycled over longer times because the longer times needed to repressurize and evacuate become significant when the cycle times are shorter.

III.B. Bed Desorption System

This system desorbs the EDC from the adsorbent beds. The EDC is desorbed by vacuum. Off-line regeneration of the adsorbent permits the unit to operate continuously in adsorption by continuously restoring adsorption capacity.

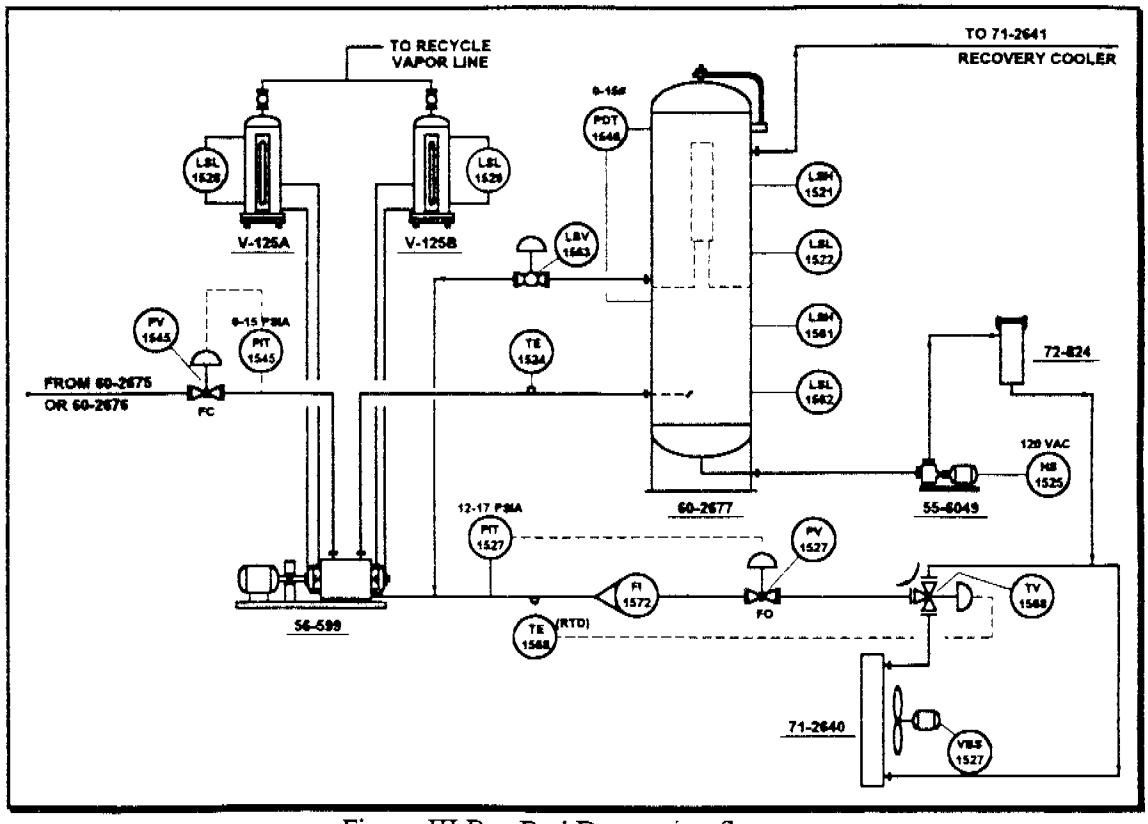


Figure III.B. - Bed Desorption System

III.B.1. Vacuum Pump (56-599)

This is a Siemens liquid ring vacuum pump (model 2BE1253) with a capacity of 1340 ACFM at 1.93 psia. The case and shaft are made of carbon steel, the impeller is made of ductile iron. It requires a 1800 rpm motor at 100 HP.

The vacuum pump level is actually controlled by pressure. The vacuum pump has a shaft (Fig III.B.1.-1) with impeller blades on it. The shaft is mounted off-center with regard to the pump case. This creates more clearance at the bottom of the pump impeller blades than at the top. To work efficiently, the liquid level in the pump should just touch the bottom impeller blade. Section A-A shows that the impellers on the top are full of liquid. As the pump turns counter-clockwise, the area between the impeller blades and the pump case increases. This pulls a vacuum in the part

of the pump where the area (volume) between the impeller and the case is increasing. This is where the suction port is located. On the other side of the pump, the area (volume) is decreasing between the impeller and the pump case. Since the service liquid (oil in this case) is non-compressible, the vapor in the chamber is compressed. This is where the discharge port is located. There is a suction port on one side of the impeller and a discharge port on the other side of the impeller. The service liquid inlet is located just past the suction port. The pump level is correct when the pressure at the service liquid inlet point is held at 0 psig. The area between the impeller blades as they pass the service liquid inlet is at a vacuum. Addition of service liquid increases the pressure to 0 psig. If too much is added, that area will become pressurized as the area is sealed and the volume is fixed. If too little service liquid is added, the area will remain under a vacuum.

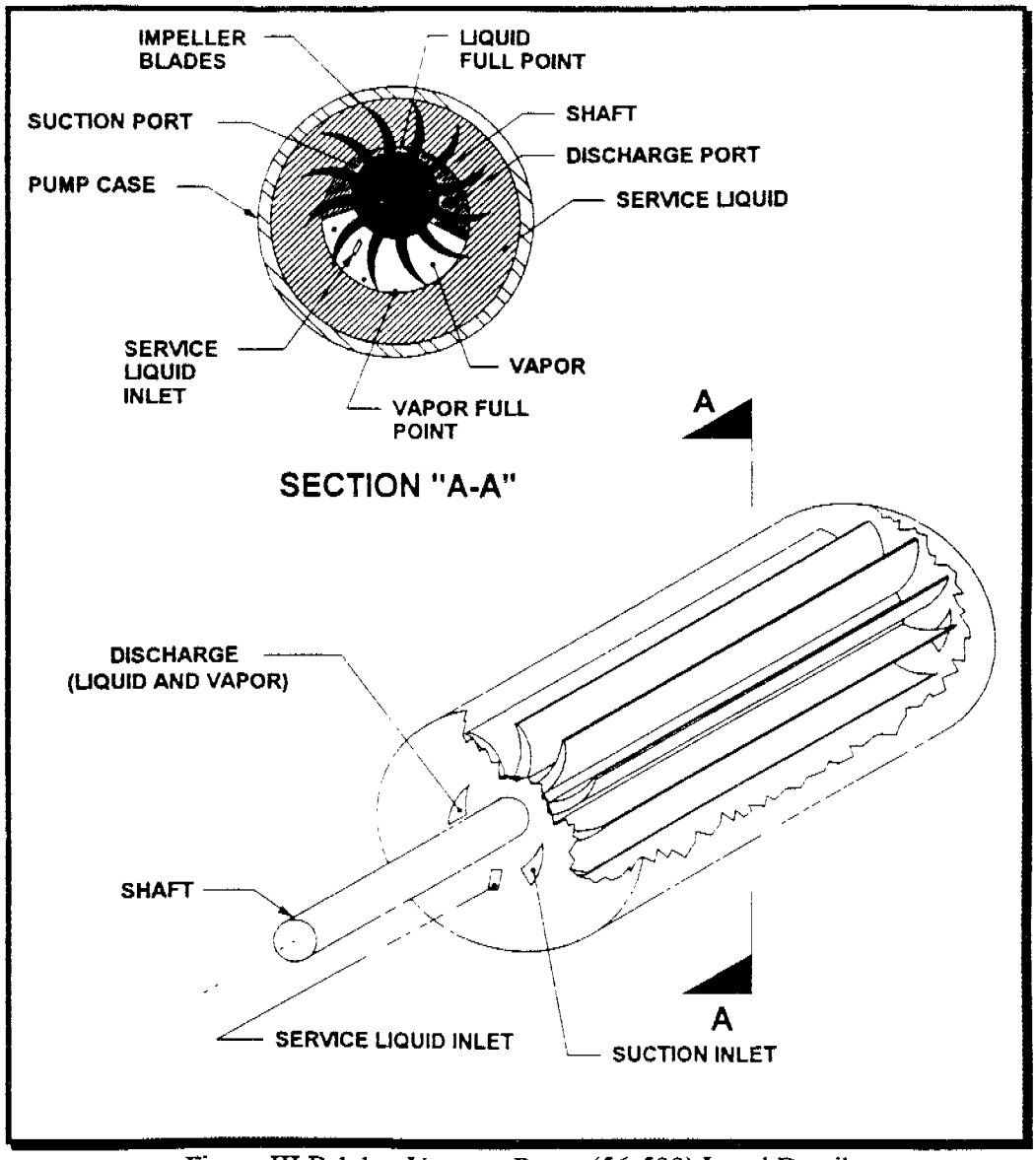


Figure III.B.1.1 - Vacuum Pump (56-599) Level Detail

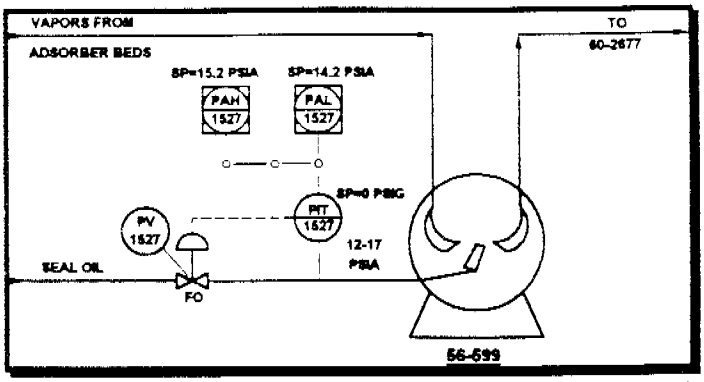


Figure III.B.1.2. - Vacuum Pump (56-599) level Control

III.B.2. EDC/Oil Separator (60-2677)

The EDC vapor and the vacuum pump seal oil are separated in the EDC/Oil Separator. This separator is equipped with a coalescer for oil recovery. Oil is knocked out in the separator and returned to the vacuum pump. The EDC vapor and back-purge nitrogen gas flow through the coalescer and enter the vapor condensing and storage system.

The oil coalescer removes greater than 99% of any oil droplets that could be carried over in the vapor stream leaving the knock-out section of the EDC/oil separator.

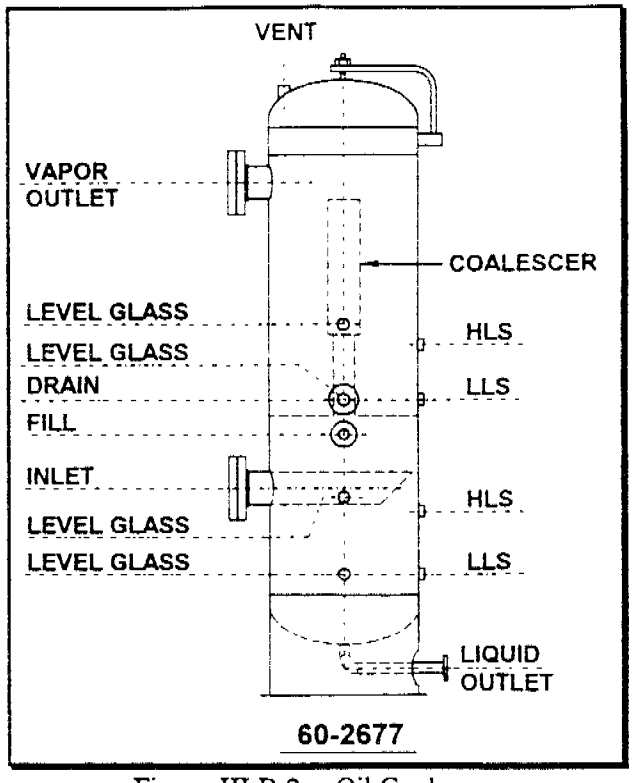


Figure III.B.2. - Oil Coalescer

III.B.3. Oil Cooler (71-2640)

An oil cooler removes the heat of compression generated in the vacuum pump. This air-cooled exchanger is controlled by bypass so that the operating temperature of the vacuum pump is above the temperature of condensation for EDC and below the temperature of EDC fractionation. An RTD (TE 1568) is located downstream of the oil-cooler bypass valve and ahead of the liquid supply port on the vacuum pump. This RTD provides feedback to the bypass valve.

The oil cooler is carbon steel. A 3 HP motor drives the cooling fan.

III.B.4. Oil Circulation Pump (55-6049)

An oil circulation pump provides constant oil flow through the vacuum pump to maintain a liquid-ring seal required for compression in the liquid-ring vacuum pump. An oil filter is provided at the outlet of the pump to remove solid particles which might accumulate in the oil. The oil circulation pump is ductile iron. The filter at its outlet is carbon steel. The filtering material is polyester for 10 micron filtration.

III.C. Vapor Condensing and Storage System

The vapor condensing and storage system recovers the EDC from the adsorption regeneration system. The EDC is condensed in an air-cooled exchanger and the condesed EDC is stored in a recovery tank until it is pumped out by plant operating personnel.

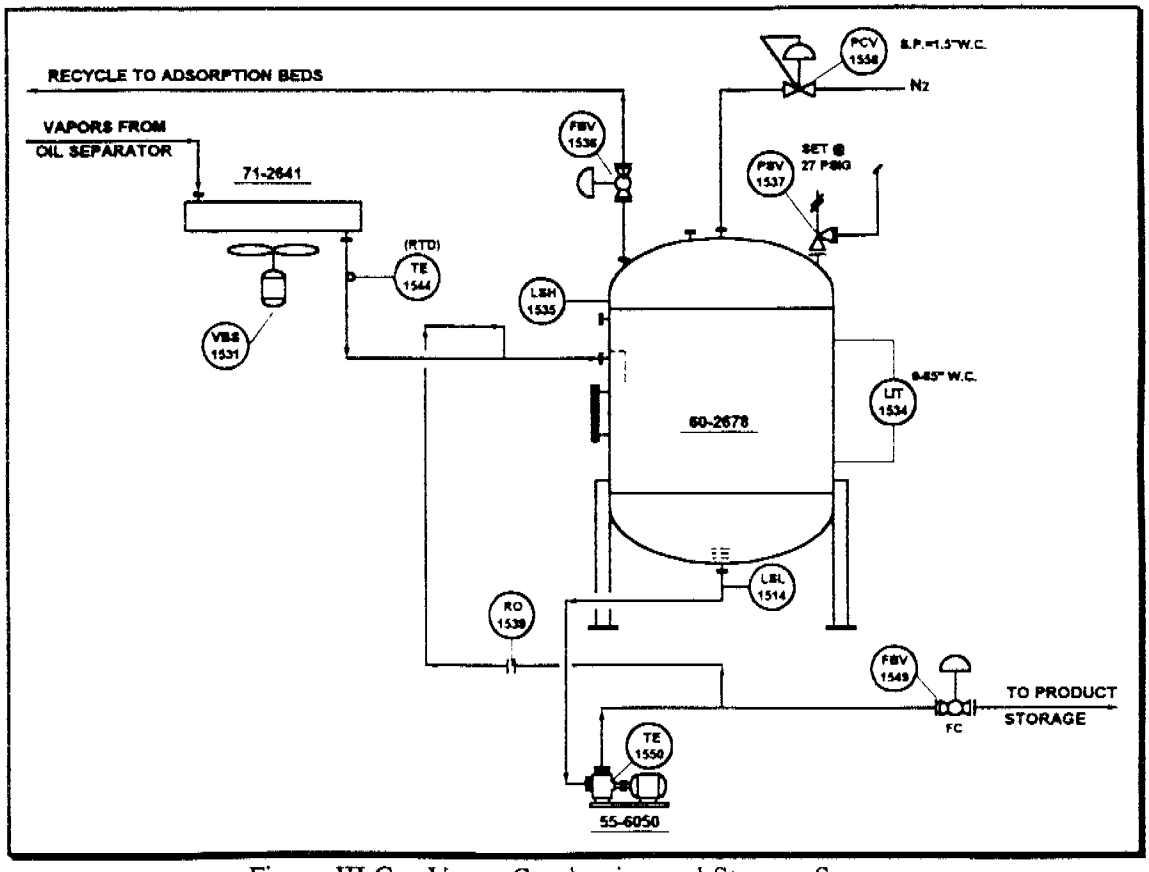


Figure III.C. - Vapor Condensing and Storage System

III.F.1. EDC Recovery Cooler (71-2641)

The EDC recovery cooler is an air-cooled heat exchanger A concentrated stream of EDC and nitrogen from the vacuum regeneration system enters the cooler where condensation of the EDC occurs. The two phase flow of liquid EDC and EDC-saturated nitrogen discharge from the condenser and flow to the EDC recovery tank. The EDC recovery cooler is carbon steel with a 7.5 HP motor.

III.F 2. EDC Recovery Tank (60-2678)

Recovered EDC liquid is stored in the 1000 gallon EDC recovery tank. The vapor stream of EDC-saturated nitrogen leaves the EDC recovery tank and is returned to the on-line adsorber Plant operators may pump-out the tank when the unit is in a process wait step. The tank is equipped with a level transmitter to measure level and alarm at 90% and shut down operation of the SORBATHENE unit and barge unloading if the recovered EDC level is 95%. A high level switch also indicates high high level in the tank and causes a shut-down. A low level sensor in the pump-out line at the bottom of the tank disables the EDC transfer pump to stop unloading operations and prevent the running of this pump.

III.F.3. EDC Transfer Pump (55-6050)

A mag-drive EDC transfer pump is used for return of the recovered EDC liquid to an EDC storage facility located in the dock area. This pump is operated by plant personnel when product discharge is desired. A recycle line on the outlet of the pump returns a fraction of the EDC liquid to the EDC Recovery Tank so that the recovered EDC may be sampled. The pump is shut off when the level in the recovery tank is reduced to less than the low-low-level alarm. Additionally, the pump is equipped with a temperature sensor (TE-1550) to shut off the pump if it is run dry.

IV. Operational Procedure

The SORBATHENE Skid has been designed for an automated start-up. The SORBATHENE Skid Program will perform Shut-Downs related to process control or the SORBATHENE Skid can be Shut-Down on request of the Operator as part of the normal operating sequence or in response to an emergency. The automated start-up will consist of several Steps initiated by an Operator. The Program will then run through the sequences required to complete each Step and then continue on to the next Step. Should the Step be unsuccessful, the Program will inform the Operator of the problem and Shut-Down.

IV.A. Operational Steps

IV.A.1.A Step 1 - Process Wait

a Step Description

This Step is the initial Program Step. This Step will be used for plant maintenance which requires line openings. The Skid will be in this Step when not in use, and the Skid will come to this Step after an operator-initiated Shut-Down or an SD-2 Level Shut-Down.

b. Conditions Required to Enter Step

1) System power up will begin at this Step.
2) Operator may enter this Step with Shut-Down request.
3) Program will enter this Step in reponse to an SD-2 Level Shut-Down

c. Program Actions Taken During Step

1) All automated motors are disabled.

50-7751, 50-7752, 50-7753, and 50-7754.

2) All controllers are put in manual and outputs put to 0%

Controllers:	Valve:	Fail Position:
TIC-1568	TV-1568	Open
PIC-1527	PV-1527	Open
PIC-1545	PV-1545	Closed

3) All automated actuated valves Disabled.

Actuated Valve	Valve Fail Position
FBV-1502	Open
FBV-1511	Open
FBV-1512	Closed

FBV-1515	Closed
FBV-1516	Closed
FBV-1518	Closed
FBV-1519	Closed
FBV-1523	Closed
FBV-1547	Closed
FBV-1548	Closed
FBV-1536	Closed
LBV-1563	Open
FBV-1549	Closed

4) Enable 55-6050 (DO-1532).
5) LSL-1514 will disable 55-6050 (DO-1532) when in disabled (open) state.
6) TE-1550 (TAH-1550) will disable 55-6050 (DO-1532) when at 200 °F.
7) Enable EV-1549 (DO-1549) when 55-6050 (DI-1532) is enabled (closed) and motor is running and disable EV-1549 (DO-1549) when 55-6050 (DI-1532) is disabled (open) or motor is stopped.
8) Vapor Recovery System Start Permissive pushbutton HS-1009 located on the EDC loading control panel in the South Terminal Control Room must be enabled before Master control Switch HS-1570 is enabled to start Skid.

d. Operator Actions Taken During Step

1) The Operator must open the Nitrogen supply header to the Skid
2) The Operator must open the Instrument Air header supply to the Skid.
3) The Operator should lower the EDC liquid in 60-2678 before starting Skid.
4) The Operator should check the oil level of 60-2677 for proper level.
5) The Operator must enable the Vapor Recovery Sysem Start Permissive pushbutton HS-1009. This switch is in the control room.
6) The Operator must press the "START" pushbutton on the Master Control Station HS-1570 located at the skid. This will start the Skid.
7) The HS-1009 and HS-1570 pushbuttons must be enabled in the correct order. If the HS-1570 pushbutton is enabled before the HS-1009 pushbutton, the Skid will not Start.

e. Conditions Required to Exit Step

1) Nitrogen supply header open.
2) Instrument Air supply header open.
3) Vapor Recovery System Shut-Down pushbutton HS-1024 (SD-2) enabled (closed).
4) Vapor Recovery System Start Permissive pushbutton HS-1009 enabled.
5) Master Control Station HS-1570 "START" pushbutton enabled.

IV.A.1.B Step 1A - Emergency Shut-Down Step

a. Step Description

This Step is the Emergency Shut-Down Step. This Step is entered on a High-High temperature alarm from a RTD in either bed. Both beds are purged with nitrogen. The Skid will stay in this step until the operator initiates an advance to Step 1.

b. Conditions Required to Enter Step

1) High-High Temperature Alarm from RTD in bed.

c. Program Actions Taken During Step

1) All automated motors are disabled

50-7751, 50-7752, 50-7753, and 50-7754

2) All controllers are put in manual and outputs put to 0%.

Controllers.	Valve.	Fail Position.
TIC-1568	TV-1568	Open
PIC-1527	PV-1527	Open
PIC-1545	PV-1545	Closed

3) All automated actuated valves are positioned as follows:

Actuated Valve	Valve Fail Position
FBV-1502	Closed
FBV-1511	Closed
FBV-1512	Closed
FBV-1515	Closed
FBV-1516	Closed
FBV-1518	Open
FBV-1519	Open
FBV-1523	Closed
FBV-1547	Open
FBV-1548	Open
FBV-1536	Closed
LBV-1563	Closed
FBV-1549	Closed

d Operator Actions Taken During Step

1) The Operator must initiate Shut=Down to go to Step 1 (Process Wait).

e Conditions Required to Exit Step

1) Operator must request Step 1.

IV A.2. Step 2 - Warm-up

a. Step Description

In this Step the Vacuum Pump, 56-599, is warming the liquid seal oil. The adsorption beds are purged with nitrogen.

b. Conditions Required to Enter Step

1) Nitrogen supply header open.
2) Instrument Air supply header open.
3) Vapor Recovery System Shut-Down pushbutton HS-1024 (SD-2) enabled (closed).
4) Vapor Recovery System Start Permissive pushbutton HS-1009 enabled.
5) Master Control Station HS-1570 "START" pushbutton enabled.

c. Program Actions Taken During Step

1) Enable controller PIC-1527 and put set-point to 0.0 psig.
2) Enable EDC/Oil Separator (60-2677) level switches LSL-1522 and LSH-1521, and level block valve LBV-1563.
3) Enable the following actuated valves; FBV-1518, FBV-1519, and FBV-1536.
4) Enable EDC Recovery Cooler motor 50-7754.
5) Enable Vacuum Pump motor 50-7751.
6) Enable Oil Circulation Pump motor 50-7752.
7) Enable Oil Cooler motor 50-7753.
8) Enable controller TIC-1568 and put set-point to 210 °F.

d. Operator Actions Taken During Step

1) The Operator should observe all equipment on the Skid is operating properly.

e. Conditions Required to Exit Step

1) Program will advance to Step 3 when TIC-1568 is equal to or greater than 210 °F.
2) Vapor Recovery System Shut-Down pushbutton HS-1024 is disabled (opened) indicating an operator request for a Shut-Down
3) Program will Shut-Down Skid on SD-2 alarm.

IV.A.3. Step 3- Start Bed Cycle

a. Step Description

This Step will start the Adsorption and Desorption Bed cycle.

b. Conditions Required to Enter Step

1) Program will advance to Step 3 when TIC-1568 is equal to or greater than 210 °F.

c. Program Actions Taken During Step

1) Enable (close) FBV-1511 and Disable (close) FBV-1519.
2) Enable (open) FBV-1523.
3) Enable controller PIC-1545 and put set-point 6 psia.
4) Wait here until PIC-1545 is 1.9 psia or Shut-Down IF in this sequence for more than 3 minutes.
5) Enable (open) FBV-1516 and wait here for 10 minutes.
6) Disable (close) FBV-1516.
7) Put controller PIC-1545 set point to 0 psia.
8) Disable (close) FBV-1523.
9) Enable (open) FBV-1548 until Pressure indicator PIT-1507 is equal to or greater than 14.7 psia, then disable (close) FBV-1548.
10) Enable (open) FBV-1519 and Disable (open) FBV-1511.
11) Advance Program to Step 4, but continue these sequence.
12) Enable (close) FBV-1502 and Disable (close) FBV-1518.
13) Enable (open) FBV-1512.
14) Enable controller PIC-1545 and put set-point 6 psia.
15) Wait here until PIC-1545 is 1.9 psia or Shut-Down IF in this sequence for more than 3 minutes.
16) Enable (open) FBV-1515 and wait here for 10 minutes.
17) Disable (close) FBV-1515.
18) Put controller PIC-1545 set point to 0 psia.
19) Disable (close) FBV-1512.
20) Enable (open) FBV-1547 until Pressure indicator PIT-1503 is equal to or greater than 14.7 psia, then disable (close) FBV-1547.
21) Enable (open) FBV-1518 and Disable (open) FBV-1502.
22) Enable (close) FBV-1511 and Disable (close) FBV-1519.
23) Enable (open) FBV-1523.
24) Enable controller PIC-1545 and put set-point 6 psia.
25) Wait here until PIC-1545 is 1.9 psia or Shut-Down IF in this sequence for more than 3 minutes.
26) Enable (open) FBV-1516 and wait here for 10 minutes.
27) Disable (close) FBV-1516.
28) Put controller PIC-1545 set point to 0 psia.

29) Disable (close) FBV-1523.
30) Enable (open) FBV-1548 until Pressure indicator PIT-1507 is equal to or greater than 14.7 psia, then disable (close) FBV-1548.
31) Enable (open) FBV-1519 and Disable (open) FBV-1511.
32) Return to sequence 12 and repeat until Skid is Shut-Down.

d. Operator Actions Taken During Step

1) The Operator should observe all equipment on the Skid is operating properly.

e. Conditions Required to Exit Step

1) Program will advance to Step 4 after adsorption Bed 60-2675 has been desorbed.
2) Operator request for Shut-Down.
3) Program will Shut-Down Skid on SD-2 alarm.

IV A.4. Step 4 - Run

a. Step Description

This Step the Skid is in full operation and unloading of the barge can begin.

b. Conditions Required to Enter Step

1) Program will advance to Step 4 after adsorption Bed 60-2675 has been desorbed.

c. Program Actions Taken During Step

1) Continue Adsorption and Desorption Bed cycle.

d. Operator Actions Taken During Step

1) The Operator should observe all equipment on the Skid is operating properly.

e. Conditions Required to Exit Step

1) Operator request for Shut-Down.
2) Program will Shut-Down Skid on SD-2 alarm.

V. Abnormal Operating Conditions

V.A. Vapor Adsorption System

Alarm: **PDAH-1500**
Description: 72-821 High Differential Pressure
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Plugged Filter Bag	Replace filter bag.
Line blocked	Check all manual block valves for proper position, filter maybe plugged.
Bad instrument	Repair instrument PDT-1500

Alarm: **FAH-1501H**
Description: High Inlet Flow
Instrument of comparison: FIT-1501

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Loading barge or ship too fast.	Slow down loading or continue loading rate. May emit vapors to atmosphere.
Bad instrument	Repair instrument FIT-1501.

Alarm: **FAHH-1501H**
Description: High High Inlet Flow
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Loading barge or ship too fast.	Slow down loading or continue loading rate. May emit vapors to atmosphere.
Bad instrument	Repair instrument FIT-1501H.

Alarm: **TAH-1504**
Description: High Temperature 60-2676
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1504.

Alarm: **TAHH-1504**
Description: High-High Temperature 60-2676
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1504.

Alarm: **TAH-1505**
Description: High Temperature 60-2676
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1505.

Alarm: **TAHH-1505**
Description: High-High Temperature 60-2676
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1505.

Alarm: **TAH-1506**
Description: High Temperature 60-2676
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1506.

Alarm: **TAHH-1506**
Description: High-High Temperature 60-2676
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1506

Alarm: **TAH-1508**
Description: High Temperature 60-2675
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1508.

Alarm: **TAHH-1508**
Description: High-High Temperature 60-2675
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1508

Alarm: **TAH-1509**
Description: High Temperature 60-2675
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1509.

Alarm: **TAHH-1509**
Description: High-High Temperature 60-2675
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1509.

Alarm: **TAH-1510**
Description: High Temperature 60-2675
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1510.

Alarm: **TAHH-1510**
Description: High-High Temperature 60-2675
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Adsorption rate too high due to concentration or flow rate.	Lower concentration or slow down flow rate.
Exothermic chemical reaction.	Stop loading of barge or ship, purge bed with Nitrogen.
Adsorption Bed on fire	Stop loading of barge or ship, purge bed with Nitrogen.
Bad instrument	Repair instrument TE-1510.

Alarm: **FAH-1517**
Description: Desorption Sweep Gas High Flow
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
HCV-1567 open.	Adjust HCV-1567 to correct flow rate.
Leak or open vent/drain	Check and fix leaks, close vents or drains.
Bad instrument	Repair instrument FIT-1517.

Alarm: **PSL-1533**
Description: Instrument Air Low Pressure
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Line blocked	Check all manual valves for proper position.
Leak or open vent/drain	Check and fix leaks, close vents or drains.
Bad instrument	Repair instrument PSL-1533.

The following valves will alarm and Shut-Down the Skid if they are not in the position the Program expects them to be in. The Program will scan valve positions with each sequence of the Program: FBV-1502, FBV-1511, FBV-1512, FBV-1515, FBV-1516, FBV-1518, FBV-1519, FBV-1523, FBV-1547, and FBV-1548.

Listed below are some causes that may have prevented the valve from going to the correct position.

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Stuck valve	Try to manually open or close valve, repair valve.
Instrument air off	Turn on instrument air.
Solenoid valve bad	Repair or replace solenoid valve.
Bad actuator	Repair or replace actuator.
Bad position switch	Repair instrument ZSO or ZSC switch.

V.B. Bed Desorption System

Alarm: **TAH-1524**
Description: 56-599 Discharge High Temperature
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
TV-1568 not working	Instrument air off, I/P not working, or control valve stuck. Make repairs as needed.
TV-1568 in manual.	Put control valve TV-1568 in AUTO..
71-2640 not working.	Check 71-2640 to find cause for not cooling, air way blocked, drive belt broken, etc.
Bad instrument	Repair instrument TE-1524.

Alarm: **TAHH-1524**
Description: 56-599 Discharge High-High Temperature
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
TV-1568 not working	Instrument air off, I/P not working, or control valve stuck. Make repairs as needed.
TV-1568 in manual.	Put control valve TV-1568 in AUTO..
71-2640 not working.	Check 71-2640 to find cause for not cooling, air way blocked, drive belt broken, etc.
Bad instrument	Repair instrument TE-1524.

Alarm: **TAL-1524**
Description: 56-599 Discharge Low Temperature
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
TV-1568 not working	Instrument air off, I/P not working, or control valve stuck. Make repairs as needed.
TV-1568 in manual.	Put control valve TV-1568 in AUTO..
Bad instrument	Repair instrument TE-1524.

Alarm: **TALL-1524**
Description. 56-599 Discharge Low-Low Temperature
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
TV-1568 not working	Instrument air off, I/P not working, or control valve stuck. Make repairs as needed.
TV-1568 in manual.	Put control valve TV-1568 in AUTO..
Bad instrument	Repair instrument TE-1524.

Alarm: **PAH-1527**
Description: 56-599 Seal Oil High Pressure
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
PV-1527 open	Instrument air off, I/P not working, or control valve stuck. Make repairs as needed.
PV-1527 in manual	Put PV-1527 in AUTO.
Bad instrument	Repair instrument PIT-1527.

Alarm: **PAHH-1527**
Description: 56-599 Seal Oil High-High Pressure
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
PV-1527 open	Instrument air off, I/P not working, or control valve stuck. Make repairs as needed.
PV-1527 in manual	Put PV-1527 in AUTO
Bad instrument	Repair instrument PIT-1527.

Alarm: **PAL-1527**
Description: 56-599 Seal Oil Low Pressure
Instrument of comparison

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
PV-1527 closed	I/P not working, or control valve stuck. Make repairs as needed.
PV-1527 in manual	Put PV-1527 in AUTO.
Line blocked	Check all manual valves for proper position.
Bad instrument	Repair instrument PIT-1527

Alarm: **PALL-1527**
Description: 56-599 Seal Oil Low-Low Pressure
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
PV-1527 closed	I/P not working, or control valve stuck. Make repairs as needed.
PV-1527 in manual	Put PV-1527 in AUTO.
Line blocked	Check all manual valves for proper position.
Bad instrument	Repair instrument PIT-1527.

Alarm: **VAH-1569**
Description: 71-2640 Vibration
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Bad bearing	Check bearings.
Loose mounting	Check mountings.
Foreign object	Check for foreign objects.
Fan blade balance	Check balance of fan blades.
Bad instrument	Repair instrument VBS-1569.

Alarm: **LAL-1528**
Description: V-125A Seal Pot Low Level
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Bad seal	Check 56-599 seals for leak.
Vessel or line leak	Check for leaks.
Bad instrument	Repair instrument LSL-1528.

Alarm: **LAL-1529**
Description. V-125B Seal Pot Low Level
Instrument of comparison

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Bad seal	Check 56-599 seals for leak.
Vessel or line leak	Check for leaks.
Bad instrument	Repair instrument LSL-1529.

Alarm: **PDAH-1546**
Description: 60-2677 High Differential Pressure
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Oil demister plugged	Check oil demister.
Oil level in demister section too high	Check oil level in demister section. Check valve LBV-1563 for proper operation.
Bad instrument	Repair instrument PDT-1546.

Alarm: **PDAHH-1546**
Description: 60-2677 High-High Differential Pressure
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Oil demister plugged	Check oil demister.
Oil level in demister section too high	Check oil level in demister section. Check valve LBV-1563 for proper operation.
Bad instrument	Repair instrument PDT-1546

Alarm: **LAH-1561**
Description: 60-2677 High Oil Level
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Low seal oil Temp.	Check seal oil temperature, TE-1523 may be bad.
Foreign liquid intrusion	Check seal oil for intrusion of other liquids.
Bad instrument	Repair instrument LSH-1561.

Alarm: **LAL-1562**
Description: 60-2677 Low Oil Level
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Oil in demister section of 60-2677	Check valve LBV-1563, may not have opened to drain seal oil back into vacuum pump.
Vessel or line leak	Check for leaks.
Bad instrument	Repair instrument LSL-1562.

The following equipment will shut-down the SORBATHENE Unit if it fails when the PLC program expects it to be running. The PLC program will scan equipment with each sequence of the program and alarm if it fails: 56-599, 55-6049, and 50-7753.

Listed below are some causes that may have made the equipment fail.

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Motor starter	Check motor starter breaker, fuses, and over loads.
Failed coupling	Check and/or repair coupling.
Bad motor	Repair or replace motor.
Equipment fail	Check manufactures booklet for repair.

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V.C. Vapor Condensing and Storage System

Alarm: **VAH-1531**
Description: 71-2641 Vibration
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Bad bearing	Check bearings.
Loose mounting	Check mountings.
Foreign object	Check for foreign objects,
Fan blade balance	Check balance of fan blades.
Bad instrument	Repair instrument VBS-1531.

Alarm: **LAH-1534**
Description: 60-2678 High Level
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Operations Error	Operator should transfer product.
Bad instrument	Repair instrument LIT-1534.

Alarm: **LAHH-1534**
Description: 60-2678 High-High Level
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Operations Error	Operator should transfer product.
Bad instrument	Repair instrument LIT-1534.

Alarm: **LAHH-1535**
Description: 60-2678 High-High Level
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Operations Error	Operator should transfer product.
Bad instrument	Repair instrument LSH-1535.

Alarm: **TAH-1544**
Description: 71-2641 High Outlet Temperature
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Broken drive belt	Check and/or repair drive belt.
Seal oil too hot	Check seal oil temperature and try to lower if above its normal temperature (210 °F into 56-599).
Bad instrument	Repair instrument TE-1544.

Alarm: **TAHH-1544**
Description: 71-2641 High-High Outlet Temperature
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Broken drive belt	Check and/or repair drive belt.
Seal oil too hot	Check seal oil temperature and try to lower if above its normal temperature (210 °F into 56-599).
Bad instrument	Repair instrument TE-1544.

Alarm: **TAH-1550**
Description: 55-6050 High Temperature
Instrument of comparison:

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Line blocked	Check all manual valves for proper position.
FBV-1549 failed to open	Check FBV-1549 to see if it opens when 55-6050 start. Check for blocked instrument air or stuck valve
Bad instrument	Repair instrument TE-1550.

The following valves will alarm and Shut-Down the Skid if they are not in the position the Program expects them to be in. The Program will scan valve positions with each sequence of the Program: FBV-1536

Listed below are some causes that may have prevented the valve from going to the correct position.

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Stuck valve	Try to manually open or close valve, repair valve.
Instrument air off	Turn on instrument air.
Solenoid valve bad	Repair or replace solenoid valve.
Bad actuator	Repair or replace actuator.
Bad position switch	Repair instrument ZSO or ZSC switch.

The following equipment will shut-down the SORBATHENE Unit if it fails when the PLC program expects it to be running. The PLC program will scan equipment with each sequence of the program and alarm if it fails: 50-7754.

Listed below are some causes that may have made the equipment fail.

PROBABLE CAUSES	ALARM CORRECTION - OPERATOR ACTION TO:
Motor starter	Check motor starter breaker, fuses, and over loads.
Failed coupling	Check and/or repair coupling.
Bad motor	Repair or replace motor.
Equipment fail	Check manufactures booklet for repair.

VI. Shut-Downs

VI.A. Normal

There are several Shut-Downs built into the Program. The Program will automatically shut-down the SORBATHENE Unit if any of these alarms are activated while the Skid is Running. The Program will Shut-down the Skid to Step 1 and turn off all equipment.

VI.B. Operator Request

The Operator may Shut-Down the Skid at any time in any of the Steps by means of the Vapor Recovery System Shut-Down pushbutton HS-1024(SD-2) in the control room. The Operator can Shut-Down the Skid in the Field by pressing the "STOP" pushbutton on the Master Control Station, HS-1570, or by turning off any of the four motors that run continuously

Shut-Downs on the Skid in most cases will be done by the program, but the Operator can Shut-Down the Skid in an emergency in the same manner as a Normal Shut-down. An SD-2 level Shut-Down and a Normal Shut-Down will take the Skid to Step 1.

VI.C. Emergency Shut-Down

The skid will go to an SD-3 Emenrgency Shut-Down on High-High Temperature Alarm from an RTD in either beds. The Skid will stay in Step 1A, Emergency Shut-Down SD-3, until the operator requests advance to Step 1, Process Wait.

VII. English Language Operating Program

The SORBATHENE Skid has been designed for an automated start-up. The SORBATHENE Skid Program will perform Shut-Downs related to process control or the SORBATHENE Skid can be Shut-Down on request of the Operator as part of the normal operating sequence or in response to an emergency. The automated start-up will consist of several Steps initiated by an Operator. The Program will then run through the sequences required to complete each Step and then continue on to the next Step. Should the Step be unsuccessful, the Program will inform the Operator of the problem and Shut-Down.

VII.A. Operational Steps

VII.A.1. Step 1 - Process Wait

a. Step Description

This Step is the initial Program Step. This Step will be used for plant maintenance which requires line openings. The Skid will be in this Step when not in use, and the Skid will come to this Step after an operator-initiated Shut-Down or an SD-2 Level Shut-Down.

b. Conditions Required to Enter Step

1) System power up will begin at this Step.
2) Operator may enter this Step with Shut-Down request.
3) Program will enter this Step in response to an SD-2 Level Shut-Down

c. Actions Taken During Step

1) All automated motors are disabled.

50-7751, 50-7752, 50-7753, and 50-7754

2) All controllers are put in manual and outputs put to 0%.

Controllers:	Valve:	Fail Position:
TIC-1568	TV-1568	Open
PIC-1527	PV-1527	Open
PIC-1545	PV-1545	Closed

3) All automated actuated valves Disabled.

Actuated Valve	Valve Fail Position
FBV-1502	Open
FBV-1511	Open
FBV-1512	Closed

FBV-1515	Closed
FBV-1516	Closed
FBV-1518	Closed
FBV-1519	Closed
FBV-1523	Closed
FBV-1547	Closed
FBV-1548	Closed
FBV-1536	Closed
LBV-1563	Open
FBV-1549	Closed

4) Enable 55-6050 (DO-1532).
5) LSL-1514 will disable 55-6050 (DO-1532) when in disabled (open) state
6) TE-1550 (TAH-1550) will disable 55-6050 (DO-1532) when at 200 °F.
7) Enable EV-1549 (DO-1549) when 55-6050 (DI-1532) is enabled (closed) and disable EV-1549 (DO-1549) when 55-6050 (DI-1532) is disabled (open).
8) Vapor Recovery System Start Permissive switch HS-1009 must be enable before Master control Switch HS-1570 is enabled to start Skid.

d. Conditions Required to Exit Step

1) Nitrogen supply header open
2) Instrument Air supply header open.
3) Vapor Recovery System Shut-Down switch HS-1024 (SD-2) enabled (closed)
4) Vapor Recovery System Start Permissive switch HS-1009 enabled
5) Master Control Switch HS-1570 enabled.

e. Summary of Software Alarms Enabled During Step

1) LAH-1534 , 60-2678 High Level.
2) LAL-1534 , 60-2678 Low Level.
3) LALL-1534 , 60-2678 Low-Low Level.

f. Summary of Software Shutdowns Enabled During Step

1) LAHH-1534 , 60-2678 High-High Liquid Level.
2) LAHH-1535 , 60-2678 High-High Liquid Level.
3) TAH-1550 , 55-6050 High Temperature. Disable (DO-1532) pump 55-6050 only.
4) LSL-1514 , 60-2678 Low Level. Disable (DO-1532) pump 55-6050 only.

VII.A.1.B Step 1A - Emergency Shut-Down Step

a Step Description

This Step is the Emergency Shut-Down Step. This Step is entered on a High-High temperature alarm from a RTD in either bed. Both beds are purged with nitrogen The Skid will stay in this step until the operator initiates an advance to Step 1.

b Conditions Required to Enter Step

1) High-High Temperature Alarm from RTD in bed.

c. Program Actions Taken During Step

1) All automated motors are disabled.

50-7751, 50-7752, 50-7753, and 50-7754.

2) All controllers are put in manual and outputs put to 0%.

Controllers:	Valve:	Fail Position:
TIC-1568	TV-1568	Open
PIC-1527	PV-1527	Open
PIC-1545	PV-1545	Closed

3) All automated actuated valves are positioned as follows

Actuated Valve	Valve Fail Position
FBV-1502	Closed
FBV-1511	Closed
FBV-1512	Closed
FBV-1515	Closed
FBV-1516	Closed
FBV-1518	Open
FBV-1519	Open
FBV-1523	Closed
FBV-1547	Open
FBV-1548	Open
FBV-1536	Closed
LBV-1563	Closed
FBV-1549	Closed

d. Conditions Required to Exit Step

1) Operator must request Step 1

e. Summary of Software Alarms Enabled During Step

none

f. Summary of Software Shut-Downs Enabled During Step

none

VII.A.2. Step 2 - Warm-up

a. Step Description

In this Step the Vacuum Pump, 56-599, is warming the liquid seal oil. The adsorption beds are purged with nitrogen

b. Conditions Required to Enter Step

1) Nitrogen supply header open.
2) Instrument Air supply header open.
3) Vapor Recovery System Shut-Down pushbutton HS-1024 (SD-2) enabled (closed).
4) Vapor Recovery System Start Permissive pushbutton HS-1009 enabled.
5) Master Control Station HS-1570 "START" pushbutton enabled.

c. Actions Taken During Step

1) Enable controller PIC-1527 and put set-point to 0.0 psig.
2) Enable EDC/Oil Separator (60-2677) level switches LSL-1522 and LSH-1521, and level block valve LBV-1563.
3) Enable the following actuated valves; FBV-1518, FBV-1519, and FBV-1536.
4) Enable EDC Recovery Cooler motor 50-7754.
5) Enable Vacuum Pump motor 50-7751.
6) Enable Oil Circulation Pump motor 50-7752.
7) Enable Oil Cooler motor 50-7753.
8) Enable controller TIC-1568 and put set-point to 210 °F

d. Conditions Required to Exit Step

1) Program will advance to Step 3 when TIC-1568 is equal to or greater than 210 °F.
2) Vapor Recovery System Shut-Down pushbutton HS-1024 is disabled (opened) indicating an operator request for Shut-Down
3) Program will Shut-Down Skid on SD-2 alarm.

e. Summary of Software Alarms Enabled During Step

1) PDAH-1500 , 72-821 High Differential Pressure.
2) FAH-1501H , High Inlet Flow.
3) FAHH-1501H, High-High Inlet Flow.
4) TAH-1504 , 60-2676 High Temperature.
5) TAH-1505 , 60-2676 High Temperature.
6) TAH-1506 , 60-2676 High Temperature.
7) TAH-1508 , 60-2675 High Temperature.
8) TAH-1509 , 60-2675 High Temperature.
9) TAH-1510 , 60-2675 High Temperature.
10) TAH-1524 , 56-599 Discharge High Temperature.
11) PAL-1527 , 56-599 Seal Oil Low Pressure.

12) PAH-1527 , 56-599 Seal Oil High Pressure.
13) LAL-1528 , V-125A Seal Pot Low Level.
14) LAL-1529 , V-125B Seal Pot Low Level.
15) PDAH-1546 , 60-2677 High Differential Pressure.
16) TAH-1544 , 71-2641 High Outlet Temperature.
17) FAH-1517 , Desorption Sweep Gas High Flow

f. Summary of Software Shutdowns Enabled During Step

1) TAHH-1504 , 60-2676 High-High Temperature, Goes to Step 1A.
2) TAHH-1505 , 60-2676 High-High Temperature, Goes to Step 1A.
3) TAHH-1506 , 60-2676 High-High Temperature, Goes to Step 1A.
4) TAHH-1508 , 60-2675 High-High Temperature, Goes to Step 1A.
5) TAHH-1509 , 60-2675 High-High Temperature, Goes to Step 1A.
6) TAHH-1510 , 60-2675 High-High Temperature, Goes to Step 1A.
7) PAHH-1527 , 56-599 Seal Oil High-High Pressure.
8) PALL-1527 , 56-599 Seal Oil Low-Low Pressure.
9) TAHH-1524 , 56-599 Discharge High-High Temperature.
10) LAHH-1534 , 60-2678 High-High Liquid Level.
11) LAHH-1535 , 60-2678 High-High Liquid Level
12) PDAHH-1546 , 60-2677 High-High Differential Pressure.
13) LAL-1562 , 60-2677 Low Oil Level.
14) VAH-1531 , 71-2641 High Vibration.
15) VAH-1569 , 71-2640 High Vibration.
16) TAHH-1544 , 71-2641 High-High Outlet Temperature.
17) PAL-1533 , Instrument Air Low Pressure
18) ZIO-1502 , FBV-1502 Failed To Open.
19) ZIC-1502 , FBV-1502 Failed To Close
20) ZIO-1511 , FBV-1511 Failed To Open
21) ZIC-1511 , FBV-1511 Failed To Close.
22) ZIO-1512 , FBV-1512 Failed To Open.
23) ZIC-1512 , FBV-1512 Failed To Close.
24) ZIO-1515 , FBV-1515 Failed To Open
25) ZIC-1515 , FBV-1515 Failed To Close.
26) ZIO-1516 , FBV-1516 Failed To Open.
27) ZIC-1516 , FBV-1516 Failed To Close.
28) ZIO-1518 , FBV-1518 Failed To Open.
29) ZIC-1518 , FBV-1518 Failed To Close.
30) ZIO-1519 , FBV-1519 Failed To Open.
31) ZIC-1519 , FBV-1519 Failed To Close.
32) ZIO-1523 , FBV-1523 Failed To Open.
33) ZIC-1523 , FBV-1523 Failed To Close.
34) ZIO-1536 , FBV-1536 Failed To Open.

35) ZIC-1536 , FBV-1536 Failed To Close.
36) ZIO-1547 , FBV-1547 Failed To Open.
37) ZIC-1547 , FBV-1547 Failed To Close.
38) ZIO-1548 , FBV-1548 Failed To Open.
39) ZIC-1548 , FBV-1548 Failed To Close.
40) ZI-1520 , 50-7751 Failed.
41) ZI-1525 , 50-7752 Failed
42) ZI-1526 , 50-7753 Failed.
43) ZI-1530 , 50-7754 Failed.
44) PAH-1503 , 60-2676 High Pressure.
45) PAH-1507 , 60-2675 High Pressure.

VII.A.3. Step 3- Start Bed Cycle

a. Step Description

This Step will start the Adsorption and Desorption Bed cycle.

b Conditions Required to Enter Step

1) Program will advance to Step 3 when TIC-1568 is equal to or greater than 210 °F

c Actions Taken During Step

1) Enable (close) FBV-1511 and Disable (close) FBV-1519.
2) Enable (open) FBV-1523.
3) Enable controller PIC-1545 and put set-point 6 psia.
4) Wait here until PIC-1545 is 1.9 psia or Shut-Down IF in this sequence for more than 3 minutes.
5) Enable (open) FBV-1516 and wait here for 10 minutes.
6) Disable (close) FBV-1516.
7) Disable (close) FBV-1523 and put controller PIC-1545 set point to 0 psia.
8) Enable (open) FBV-1548 until Pressure indicator PIT-1507 is equal to or greater than 14.7 psia, then disable (close) FBV-1548.
9) Enable (open) FBV-1519 and Disable (open) FBV-1511.
10) Advance Program to Step 4, but continue these sequence.
11) Enable (close) FBV-1502 and Disable (close) FBV-1518.
12) Enable (open) FBV-1512.
13) Enable controller PIC-1545 and put set-point 6 psia.
14) Wait here until PIC-1545 is 1.9 psia or Shut-Down IF in this sequence for more than 3 minutes.
15) Enable (open) FBV-1515 and wait here for 10 minutes
16) Disable (close) FBV-1515.
17) Disable (close) FBV-1512 and put controller PIC-1545 set point to 0 psia.
18) Enable (open) FBV-1547 until Pressure indicator PIT-1503 is equal to or greater than 14.7 psia, then disable (close) FBV-1547.
19) Enable (open) FBV-1518 and Disable (open) FBV-1502.
20) Enable (close) FBV-1511 and Disable (close) FBV-1519
21) Enable (open) FBV-1523.
22) Enable controller PIC-1545 and put set-point 6 psia.
23) Wait here until PIC-1545 is 1.9 psia or Shut-Down IF in this sequence for more than 3 minutes.
24) Enable (open) FBV-1516 and wait here for 10 minutes.
25) Disable (close) FBV-1516.
26) Disable (close) FBV-1523 and put controller PIC-1545 set point to 0 psia.
27) Enable (open) FBV-1548 until Pressure indicator PIT-1507 is equal to or greater than 14.7 psia, then disable (close) FBV-1548.

28) Enable (open) FBV-1519 and Disable (open) FBV-1511.
29) Return to sequence 11 and repeat until Skid is Shut-Down

d. Conditions Required to Exit Step

1) Program will advance to Step 4 after adsorption Bed 60-2675 has been desorbed
2) Operator request for Shut-Down
3) Program will Shut-Down Skid on ESD alarm.

e. Summary of Software Alarms Enabled During Step

1) TAL-1524 , 56-599 Low Discharge Temperature.

f. Summary of Software Shutdowns Enabled During Step

1) TALL-1524 , 56-599 Low-Low Discharge Temperature.
2) LAH-1561 , 60-2677 High Oil Level.

VII.A.4 Step 4 - Run

a. Step Description

This Step the Skid is in full operation and unloading of the barge can begin

b Conditions Required to Enter Step

1) Program will advance to Step 4 after adsorption Bed 60-2675 has been desorbed

c. Actions Taken During Step

1) Continue Adsorption and Desorption Bed cycle.

d. Conditions Required to Exit Step

1) Operator request for Shut-Down.
2) Program will Shut-Down Skid on ESD alarm.

e. Summary of Software Alarms Enabled During Step

1) None by Program this Step
2) Announce on screen and print, "Skid Operational".

f. Summary of Software Shutdowns Enabled During Step

None by Program this Step.

VII.B. Digital Output Summary

DO No.	Description	Enable Permissive
DO-1502	FBV-1502 Close	Selected by Program
DO-1511	FBV-1511 Close	Selected by Program
DO-1512	FBV-1512 Open	Selected by Program
DO-1515	FBV-1515 Open	Selected by Program
DO-1516	FBV-1516 Open	Selected by Program
DO-1518	FBV-1518 Open	Selected by Program
DO-1519	FBV-1519 Open	Selected by Program
DO-1520	50-7751 Start	Selected by Program
DO-1523	FBV-1523 Open	Selected by Program
DO-1525	50-7752 Start	Selected by Program
DO-1526	50-7753 Start	Selected by Program
DO-1530	50-7754 Start	Selected by Program
DO-1532	55-6050 Start	Selected by Program
DO-1536	FBV-1536 Open	Selected by Program
DO-1547	FBV-1547 Open	Selected by Program
DO-1548	FBV-1548 Open	Selected by Program
DO-1549	FBV-1549 Open	Selected by Program
DO-1563	FBV-1563 Open	Selected by Program

VII.C. Controller Summary

Tag No.	Description	Range	Set-Point	Action
TIC-1568	56-599 Seal Oil Temp. Controller	50-300 °F	210 °F	Direct
PIC-1527	56-599 Seal Oil Pressure Controller	12-17 psia	0.0 psig	Reverse
PIC-1545	56-599 Inlet Pressure Controller	0-15 psia	6.0 psia	Reverse

VII.D. Analog Alarm Summary

Tag No.	Description	Controller Indicator Tag	Set-Point	Type
PDAH-1500	72-821 High Differential Pressure	PDI-1500	0.5" WC	High
FAH-1501H	High Inlet Flow	FI-1501H	800 CFM	High
FAHH-1501H	High-High Inlet Flow	FI-1501H	900 CFM	High-High
TAH-1504	60-2676 High Temperature	TI-1504	130 °F	High
TAHH-1504	60-2676 High-High Temperature	TI-1504	150 °F	High-High
TAH-1505	60-2676 High Temperature	TI-1505	130 °F	High
TAHH-1505	60-2676 High-High Temperature	TI-1505	150 °F	High-High
TAH-1506	60-2676 High Temperature	TI-1506	130 °F	High
TAHH-1506	60-2676 High-High Temperature	TI-1506	150 °F	High-High
TAH-1508	60-2675 High Temperature	TI-1508	130 °F	High
TAHH-1508	60-2675 High-High Temperature	TI-1508	150 °F	High-High
TAH-1509	60-2675 High Temperature	TI-1509	130 °F	High
TAHH-1509	60-2675 High-High Temperature	TI-1509	150 °F	High-High
TAH-1510	60-2675 High Temperature	TI-1510	130 °F	High
TAHH-1510	60-2675 High-High Temperature	TI-1510	150 °F	High-High
FAH-1517	Desorption Sweep Gas High Flow	FI-1517	225 CFM	High
TAH-1524	56-599 Discharge High Temperature	TI-1524	240 °F	High
TAHH-1524	56-599 Discharge High-High Temp.	TI-1524	250 °F	High-High
TAL-1524	56-599 Discharge Low Temperature	TI-1524	210 °F	Low
TALL-1524	56-599 Discharge Low-Low Temp.	TI-1524	200 °F	Low-Low
PAH-1527	56-599 Seal Oil High Pressure	PIC-1527	0.5 psig	High
PAHH-1527	56-599 Seal Oil High-High Pressure	PIC-1527	1.0 psig	High-High
PAL-1527	56-599 Seal Oil Low Pressure	PIC-1527	-0.5 psig	Low
PALL-1527	56-599 Seal Oil Low-Low Pressure	PIC-1527	-1.0 psig	Low-Low
LAH-1534	60-2678 High Level	LIC-1534	90%	High
LAHH-1534	60-2678 High-High Level	LIC-1534	95%	High-High
LAL-1534	60-2678 Low Level	LIC-1534	10%	Low
LALL-1534	60-2678 Low-LOw Level	LIC-1534	5%	Low-Low
TAH-1544	71-2641 High Outlet Temperature	TI-1544	130 °F	High
TAHH-1544	71-2641 High-High Outlet Temp.	TI-1544	140 °F	High-High
PDAH-1546	60-2677 High Differential Pressure	PDI-1546	3.0 psig	High
PDAHH-1546	60-2677 High-High Differential Press.	PDI-1546	5.0 psig	High-High
TAH-1550	55-6050 High Temperature	TI-1550	200 °F	High
VAH-1503	60-2676 High Pressure	LI-1503	16.7 psia	High
VAH-1507	60-2675 High Pressure	LI-1507	16.7 psia	High

VII.E. Digital Alarm Summary

Tag No.	Description	Set-Point	Type	Contact Position
VBS-1569	71-2640 Vibration	N/A	High	Open
VBS-1531	71-2641 Vibration	N/A	High	Open
PSL-1533	Instrument Air Low Pressure	60 psig	Low	Open
LSL-1528	V-125A Seal Pot Low Level	N/A	Low	Open
LSL-1529	V-125B Seal Pot Low Level	N/A	Low	Open
LSH-1535	60-2678 High-High Level	N/A	High-High	Open
LSH-1561	60-2677 High Oil Level	N/A	High	Open
LSL-1562	60-2677 Low Oil Level	N/A	High	Open

VII.F. Indicator Summary

Tag No.	Description	Range
PDI-1500	72-821 Differential Pressure	0-2" WC
FI-1501L	Inlet Flow	0-400 ACFM
FI-1501H	Inlet Flow	0-1,000 ACFM
PI-1503	60-2676 Pressure	0-20 psia
PI-1507	60-2675 Pressure	0-20 psia
TI-1504	60-2676 Temperature	0-200 °F
TI-1505	60-2676 Temperature	0-200 °F
TI-1506	60-2676 Temperature	0-200 °F
TI-1508	60-2675 Temperature	0-200 °F
TI-1509	60-2675 Temperature	0-200 °F
TI-1510	60-2675 Temperature	0-200 °F
FI-1517	Desorption Sweep Gas	0-300 ACFM
TI-1524	56-599 Discharge Temperature	50-300 °F
LI-1534	60-2678 Level	0-100%
TI-1544	71-2641 Outlet Temperature	0-250 °F
PDI-1546	60-2677 Differential Pressure	0-15 psig

VII.G. Digital Input Summary

Tag No.	Instrument or Equipment Location and Description	Contact Position
ZSO-1502A	FBV-1502 Open	Closed
ZSC-1502B	FBV-1502 Closed	Closed
ZSO-1511A	FBV-1511 Open	Closed
ZSC-1511B	FBV-1511 Closed	Closed
ZSO-1512A	FBV-1512 Open	Closed
ZSC-1512B	FBV-1512 Closed	Closed
ZSO-1515A	FBV-1515 Open	Closed
ZSC-1515B	FBV-1515 Closed	Closed
ZSO-1516A	FBV-1516 Open	Closed
ZSC-1516B	FBV-1516 Closed	Closed
ZSO-1518A	FBV-1518 Open	Closed
ZSC-1518B	FBV-1518 Closed	Closed
ZSO-1519A	FBV-1519 Open	Closed
ZSC-1519B	FBV-1519 Closed	Closed
ZSO-1523A	FBV-1523 Open	Closed
ZSC-1523B	FBV-1523 Closed	Closed
ZSO-1536A	FBV-1536 Open	Closed
ZSC-1536B	FBV-1536 Closed	Closed
ZSO-1547A	FBV-1547 Open	Closed
ZSC-1547B	FBV-1547 Closed	Closed
ZSO-1548A	FBV-1548 Open	Closed
ZSC-1548B	FBV-1548 Closed	Closed
ZSO-1549A	FBV-1549 Open	Closed
ZSC-1549B	FBV-1549 Closed	Closed
ZSO-1563A	FBV-1563 Open	Closed
ZSC-1563B	FBV-1563 Closed	Closed
DI-1520	56-599 Start	Closed
DI-1525	55-6049 Start	Closed
DI-1526	71-2640 Start	Closed
DI-1530	71-2741 Start	Closed
DI-1532	55-6050 Start	Closed
LSL-1514	55-6050 Stop	Open
LSH-1521	FBV-1563 Open	Open
LSL-1522	FBV-1563 Close	Open

VII.I. Notes to Programmer

1. The Vapor Recovery System Shut-Down switch HS-1024(SD-2) will return the Program to Step 1 from any higher Step at any time. The Vapor Recovery System Start Permissive switch HS-1009 must be enabled before the Master Control switch is enabled to start the Skid, when this two swiches are enabled in the correct order the Skid will start.

2. Shut-Down alarms in the Program will return the Program to Step 1 from any Step at any time.

3. An enabled controller does not enable the alarms on the controller. Alarms are enabled as noted in the English Language Operating Program.

4. Controllers disabled by the program are disabled only in auto and put in manual, they should not be locked out in the manual mode.

5. Actuated block valves position switches will be on a make contact basis. If a block valve does not go to the position the Program expects it to be, the Program will alarm the valve failed to make the correct position. A block valve enabled will have output, and a block valve disabled will not have an output, from the Program. Position switches on block valves will have a 8 second delay (time-out) before they alarm positioned failed. Some valves failing to make their proper position will Shut-Down the Skid, for the listing of these valves see the Abnormal Operating Conditions section.

6. An alarm enabled in a Step of the Program will remain enabled throughout the program, unless noted otherwise in Program.

7. All digital input alarms and analog alarms will have a 3 second delay (time-out), unless noted otherwise in the English language procedure.

VIII. Process Control Diagrams

PPG Industries, Inc.

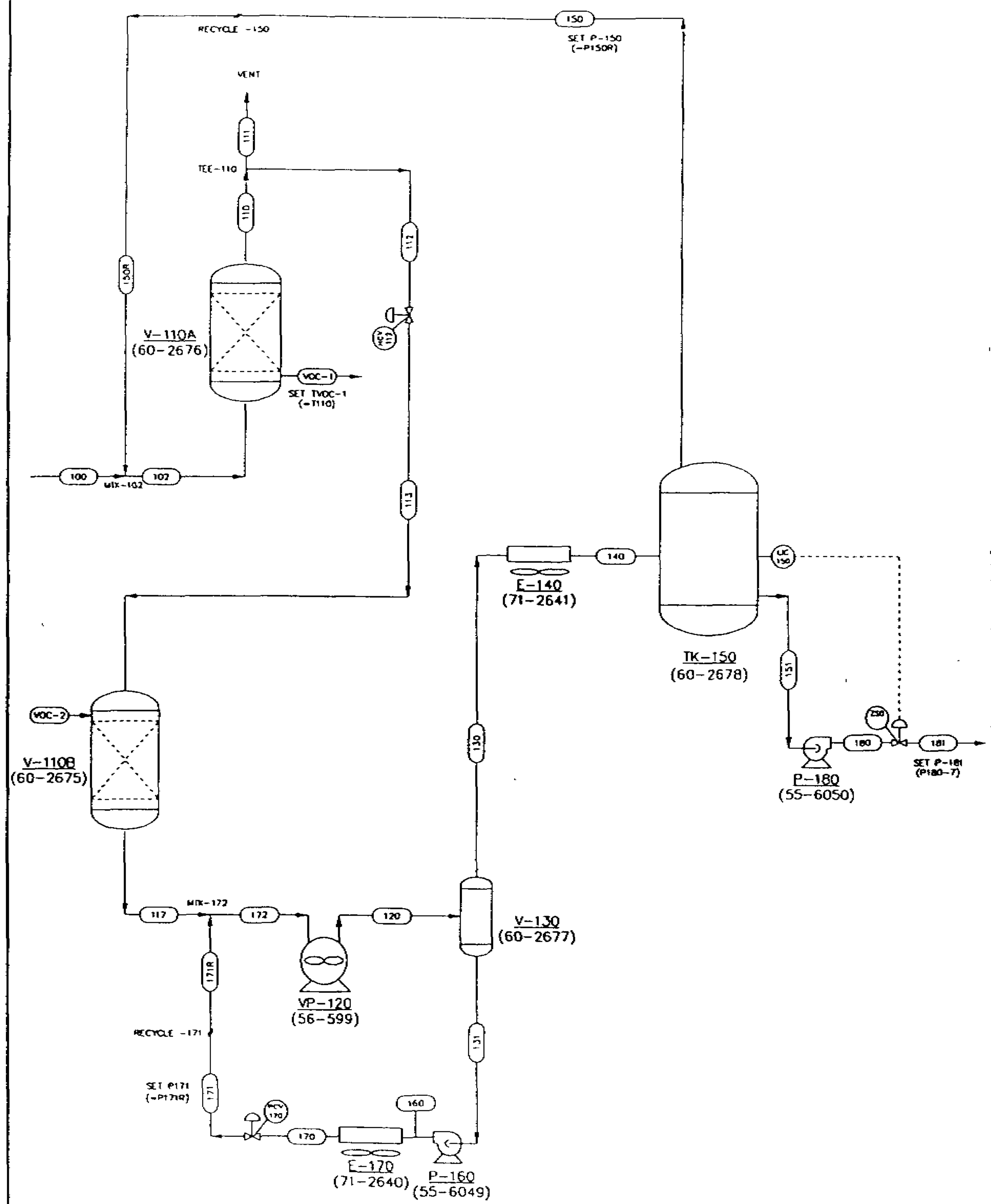
Lake Charles, Louisiana

Sorbathene Unit

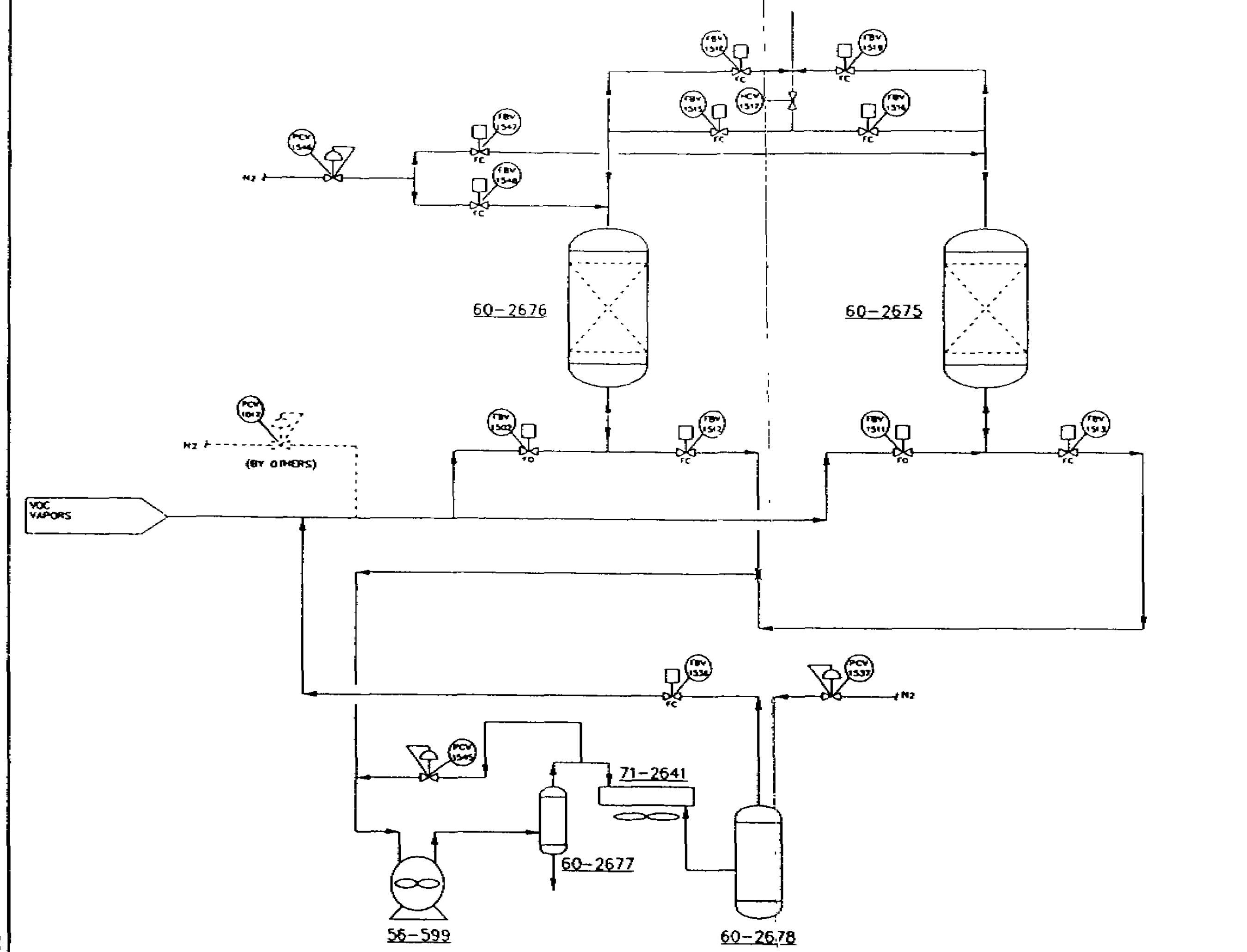
AWD TECHNOLOGIES, INC.

AWD
TECHNOLOGIES
HOUSTON, TEXAS

SL 085692



PROCESS DIAGRAM



SYSTEM STEPS					VALVE POSITIONS										
STEP	BED V-110A(60-2676)	BED V-110B(60-2675)	TIME(MIN)	SIMULATION CASE	FBV-1502	FBV-1511	FBV-1518	FBV-1519	FBV-1512	FBV-1513	FBV-1515	FBV-1516	FBV-1548	FBV-1547	FBV-1536
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2															
3															
4															
5															
6															
7															
8															
9															
10															

ISSUED FOR INTERNAL REVIEW

AWD TECHNOLOGIES, INC.

AWD

PROCESS FLOW/CONTROL DIAGRAM
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES, INC   JOB NUMBER 6A01

SL 085693

MECHANICAL FLOW SHEET SYMBOLS

GENERAL EQUIPMENT

- ROTARY PUMP, GEAR PUMP, LOBE PUMP OR POSITIVE DISPLACEMENT
- AIR-OPERATED DIAPHRAGM PUMP
- PROPORTIONING, POSITIVE-DISPLACEMENT PISTON PUMP
- SUMP PUMP CENTRIFUGAL SUBMERSIBLE
- BLOWER OR FAN (CENTRIFUGAL)
- VACUUM PUMP
- IN-LINE VERTICAL CENTRIFUGAL PUMP
- HORIZONTAL CENTRIFUGAL PUMP
- SINGLE DIAPHRAGM PUMP
- POSITIVE DISPLACEMENT PUMP
- PRESSURE VESSEL
- ATMOSPHERIC TANK
- SHELL AND TUBE HEAT EXCHANGER
- U-TUBE HEAT EXCHANGER
- STORAGE TANK
- AGITATOR
- BAG OR CARTRIDGE FILTER
- IN-LINE LUBRICATOR
- MODULE BREAK
- "Y" TYPE STRAINER
- CONICAL START-UP STRAINER
- DRAINER
- STEAM TRAP (ABBREVIATED FORM OF CONFIGURATION BELOW)
- EQUIPMENT PACKAGE OUTLINE

INSTRUMENTS

- ELECTRICAL SIGNAL
- SOFTWARE/DATA LINK
- PNEUMATIC SIGNAL
- HYDRAULIC SIGNAL
- CAPILLARY
- AI — INSTRUMENT ANALOG SIGNAL
- AI — INSTRUMENT DIGITAL SIGNAL
- (V) INSTRUMENT FURNISHED BY EQUIPMENT PACKAGE VENDOR
- INSTRUMENT FOR SINGLE MEASURED VARIABLE AND ANY NUMBER OF FUNCTIONS. INSTRUMENT IS LOCALLY MOUNTED.
- FRONT OF MAIN PANEL MOUNTED INSTRUMENT.
- MOUNTED IN LOCAL PANEL (FIELD)
- MOUNTED IN CONTROL ROOM, REAR OF PANEL
- INPUT TO OR OUTPUT FROM PLC
- COMPUTER FUNCTION
- LOCAL INSTRUMENTS FOR TWO MEASURED VARIABLES SHARING COMMON HOUSING, OR MORE THAN ONE FUNCTION
- FACE OF PANEL OR CONSOLE MOUNTED INSTRUMENT, TWO MEASURED VARIABLES OR MORE THAN ONE FUNCTION.
- CRT DISPLAY
- FE — X = E — FLOW ELEMENT ORIFICE PLATE. X = O — FLOW ELEMENT RESTRICTION ORIFICE
- FR — ROTAMETER
- FTC — IN-LINE INSTRUMENT (FLOW)
- ANNUBAR FLOW SENSOR
- LE — LEVEL-INTERNAL BALL FLOAT
- PI — PRESSURE DIRECT-CONNECTED
- PT — WITH DIRECT-CONNECTED DIAPHRAM SEAL
- TE — THERMOCOUPLE AND THERMOWELL
- U — ULTRASONIC; C — CAPACITANCE
- RTD — RTD AND THERMOWELL
- MAGNETIC FLOW METER
- PCV — PRESSURE REDUCING REGULATOR SELF CONTAINED (+ = SET PRESSURE)
- PCV — BACKPRESSURE REGULATOR SELF CONTAINED (+ = SET PRESSURE)
- FLAME ARRESTOR

INSTRUMENTS

- PSV — PRESSURE RELIEF OR SAFETY VALVE
- PSV — PRESSURE/VACUUM RELIEF VALVE
- PRD — RUPTURE DISK OR SAFETY HEAD FOR PRESSURE RELIEF
- PRD — RUPTURE DISK OR SAFETY HEAD FOR VACUUM RELIEF
- PSV — PRESSURE/VACUUM RELIEF MANHOLE COVER
- PV — FAILURE MODE (F.O)

FAIL POSITIONS
FC — FAIL CLOSED (ASSUMED)
FO — FAILED OPEN
FI — FAIL INDETERMINATE
FL — FAIL LOCKED

- SOLENOID VALVE
- AS — PY — ELECTRIC ANALOG SIGNAL TO PNEUMATIC VALVE WITH I/P CONVERTOR AND POSITIONER
- AS — PY — ELECTRIC ANALOG SIGNAL TO PNEUMATIC VALVE WITH I/P CONVERTER
- AS — SY — PNEUMATIC CYLINDER SPRING RETURN TO FAIL POSITION, FOR ELECTRIC OR PNEUMATIC FAILURE WITH SOLENOID VALVE.
- RESET (OPTIONAL)
- SOLENOID VALVE

UTILITY SUPPLY LINES:
AS — INSTRUMENT AIR SUPPLY
G/S — GAS SUPPLY
HS — HYDRAULIC FLUID SUPPLY
N/S — NITROGEN SUPPLY
STM — STEAM SUPPLY
W/S — WATER SUPPLY

VALVES

- GATE VALVE
- DIAPHRAM VALVE
- CHECK VALVE
- NEEDLE VALVE W/BLEED
- GLOBE VALVE
- BALL VALVE
- PLUG VALVE
- PINCH VALVE
- BUTTERFLY VALVE
- ANGLE VALVE
- BARE STOCK MULTIPORT VALVE
- 4 WAY VALVE (SOLENOID OPERATED)
- 3 WAY SOLENOID
- PNEUMATIC OR HYDRAULICALLY OPERATED SLIDE GATE.
- MANUAL SLIDE GATE.
- LOUVERED DAMPER WITH OPERATOR
- LOUVERED DAMPER

ABBREVIATIONS

AI	- ANALOG INPUT	NO	- NORMALLY OPEN
AO	- ANALOG OUTPUT	NC	- NORMALLY CLOSED
AS	- AIR SUPPLY	HLL	- HIGH LIQUID LEVEL
DI	- DIGITAL INPUT	NLL	- NORMAL LIQUID LEVEL
DO	- DIGITAL OUTPUT	LLL	- LOW LIQUID LEVEL
ES	- ELECTRICAL SUPPLY	SC	- SAMPLE CONNECTION
HS	- HAND SWITCH	SO	- STEAM OUT
IA	- INSTRUMENT AIR	SP	- SET POINT
CSC	- CAR SEAL CLOSE (L.C.)	(D)	- DRAIN
CSO	- CAR SEAL OPEN (L.O.)	(V)	- VENT
FC	- FAIL CLOSED		
FOR	- FAIL CLOSED - MANUAL RESET		
FO	- FAIL OPEN		
FOR	- FAIL OPEN - MANUAL RESET		

GENERAL PIPING

- AK / AS — SPEC BREAK
- PRIMARY PROCESS FLOW
- SECONDARY PROCESS FLOW
- RADIATION OR SONIC SIGNAL (WITHOUT WIRING OR TUBING)
- FILLED CAPILLARY TUBING
- DIRECTION OF FLOW
- HYDRAULIC PIPING (TOP OF "L" INDICATES FLOW DIRECTION)
- EXPANSION JOINT
- QUICK CONNECT/DISCONNECT COUPLINGS/FLEXIBLE HOSE
- SAMPLE POINT — SP
- BATTERY UNIT
- TIE-IN POINT
- CONTINUATION SYMBOL
- LINE DRAIN WITH VALVE AND SCREWED CAP OR PLUG.
- PIPE REDUCER
- SPRAY NOZZLE
- NOZZLE DESIGNATION (X = NUMBER) (Y = SIZE)
- PIPE INSULATION
- EQUIPMENT INSULATION
- ATMOSPHERIC VENT
- PIPE FLANGE
- BLIND FLANGE
- WELDED CAP
- HOSE CONNECTION
- SCREWED PLUG OR CAP
- HEAT TRACING (FOR TYPE SEE PIPING SPECIFICATION LEGEND)

PIPING SPECIFICATION LEGEND

EXAMPLE: P - 12" - 106 - BC (2" C) ET

- FLUID TYPE
  - IA = INSTRUMENT AIR
  - FG = FUEL GAS
  - A = ACID
  - P = VOC
  - S = STEAM
  - W = WATER
  - C = CONDENSATE
  - PW = POTABLE WATER
  - V = VAPOR
  - AA = ATMOSPHERE AIR
- LINE SIZE
- LINE NUMBER
- FLANGE RATING
  - A = 150# ANSI R.F.
  - B = 300# ANSI R.F.
  - C = 600# ANSI R.F.
  - D = 900# AMSD R.F.
- MATERIAL SPECIFICATION
  - C = CARBON STEEL
  - D = DERAKANE
  - E = HDPE
  - F = FRP DUCTWORK
  - I = GALVANIZED CARBON STEEL
  - L = POLYPROPYLENE LINED CARBON STEEL
  - K = PVDF (KYNAR)®
  - P = PVC
  - R = CPVC
  - S = HIGH TEMP CARBON STEEL
  - 6 = 316 STAINLESS STEEL
- INSULATION THICKNESS
- INSULATION TYPE
  - C = COLD
  - H = HOT
  - PP = PERSONNEL PROTECTION
  - FP = FREEZE PROTECTION
- TRACING TYPE
  - ET = ELECTRICAL
  - ST = STEAM

IDENTIFICATION LETTERS

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME		USERS CHOICE	USERS CHOICE	USERS CHOICE
C	CONDUCTIVITY (ELECTRICAL)			CONTROL	CLOSED
D	DENSITY (MASS) OR SPECIFIC GRAVITY	DIFFERENTIAL			
E	VOLTAGE (EMF)		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	GAGING (DIMENSIONAL)		GLASS		
H	HAND (MANUALLY INITIATED)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME OR TIME-SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY	MOMENTARY			MIDDLE OR INTERMEDIATE
N	USERS CHOICE		USERS CHOICE	USERS CHOICE	USERS CHOICE
O	USERS CHOICE		ORIFICE (RESTRICTION)		OPEN
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY OR EVENT	INTEGRATE OR TOTALIZE			
R	RADIOACTIVITY		RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION			VALVE, DAMPER OR LOUVER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY OR COMPUTE, CONVERT	
Z	POSITION	Z AXIS		DRIVE ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

DRAWING NUMBER	DRAWING TITLE	CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
REFERENCE DRAWINGS			BB		TJF	DH/BH	6	FOR CONSTRUCTION	10/02/92

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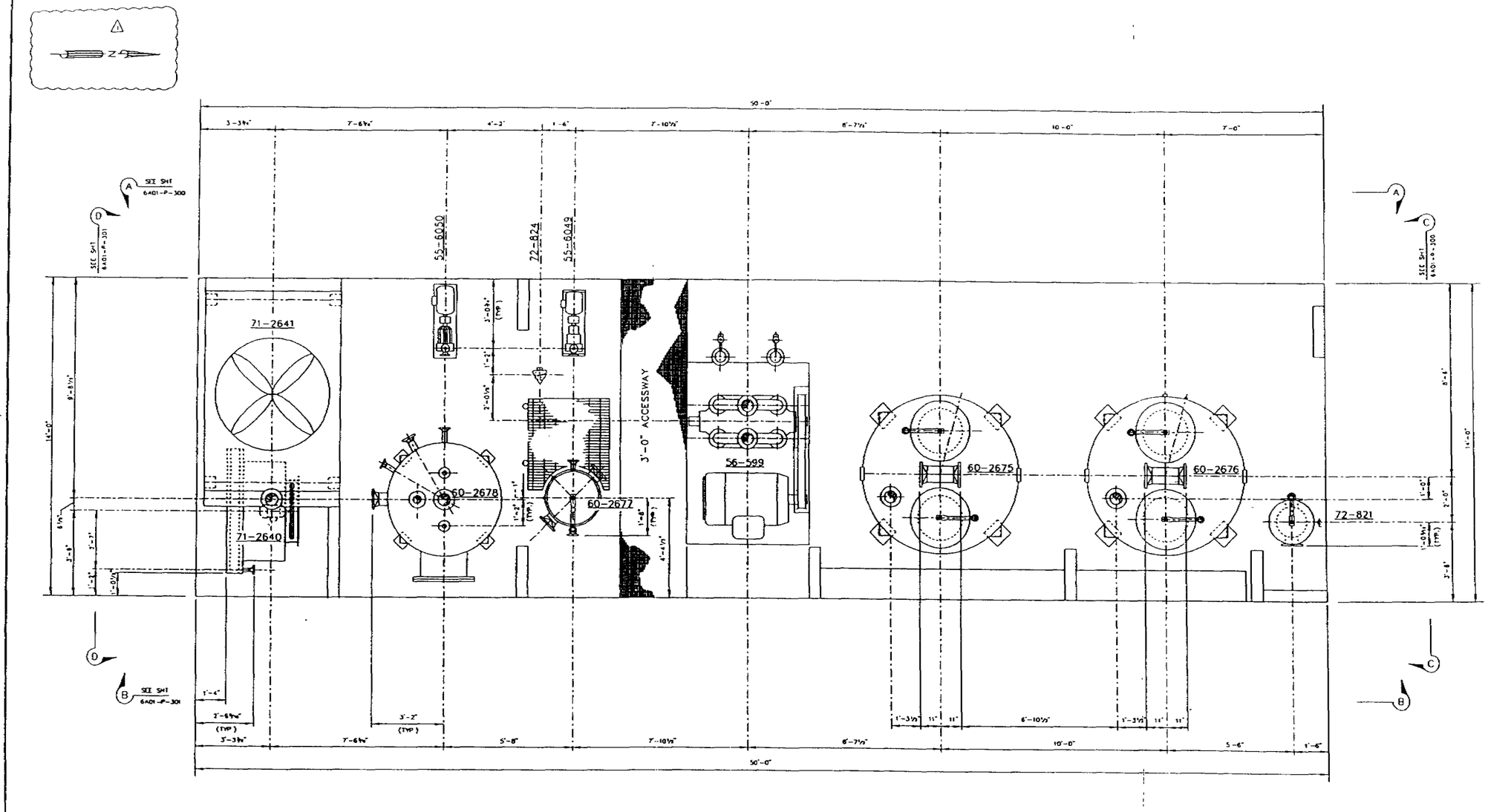
P&ID SYMBOL & LEGEND SHEET
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES, INC. JOB NUMBER 6A01
SCALE NONE DRAWING NUMBER 6A01-F-100 REV 2

SI 085694



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			RFS		RFS	DN/BH	0	ISSUED FOR CONSTRUCTION	10-07-92
REFERENCE DRAWINGS									

AWD TECHNOLOGIES, INC.

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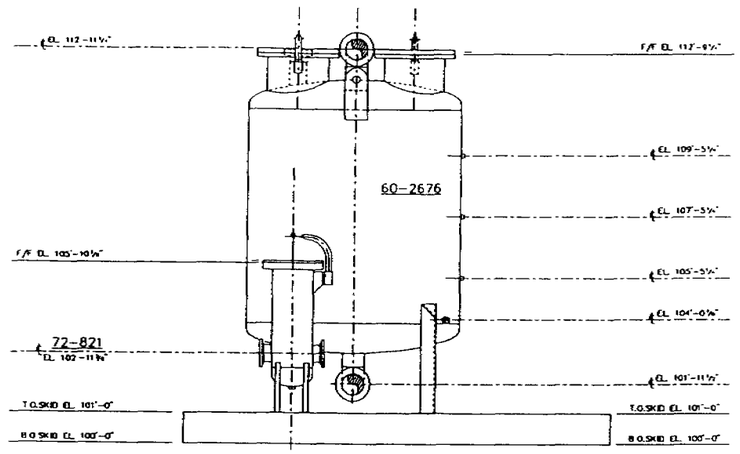
EQUIPMENT LOCATION PLAN
SORBATHENE MODULE

CUSTOMER PPG INDUSTRIES, INC — JOB NUMBER 6A01

SCALE 1/2" = 1'-0" — DRAWING NUMBER 6A01-P-20[illegible] — REV



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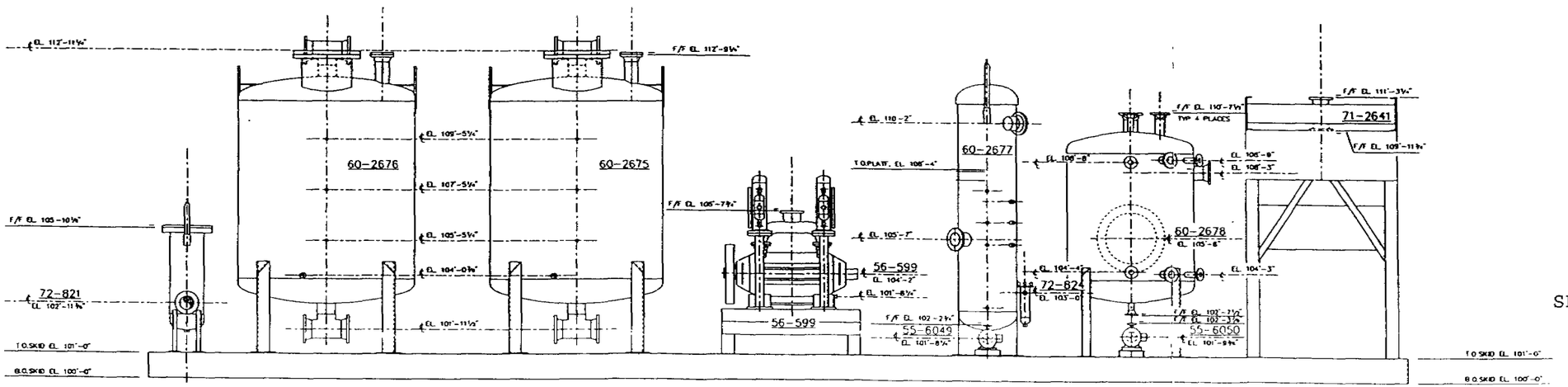

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DRAWING NUMBER	DRAWING TITLE
	REFERENCE DRAWINGS

	CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	
		RF3		RF3	DH/TH	0	ISSUED FOR CONSTRUCTION
							REVISED

DATE: 10-02-92

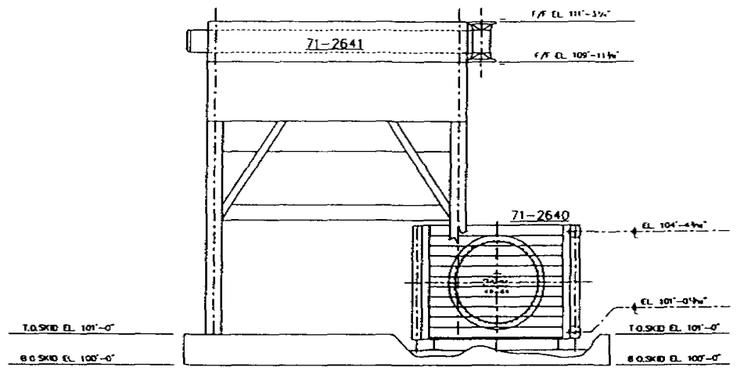
AWD TECHNOLOGIES, INC

AWD TECHNOLOGIES

EQUIPMENT LOCATION ELEVATION
SORBATHENE MODULE

CUSTOMER PPG INDUSTRIES, INC. JOB NUMBER 6A01

SCALE 1/2"=1'-0" DRAWING NUMBER 6A01-P-300 REV 0



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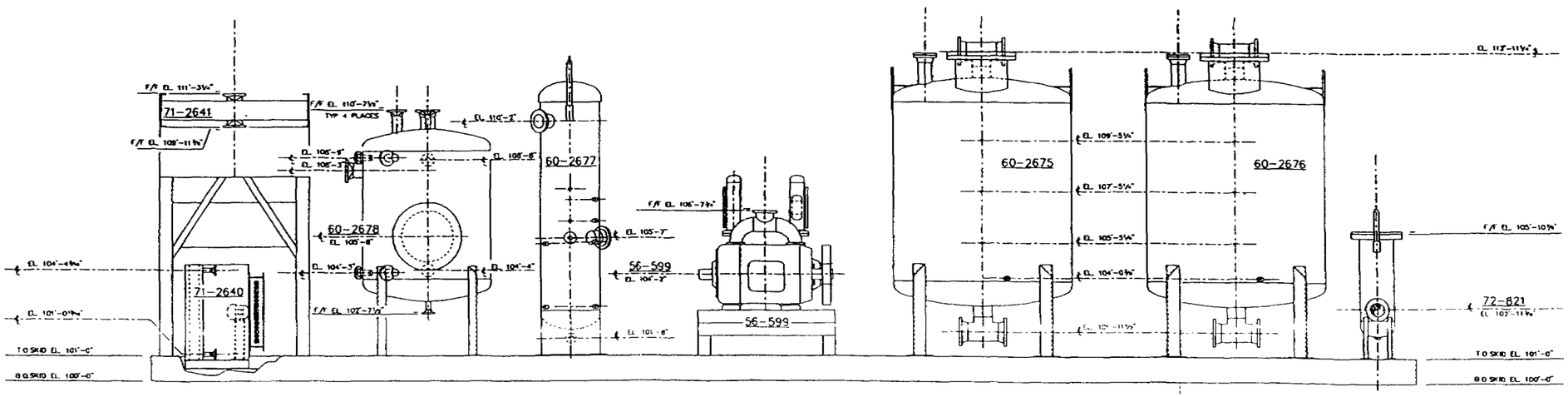


ELEVATION "B - B"

DRAWING NUMBER	DRAWING TITLE	CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	REFERENCE DRAWINGS		RFS		RFS	DN/RH	0	ISSUED FOR CONSTRUCTION	10-02-92

AWD TECHNOLOGIES, INC.

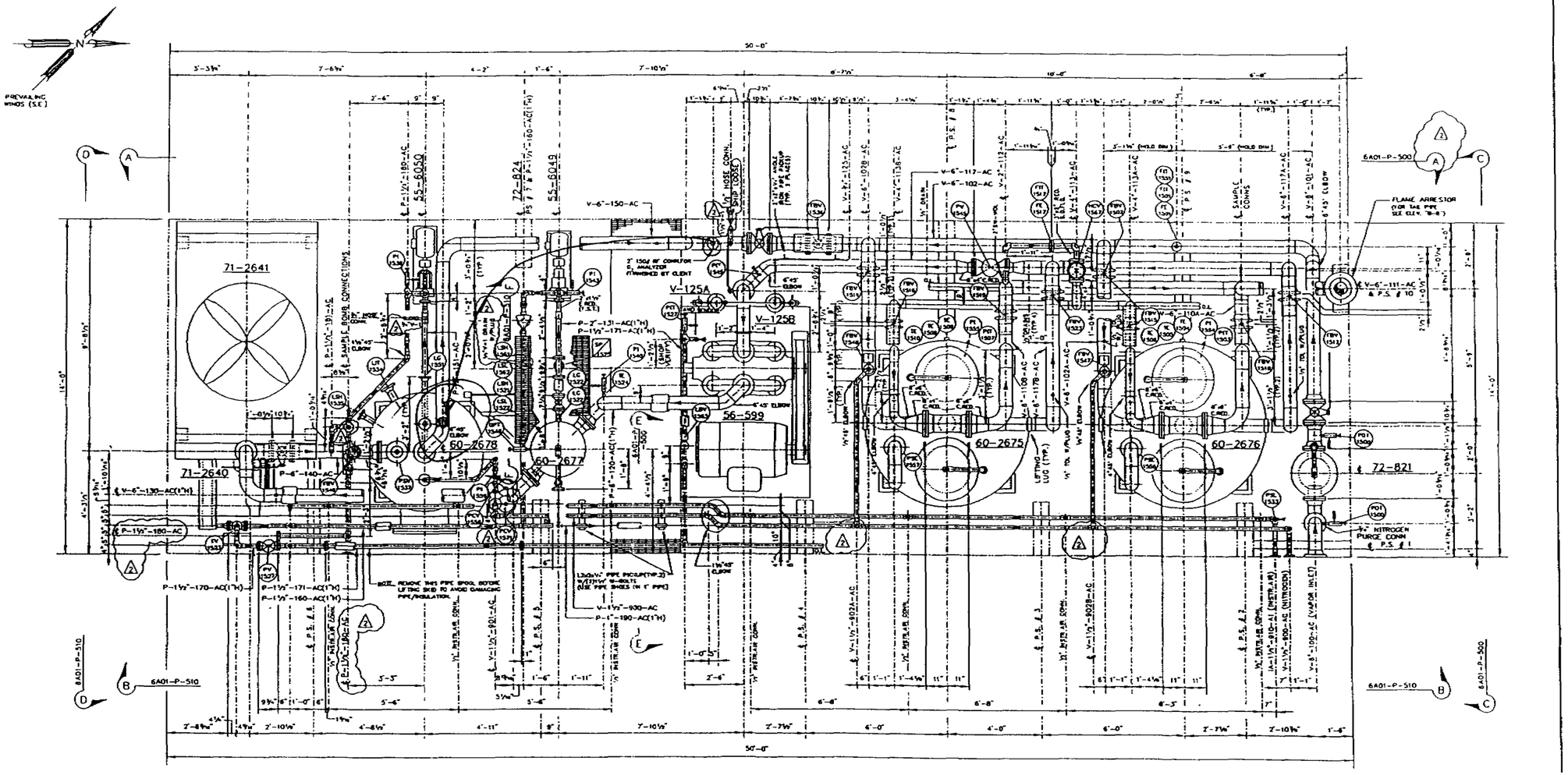
AWD TECHNOLOGIES

EQUIPMENT LOCATION ELEVATION
SORBATHENE MODULE

CUSTOMER PPG INDUSTRIES, INC. JOB NUMBER 6A01

SCALE 1/2"=1'-0" DRAWING NUMBER 6A01-P-310 REV D

TS 085697



PLAN

SL 085698

NOTE:
1 FABRICATOR TO PROVIDE HIGH POINT VENTS AND LOW POINT DRAINS (SEE PIPING SPECIFICATIONS)

DRAWING NUMBER	DRAWING TITLE	CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
REFERENCE DRAWINGS			WDC		RFS	DM/BH	2	ADDED UP DRAWG AND HP VENTS, ADDED P&ID ITEM	11-04-97
			BG		RFS	DM/BH	1	ADDED ¾" PURGE CONN BETWEEN 72-821 & 72-824, RE-ROUTED 1½" DOC LIQ. PIPING, P-1½"-180-AC, ALTERED 24-6048 DUCT. LINE (P-2"-128-AC(1"H))	10-22-97
			AW		RFS	DM/BH	0	ISSUED FOR CONSTRUCTION	10-02-97

AWD TECHNOLOGIES, INC

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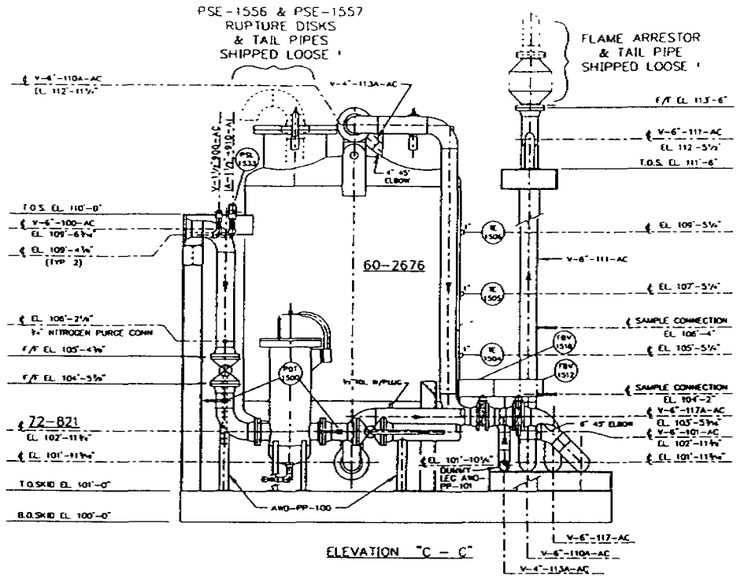
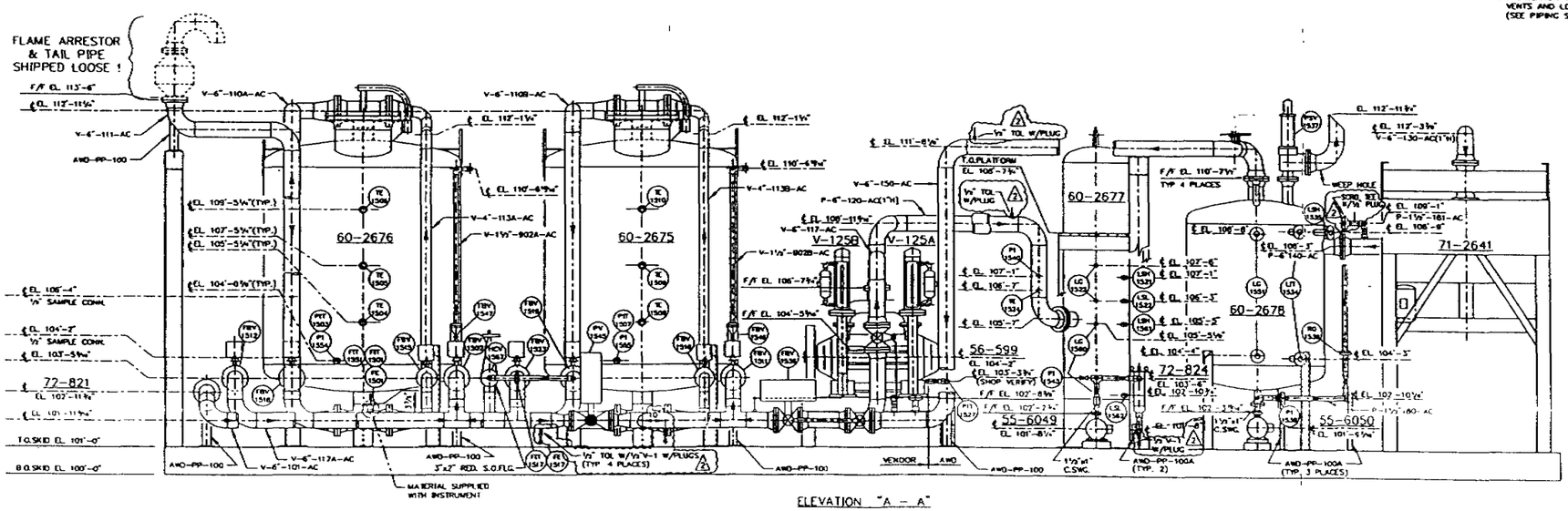
PIPING PLAN
SORBATHENE MODULE

CUSTOMER PPG INDUSTRIES, INC. JOB NUMBER 6A01

SCALE ½" = 1'-0" DRAWING NUMBER 6A01-P-400 REV



ELEVATION "C - C"



ELEVATION "A - A"

NOTE:
1. FABRICATOR TO PROVIDE HIGH POINT VENTS AND LOW POINT DRAINS. (SEE PIPING SPECIFICATIONS)

SL 085699

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REFERENCE DRAWINGS

DRAWING NUMBER	DRAWING TITLE
6A01-P-510	PIPING ELEVATIONS/SECTIONS SORBATHENE MODULE
6A01-P-500	PIPING PLAN SORBATHENE MODULE
6A01-F-102	P&ID VACUUM PUMP & CONDENSER
6A01-F-101	P&ID ADSORBERS

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	WC		WE	DN/TH	3	ADDED UP DRAWING AND UP VENTS	11-04-02
	WC		WS	DN/TH	1	RE-ROUTED 1½" SCH 40S LINE (P-1½"-160-AC)	10-22-02
	SA		BE	DN/TH	0	ISSUED FOR CONSTRUCTION	10-02-02

AWD TECHNOLOGIES, INC.

AWD TECHNOLOGIES

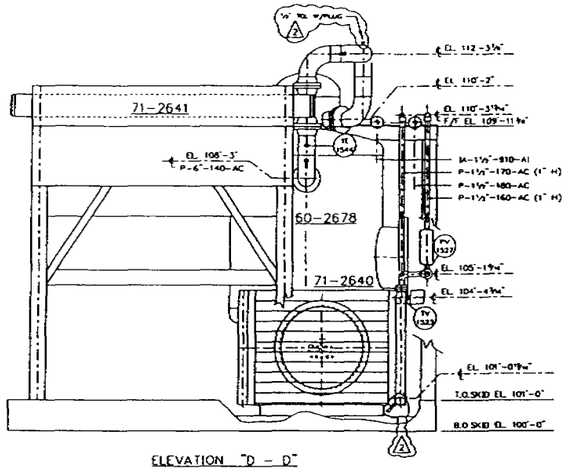
MODULE PIPING ELEV'S. "A-A" & "C-C"
SORBATHENE MODULE

CUSTOMER PPG INDUSTRIES, INC. JOB NUMBER 6A01

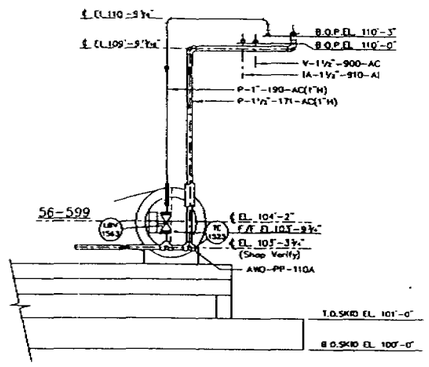
SCALE 1/2" = 1'-0" DRAWING NUMBER 6A01-P-500 REV 3

NOTES

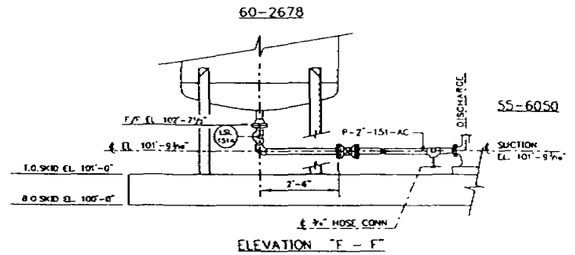
1. FABRICATOR TO PROVIDE HIGH POINT VENTS AND LOW POINT DRAINS (SEE PIPING SPECIFICATIONS)



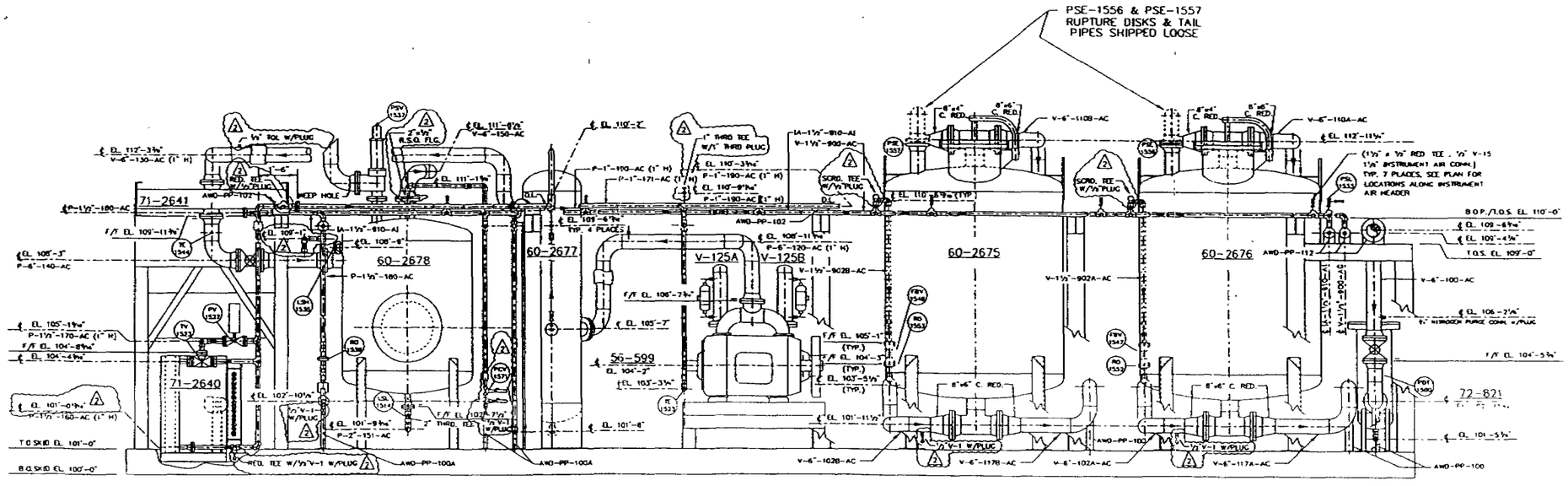
ELEVATION "D - D"



ELEVATION "E - E"



ELEVATION "F - F"



ELEVATION "B - B"

SL 085700

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DRAWING NUMBER	DRAWING TITLE

REFERENCE DRAWINGS

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	SCA		RFS	DM	2	ADDED LP DRAINS & HP VENTS, ADDED PCV-1571	11/04/92
	BM		RFS	DM	1	ADDED 3/4" HOSE CONN. BEFORE 72-821	10/22/92
	BM		RB	DM	0	ISSUED FOR CONSTRUCTION	10/05/92

AWD TECHNOLOGIES, INC.

AWD TECHNOLOGIES

MODULE PIPING ELEVATION "B-B", "D-D", "E-E", & "F-F"

SORBATHENE UNIT

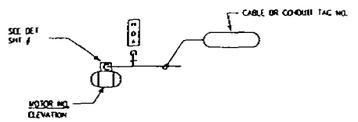
CUSTOMER PPG INDUSTRIES, INC	JOB NUMBER 6A01	
SCALE 1/2"=1'-0"	DRAWING NUMBER 6A01-P-510	REV 2

GENERAL NOTES

1. ELECTRICAL AREA CLASSIFICATION - CLASS I, DIVISION II, GROUP 'D'
2. ALL WORK SHALL CONFORM TO THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE.
3. UNDERGROUND GROUND WIRE WILL BE #2/0 AWG BARE COPPER. ABOVE GRADE GROUND WIRE WILL BE #1/0 AWG BARE COPPER. GROUND WIRE ROUTED THROUGH A CONCRETE SLAB SHALL BE INSTALLED IN IN A 1" PVC SCH.80 PIPE SLEEVE. A SUFFICIENT AMOUNT OF GROUND WIRE SHALL BE LEFT OVER TO COMPLETE GROUND SYSTEM. CONDUITS USED FOR GROUNDING WILL BE INSTALLED WITH TOP OF CONDUIT 3" ABOVE CONCRETE. CONDUITS SHALL TERMINATE WITH A METALLIC BUSHING.
4. ALL CONDUIT AND FITTINGS SHALL BE 'ROBROY RED' (UNLESS OTHERWISE NOTED)
5. ALL FLEX CONDUIT SHALL BE 'CARFLEX'. (UNLESS OTHERWISE NOTED)
6. CONDUIT OUTLET BODIES SHALL BE 'ROBROY RED' FORM 8 SERIES.
7. ANY QUESTIONS PERTAINING TO INSTALLATION OF WORK ON THESE DRAWINGS SHALL BE DIRECTED TO THE A/E FIELD COORDINATOR.
8. CONTRACTOR TO LABEL ALL PANELS PER TAG ON EQUIPMENT LOCATION DRAWING.
9. CONTRACTOR TO FURNISH AND INSTALL ALL NAMEPLATES ON ALL ELECTRICAL EQUIPMENT PER DWGS.
10. CONTRACTOR TO FURNISH AND INSTALL ALL NAMETAGS ON ALL WIRES. TAGGING MATERIAL SHALL BE BRADY HEAT-SHRINK SLEEVES.
11. GALVANIZED OR INORGANIC ZINC COATED SURFACES DAMAGED BY DRILLING, GRINDING, OR WELDING SHALL BE CLEANED AND COATED WITH A ZINC RICH COATING SUCH AS CRC'S "ZINC-IT", MALCOME'S BRUSH-WELD #-264, OR APPROVED EQUAL.
12. DAMAGED ROBROY RED COATED CONDUIT AND FITTINGS SHALL BE RE-COATED WITH ROBROY TOUCH-UP COMPOUND

NOT PART OF MODULE PACKAGE

ELECTRICAL PLAN GENERAL PRESENTATION SYMBOLS AND CIRCUITING



ELECTRICAL CABLE TAGGING SYSTEM

NOTES:

1. CABLE OR CIRCUIT NUMBER CONSISTS OF THE PREFIX CODE PLUS THE DEVICE OR EQUIPMENT TAG NUMBER. (EXAMPLE) POWER AND CONTROL CABLE FOR PUMP MOTOR MP-102 WOULD BE PC-MP-102

CABLE OR CIRCUIT PREFIX CODES:

A = ALARM	K = COMMUNICATION
C = MOTOR CONTROL	L = LIGHTING
CC = ALL OTHER CONTROL	P = POWER
DC = DIRECT CURRENT	PC = POWER & CONTROL
E = ELECTRONIC OR INSTRUMENTATION	TC = THERMOCOUPLE
F = FEEDER	X = INTRINSIC-SAFE INSTRUMENT
	TX = INTRINSIC-SAFE THERMOCOUPLE

CONDUIT PLAN SYMBOLS

	RIGID CONDUIT RUN
	CONDUIT RUN - STUB-UP/DOWN
	"T" TYPE OUTLET BODY, ROBROY RED FORM 8, SIZE AS REQUIRED
	"L" TYPE OUTLET BODY, ROBROY RED, FORM 8, SIZE AS REQUIRED
	FLEXIBLE CONDUIT - CARFLEX - SIZE AS REQUIRED OR SHOWN
1	CONDUIT NUMBER - FOR CONDUIT SCHEDULE SEE DWG. 6A01-E-030

GROUNDING PLAN SYMBOLS

- BELOW GRADE GROUNDING CABLE - #2/0 AWG STRANDED BARE COPPER LOCATED 18" BELOW GRADE, UNLESS OTHERWISE NOTED
- ABOVE GRADE GROUNDING CABLE, SIZE PER APPLICABLE DWG.
- GROUND ROD
- GROUND WELL
- INDICATES 5 -0" GROUND CABLE STUB-OUT ABOVE GRADE OR CONCRETE FOR FUTURE CONNECTION TO EQUIPMENT OR STRUCTURE SIZE AS NOTED.
- GROUND CABLE TAP OR CONNECTION
- GROUNDING TO INSULATED VESSEL
- EQUIPMENT GROUNDING
- GROUNDING TO STRUCTURE STEEL COLUMN

ELECTRICAL PLAN SYMBOLS POWER AND CONTROL

- MOTOR
- DETAIL NUMBER - REFERENCE APPLICABLE DWGS.
- JUNCTION BOX, TRANSFORMER, PANEL
- START/STOP ENCLOSURE: ALLEN-BRADLEY, NEMA 7, DIV II EXPLOSION PROOF, FEED THRU CONNECTION
  - MOMENTARY 'START' BUTTON, NEMA 7, DIV. II, 1 N.O./1 N.C. CONTACT
  - MAINTAINED 'STOP' BUTTON, NEMA 7, DIV II, 1 N.O./1 N.C. CONTACT
- PUSH BUTTON ENCLOSURE: ALLEN-BRADLEY, NEMA 7, DIV II EXPLOSION PROOF (MC)
  - MOMENTARY PUSH BUTTON UNIT, NEMA 7, DIV. II, 1 N.O./1 N.C. CONTACT
- HAND-OFF-AUTO ENCLOSURE, ALLEN-BRADLEY, NEMA 7, DIV. II EXPLOSION PROOF, FEED THRU CONNECTION (S)
  - 3 POSITION SELECTOR SWITCH UNIT, NEMA 7, DIV II, SPRING RETURN FROM LEFT POSITION; 1 N.O./1 N.C. CONTACT
- HAND-OFF-AUTO ENCLOSURE, ALLEN-BRADLEY, NEMA 7 DIV II EXPLOSION PROOF, FEED THRU CONNECTION (M)
  - 3 POSITION SELECTOR SWITCH UNIT, NEMA 7, DIV II, MAINTAINED POSITION 1 N.O./1 N.C. CONTACT

SL 085701

DRAWING NUMBER	DRAWING TITLE	CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
REFERENCE DRAWINGS			TJG	TJG	MAW	MAW	1	REVISED 'MC' SWITCH	11/92
							0		

AWD TECHNOLOGIES, INC.

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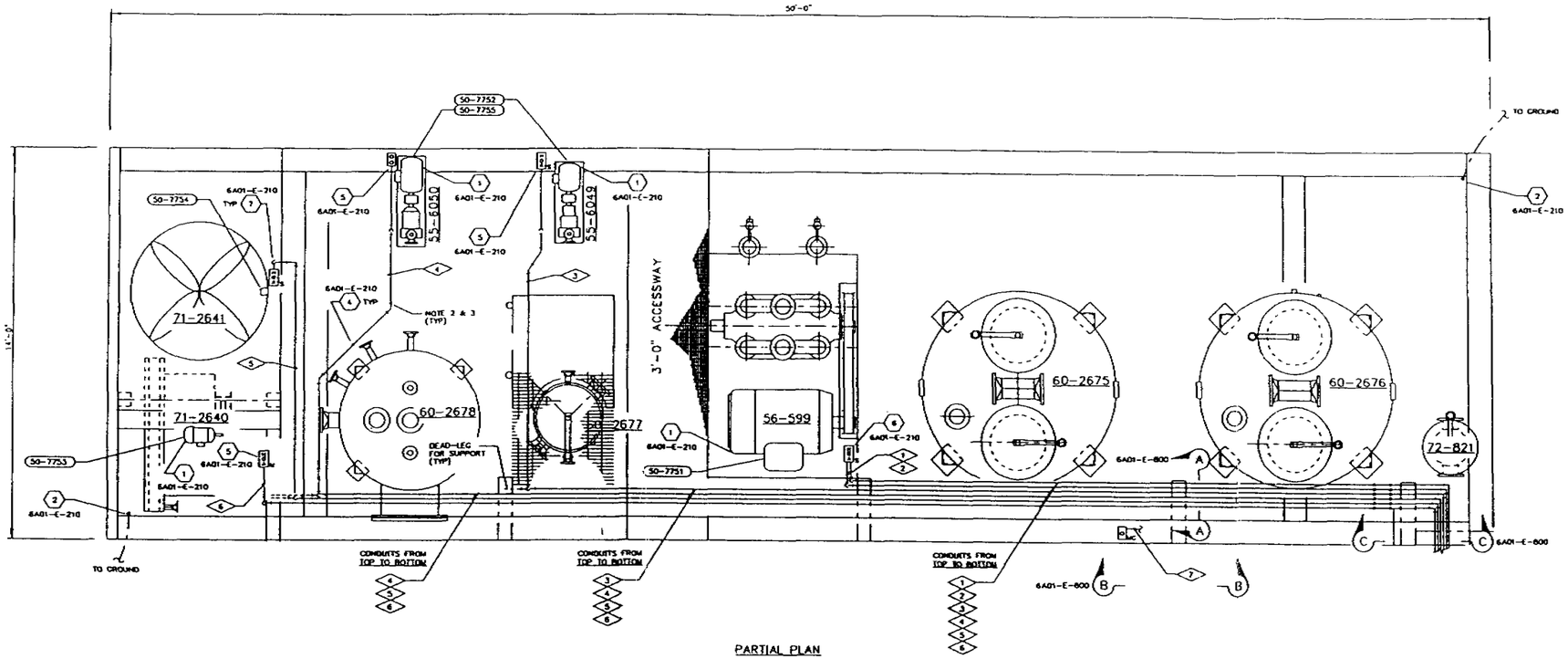
ELECTRICAL SYMBOLS AND LEGEND SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES, INC. JOB NUMBER 6A01

SCALE NONE | DRAWING NUMBER 6A01-E-001 | REV 1

NOTES:
1. CONDUIT AND FLEX SHALL CONFORM TO GENERAL NOTES 1 AND 3, DWG. 6A01-E-001.
2. USE ROBROY RED ELBOWS (+3") WHEN POSSIBLE, IN LIEU BENDS TO AVOID DAMAGING COATING.
3. CONDUIT AND FITTING COATING SHALL CONFORM TO GENERAL NOTES 12 DWG 6A01-E-001



PARTIAL PLAN

CONDUIT SCHEDULE

COND NO.	SIZE	FROM	TO	REMARKS
1	2"	SKID ENTRY	50-7751 - VACUUM PUMP MOTOR	480V POWER
2	¾"	SKID ENTRY	50-7751 - VACUUM PUMP MOTOR	120V CONTROL
3	¾"	SKID ENTRY	50-7752 - OIL CIRCULATION PUMP MOTOR	480V POWER/120V CONTROL
4	¾"	SKID ENTRY	50-7755 - EDC RECOVERY TANK PUMP MOTOR	480V POWER/120V CONTROL
5	¾"	SKID ENTRY	50-7754 - EDC RECOVERY COOLER BLOWER MOTOR	480V POWER/120V CONTROL
6	¾"	SKID ENTRY	50-7753 - OIL COOLER BLOWER MOTOR	480V POWER/120V CONTROL
7	¾"	CB-100	MASTER CONTROL PUSH BUTTON	

SL 085702

REFERENCE DRAWINGS

DRAWING NUMBER	DRAWING TITLE
6A01-E-001	SYMBOLS AND LEGEND
6A01-E-100	ONE-LINE DIAGRAM
6A01-E-210	INSTALLATION DETAILS
6A01-E-800	ELECTRICAL SECTIONS

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	TJG	TJG	MAW	MAW	2	REVISED "HC" SWITCH & CONDUIT	11/92
	TJG	TJG	MAW	MAW	1	REVISIONS FOR CLARIFICATION	10/16/92
	TJG	TJG	MAW	MAW	0		

AWD TECHNOLOGIES, INC

AWD TECHNOLOGIES

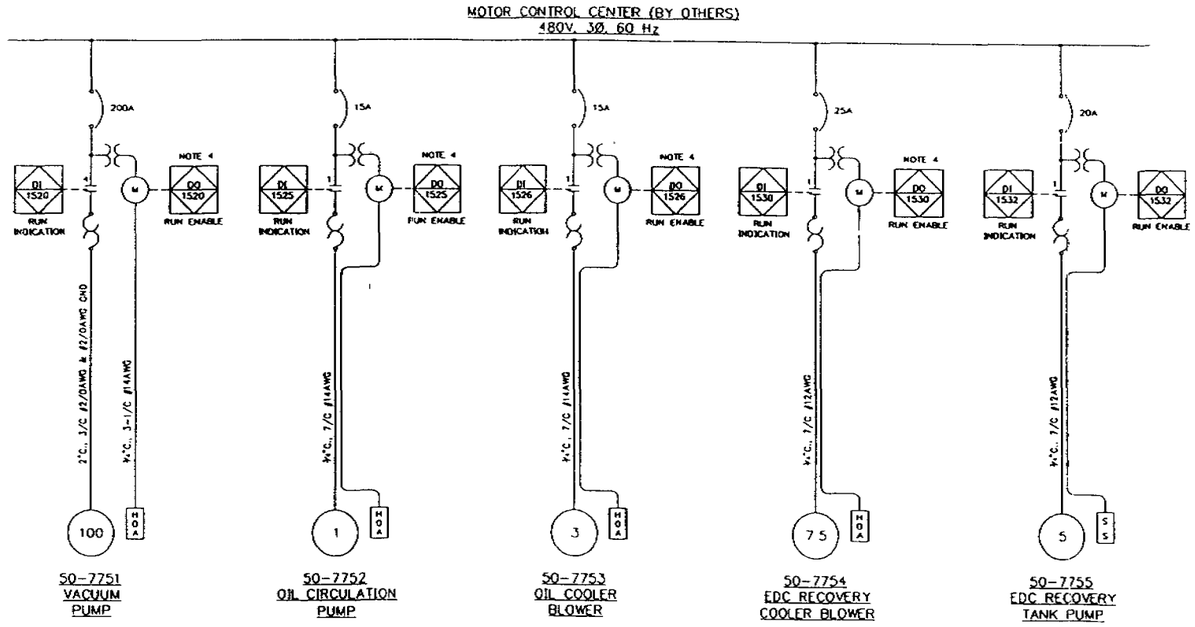
ELECTRICAL
OVERALL SKID PLAN
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES, INC — JOB NUMBER 6A01

SCALE 1/2" = 1'-0" — DRAWING NUMBER 6A01-E

NOTES

1. HAND SWITCH STATIONS SHALL BE INSTALLED AS SHOWN ON DRAWING 6A01-E-030 AND DRAWING 6A01-E-210.
2. INDIVIDUAL HAND SWITCHES SHALL BE SPECIFIED ON DRAWING 6A01-E-001.
3. "RUN ENABLE" DIGITAL OUTPUT FROM PLC SHALL BE WIRED TO ENABLE RUNNING OF MOTORS IN THE "AUTO" POSITION.



SL 085703

DRAWING NUMBER	DRAWING TITLE
6A01-E-001	SYMBOLS AND LEGEND
6A01-E-030	ONE-LINE DIAGRAM
6A01-E-210	INSTALLATION DETAILS

REFERENCE DRAWINGS

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
					2	REMOVED MASTER CONT. SW & NOTE	11/92
		MAW	TJG	MAW	1	GENERAL MODIFICATIONS	10/16/92
		MAW	TJG	MAW	0		

AWD TECHNOLOGIES, INC.
AWD TECHNOLOGIES

480V ELECTRICAL
ONE-LINE DIAGRAM
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES, INC | JOB NUMBER 6A01
SCALE NONE | DRAWING NUMBER 6A01-E-100 | REV 2

NORMAL OPERATING SEQUENCE

(SHUTDOWNS NOT SHOWN)

? moveburn-up

STEP NO.	TIME MIN. SEC.	VALVE POSITIONS											CONTROL LOOPS						ALARMS ENABLED	REQUIREMENT TO ADVANCE	NOTES
													TIC-1568		PIC-1527		PIC-1545				
		FBV-1502	FBV-1511	FBV-1512	FBV-1523	FBV-1515	FBV-1516	FBV-1518	FBV-1519	FBV-1536	FBV-1547	FBV-1548	STATUS	SET-POINT	STATUS	SET-POINT	STATUS	SET-POINT			
1 WAIT	------	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	DISABLE	------	DISABLE	------	DISABLE	------	TAH-1550, LAH-1534, LAHH-1534, LAHH-1535, LAL-1534, [illegible]	OPERATOR REQUEST TO START	1
2 WARM-UP	------	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	ENABLE	210 F	ENABLE	14.7 PSIA	DISABLE	------	TAH-1524, TAHH-1524, TAH-1544, TAHH-1544, TAH-1505, PAL-1533, PDAH-1546, PDAHH-1546, VAH-1569, PAHH-1527, PAH-1527, PAL-1527, PRC-1527, LAL-1528, LAL-1529, TAHH-1508, TAHH-1509, TAHH-1510, TAHH-1504, TAHH-1505, TAHH-1506, FAH-1517, PAH-1507, PDAH-1500, TAH-1508, TAH-1509, TAH-1512, TAH-1504, TAH-1505, PAH-1503, LAL-1562, VAH-1531 FAH-1501H, FAHH-1501H ⚠1	TE-1568 = 210 F	2
⚠1 3 ISOLATE 60-2675	------	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	DISABLE	------	FAL-1524, FALL-1524, LAH-1561	FBV-1511 & FBV-1519 = CLOSED	3
⚠1 3 DESORB 60-2675	------	OPEN	CLOSED	CLOSED	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	6 PSIA		PI-1545 = 1.9 PSIA	3, 4
3 SWEEP 60-2675	10:00	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	6 PSIA		10 MINUTE TIME-OUT	3
⚠1 3 ISOLATE 60-2675	------	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1523 = CLOSED	
⚠1 3 EQUALIZE 60-2675	------	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	OPEN (NOTE 7)	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1548 = CLOSED	
⚠1 3 OPEN 60-2675	------	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1511 & FBV-1519 = OPEN	
⚠1 3 ISOLATE 60-2676	------	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1502 & FBV-1518 = CLOSED	
⚠1 3 DESORB 60-2676	------	CLOSED	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	6 PSIA		PI-1545 = 1.9 PSIA	4
3 SWEEP 60-2676	10:00	CLOSED	OPEN	OPEN	CLOSED	OPEN	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	6 PSIA		10 MINUTE TIME-OUT	
⚠1 3 ISOLATE 60-2676	------	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1512 = CLOSED	
⚠1 3 EQUILIZE 60-2676	------	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN (NOTE 8)	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1547 = CLOSED	
⚠1 3 OPEN 60-2676	------	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1502 & FBV-1518 = OPEN	
3 ISOLATE 60-2675	------	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED	ENABLE	210 F	ENABLE	14.7 PSIA	ENABLE	0 PSIA		FBV-1511 & FBV-1519 = CLOSED	
4 CONTINUE RUN CYCLE																					5

NOTES

1. ALL AUTOMATED PUMPS AND VALVES, EXCEPT FBV-1549, DISABLED.
   EDC RECOVERY PUMP 55-6050 ENABLED TO START, WITH LOW LEVEL PERMISSIVE.
   EDC RECOVERY PUMP 55-6050 BLOCK VALVE, FBV-1548, ENABLED TO OPEN ON STARTING OF PUMP.
   TO EXIT THIS STEP OPERATOR MUST FIRST SWITCH HS-1009, IN THE CONTROL ROOM AND THEN SWITCH HS-1570, AT THE SKID. SWITCHING HS-1570 INITIATES THE PROGRAM. ⚠1
2. ENABLE FBV-1547 ~~OPEN~~ FOR 30 SECONDS, THEN DISABLE.
   ENABLED MOTORS : 50-7754, 50-7751, 50-7752, AND 50-7753.
   ENABLE EDC/OIL SEPARATOR 60-2677 LEVEL SWITCHES LSL-1572, LSH-1521 AND BLOCK VALVE LBV-1563

? →

3. ON INITIAL STARTUP THESE STEPS WILL BE A N2 PURGE FROM BARGE. ⚠1
4. IF PI-1545 DOES NOT REACH 1.9 PSIA WITHIN 3 MINUTES SYSTEM WILL SHUTDOWN.
5. CYCLE SHALL CONTINUE FOR DURATION OF BARGE UNLOADING OR UNTIL FORCED TO SHUTDOWN BY EMERGENCY, AT WHICH POINT THE PROGRAM SHALL RESET TO STEP 1.
6. FOR SHUTDOWNS SEE LADDER LOGIC DIAGRAM, DWG. 6A01-L-600. ⚠1
7. FBV-1548 WILL REMAIN OPEN UNTIL PI-1507 = 14.7 PSIA, THEN CLOSE.
8. FBV-1547 WILL REMAIN OPEN UNTIL PI-1503 = 14.2 PSIA, THEN CLOSE.

SL 085704

DRAWING NUMBER	DRAWING TITLE	CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
			TJF	LB	TJF	TJF	1	REVISED SEQUENCE	11/02/92
			KM	LB	TJF	TJF	0	FOR CONSTRUCTION	10/01/92
	REFERENCE DRAWINGS								

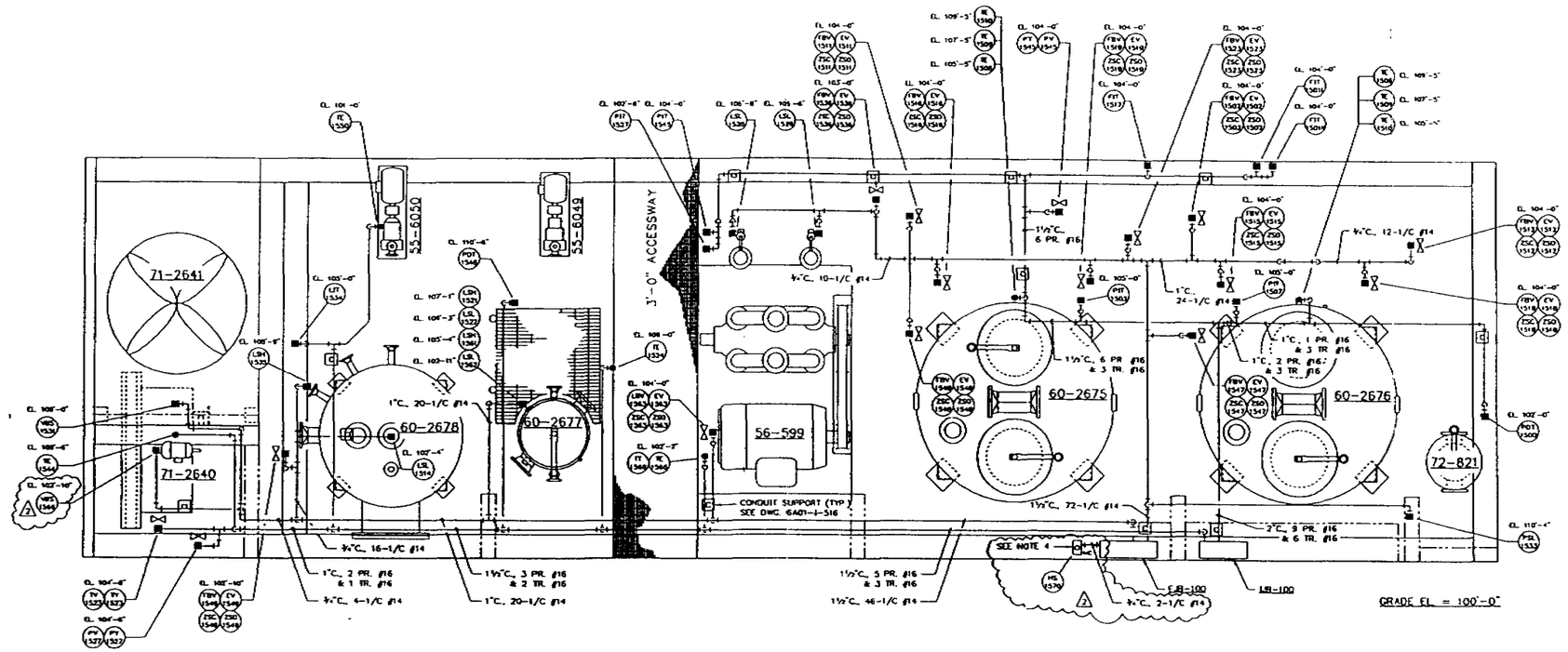
AWD TECHNOLOGIES, INC

AWD TECHNOLOGIES

PROCESS CONTROL
VALVE SEQUENCE LOGIC
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES, INC — JOB NUMBER 6A01

SCALE NONE — DRAWING NUMBER 6A01-I-101 — REV 1



LEGEND

- ■ - ELECTRICAL INSTRUMENT
- ● - ELECTRICAL TEMPERATURE ELEMENT
- ▷◁ - AUTOMATIC CONTROL/BLOCK VALVE
- ⇕ - CONDUIT TURNING DOWN

NOTES

1. CONDUIT SIZE NOT IDENTIFIED SHALL BE ¾".
2. CONDUIT RUNS MAY UTILIZE PIPING & EQUIPMENT SUPPORTS WHEN POSSIBLE.
3. MAINTAIN A MINIMUM PARALLEL DISTANCE OF 1'-0 BETWEEN 24 VDC AND ANY AC VOLTAGE LEVEL CONDUITS.
4. FOR SWITCH DESCRIPTION SEE ELECTRICAL DWG. 6A01-E-001, & DWG. 6A01-E-800 FOR MOUNTING.

REFERENCE DRAWINGS

6A01-I-400	INSTRUMENT JUNCTION BOX LIB-100 WIRING DIAGRAM
6A01-I-401	ELECTRICAL JUNCTION BOX EJB-100 WIRING DIAGRAM
6A01-I-402	FIELD WIRING DISTRIBUTION DIAGRAM
6A01-I-403	FIELD WIRING DISTRIBUTION DIAGRAM

SL 085705

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	KAM	KAM	TJF	TJF	2	CHANGED TAG NO & ADDED SWITCH	11/04/92
	KAM	KAM	TJF	TJF	1	REVISED AS NOTED	10/22/92
	KAM	KAM	TJF	TJF	0	FOR CONSTRUCTION	10/5/92

DRAWING NUMBER — DRAWING TITLE: REFERENCE DRAWINGS

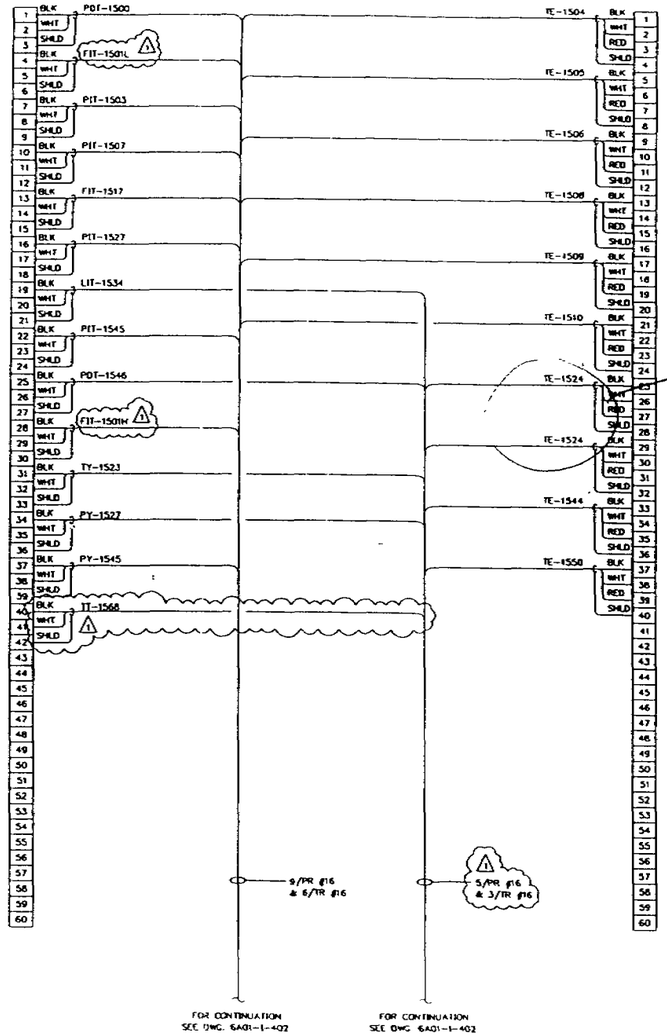
AWD TECHNOLOGIES, INC.
AWD TECHNOLOGIES

INSTRUMENT LOCATION/ CONDUIT PLAN
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES, INC. — JOB NUMBER 6A01

SCALE ½" = 1'-0" — DRAWING NUMBER 6A01-I-200 — REV 2

IJB--100



NOTES:

REFERENCE DRAWINGS

6A01-1-200 INSTRUMENT LOCATION/CONDUIT PLAN
6A01-1-300 IJB-100 ASSY DETAIL
6A01-1-402 FIELD WIRING DISTRIBUTION DIAGRAM

SL 085706

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	K.M.	T.B.	T.J.F.	T.J.F.	1	REVISED AS NOTED	10/22/92
	T.B.	T.B.	T.J.F.	T.J.F.	0	FOR CONSTRUCTION	10/5/92

DRAWING NUMBER / DRAWING TITLE
REFERENCE DRAWINGS

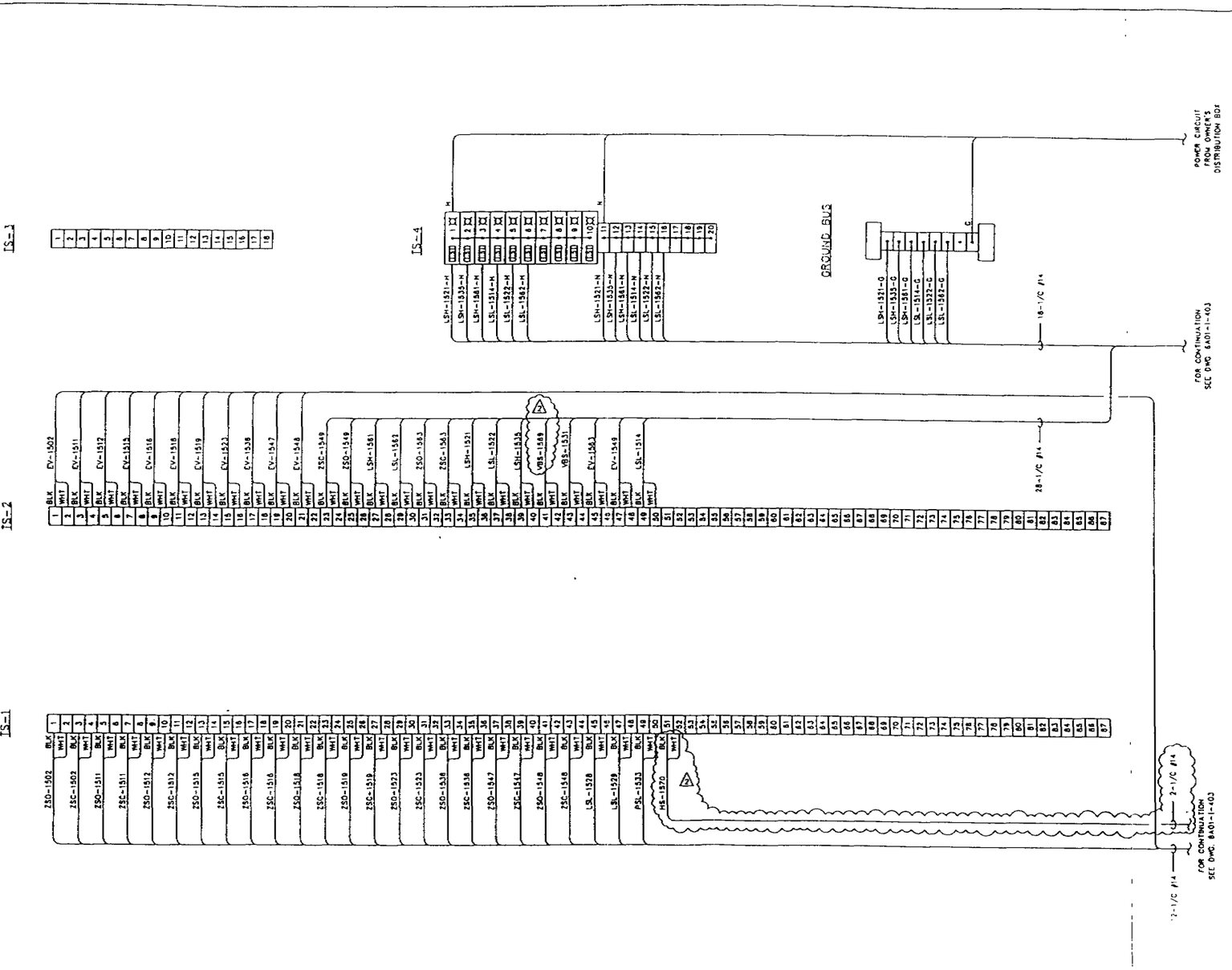
AWD TECHNOLOGIES, INC.
AWD TECHNOLOGIES

INSTRUMENT JUCTION BOX IJB-100
WIRING DIAGRAM
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES INC. JOB NUMBER 6A01

SCALE	DRAWING NUMBER	REV
NONE	6A01-1-400	1

EJB-100



NOTES:

SL 085707

REFERENCE DRAWINGS

6A01-1-200 INSTRUMENT LOCATION/CONDUIT PLAN
6A01-1-310 EJB-100 ASSY DETAIL
6A01-1-403 FIELD WIRING DISTRIBUTION DIAGRAM

DRAWING NUMBER	DRAWING TITLE
REFERENCE DRAWINGS	

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	K.M.	K.M.	T.J.F.	T.J.F.	2	REVISED TAG NO & ADDED HS-1570	11/04/92
	K.M.	K.M.	T.J.F.	T.J.F.	1	REVISED AS NOTED	10/26/92
	T.B.	T.B.	T.J.F.	T.J.F.	0	FOR CONSTRUCTION	10/5/92

AWD TECHNOLOGIES, INC

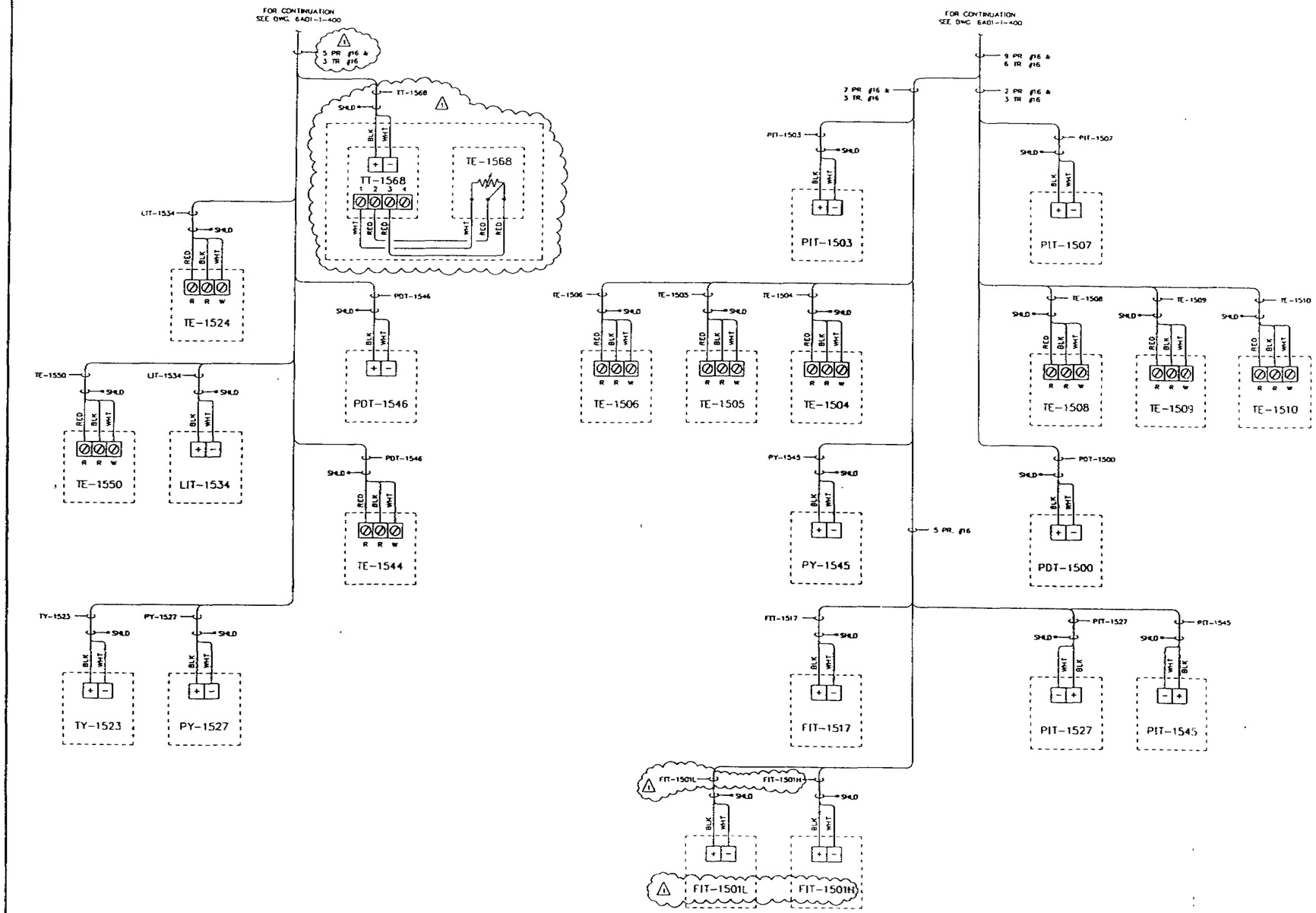
AWD TECHNOLOGIES

ELECTRICAL JUCTION BOX EJB-100 WIRING DIAGRAM

SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES INC. JOB NUMBER 6A01

SCALE NONE | DRAWING NUMBER 6A01-1-401 | REV -



NOTES:

1. COIL & TAPE ALL SHIELDS AT FIELD DEVICE. DO NOT GROUND.

REFERENCE DRAWINGS

6A01-1-200	INSTRUMENT LOCATION/CONDUIT PLAN
6A01-1-400	INSTRUMENT JUNCTION BOX JB-100 WIRING DIAGRAM

SL 085708

DRAWING NUMBER	DRAWING TITLE
REFERENCE DRAWINGS	

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	K.M.	B.C.	B.C.	T.J.F.	1	REVISED AS NOTED	10/22/92
	K.M.	B.C.	B.C.	T.J.F.	0	FOR CONSTRUCTION	10/5/92

AWD TECHNOLOGIES, INC.

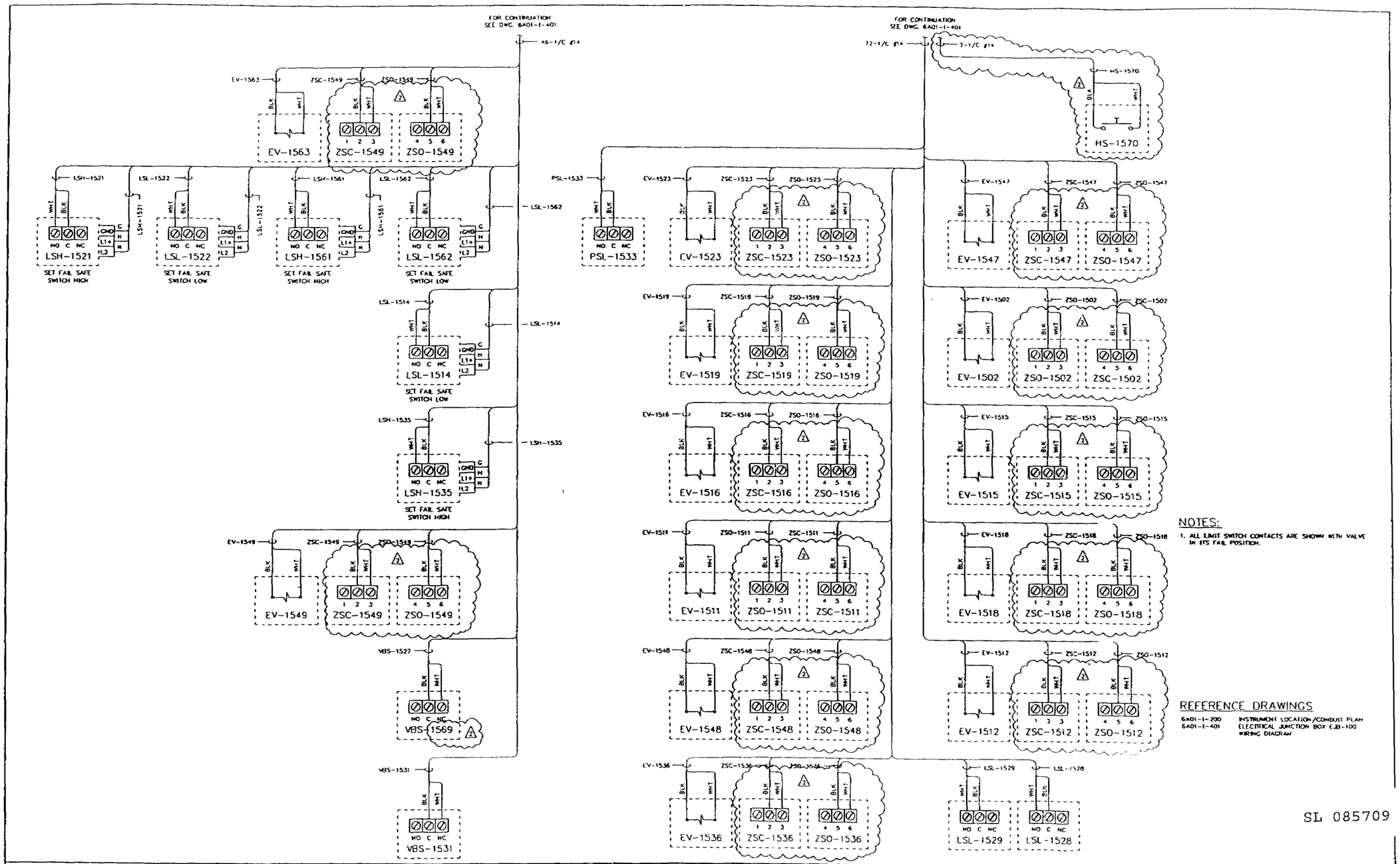
AWD TECHNOLOGIES

FIELD WIRING DISTRIBUTION DIAGRAM

SORBATHENE UNIT

CUSTOMER	JOB NUMBER
PPG INDUSTRIES INC.	6A01

SCALE	DRAWING NUMBER	REV
NONE	6A01-1-402	1



NOTES:

1. ALL LIMIT SWITCH CONTACTS ARE SHOWN WITH VALVE IN ITS FAIL POSITION.

REFERENCE DRAWINGS

6A01-I-200	INSTRUMENT LOCATION/CONDUIT PLAN
6A01-I-401	ELECTRICAL JUNCTION BOX EJB-100 WIRING DIAGRAM

SL 085709

DRAWING NUMBER	DRAWING TITLE
	REFERENCE DRAWINGS

CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
	K.M.	B.C.	B.C.	T.J.F.	2	REVISED AS NOTED	11/04/92
	K.M.	B.C.	B.C.	T.J.F.	1	WIRING REVISIONS/CLARIFICATIONS	10/21/92
	K.M.	B.C.	B.C.	T.J.F.	0	FOR CONSTRUCTION	10/5/92

AWD TECHNOLOGIES, INC.

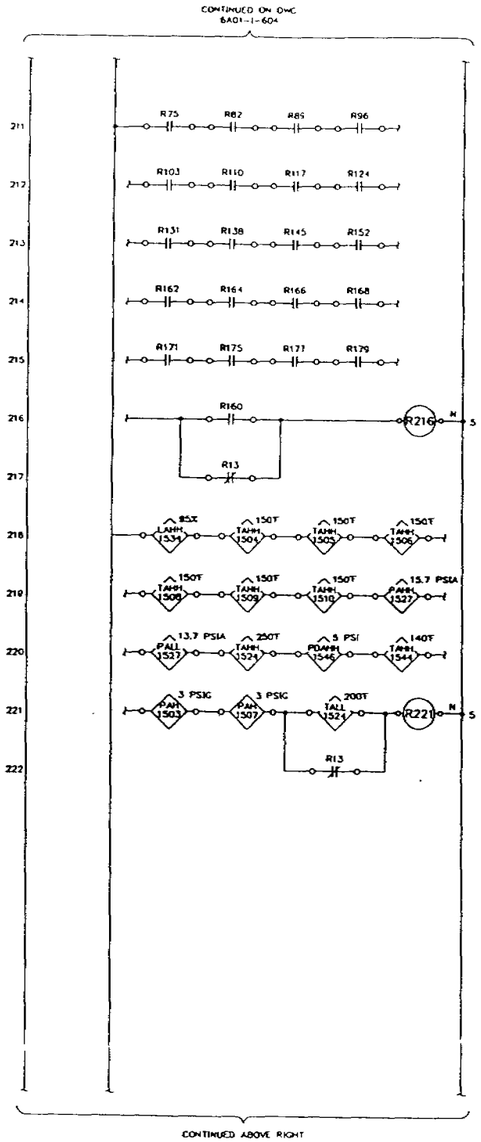
AWD TECHNOLOGIES

FIELD WIRING DISTRIBUTION DIAGRAM

SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES INC. JOB NUMBER 6A01

SCALE NONE | DRAWING NUMBER 6A01-E-403 | REV 2



LEGEND

- SOFTWARE
- INTERCONNECT
- LOCAL CONTROL TERMINATION
- FIELD TERMINATION
- XXX XXXX — EXTERNAL DEVICE
- XX XXXX — INTERNAL TO PLC
- RX — RELAY
- TR X — TIMER
- NC CONTACT
- NO CONTACT
- MOTOR/COIL

NOTES:

1. LIMIT SWITCH CONTACTS ARE SHOWN WITH VALVE IN ITS FAIL POSITION

REFERENCE DRAWINGS

6A01-1-101	VALVE SEQUENCE LOGIC
6A01-1-600	LOGIC LADDER DIAGRAM
6A01-1-601	LOGIC LADDER DIAGRAM
6A01-1-602	LOGIC LADDER DIAGRAM
6A01-1-603	LOGIC LADDER DIAGRAM

SL 085710

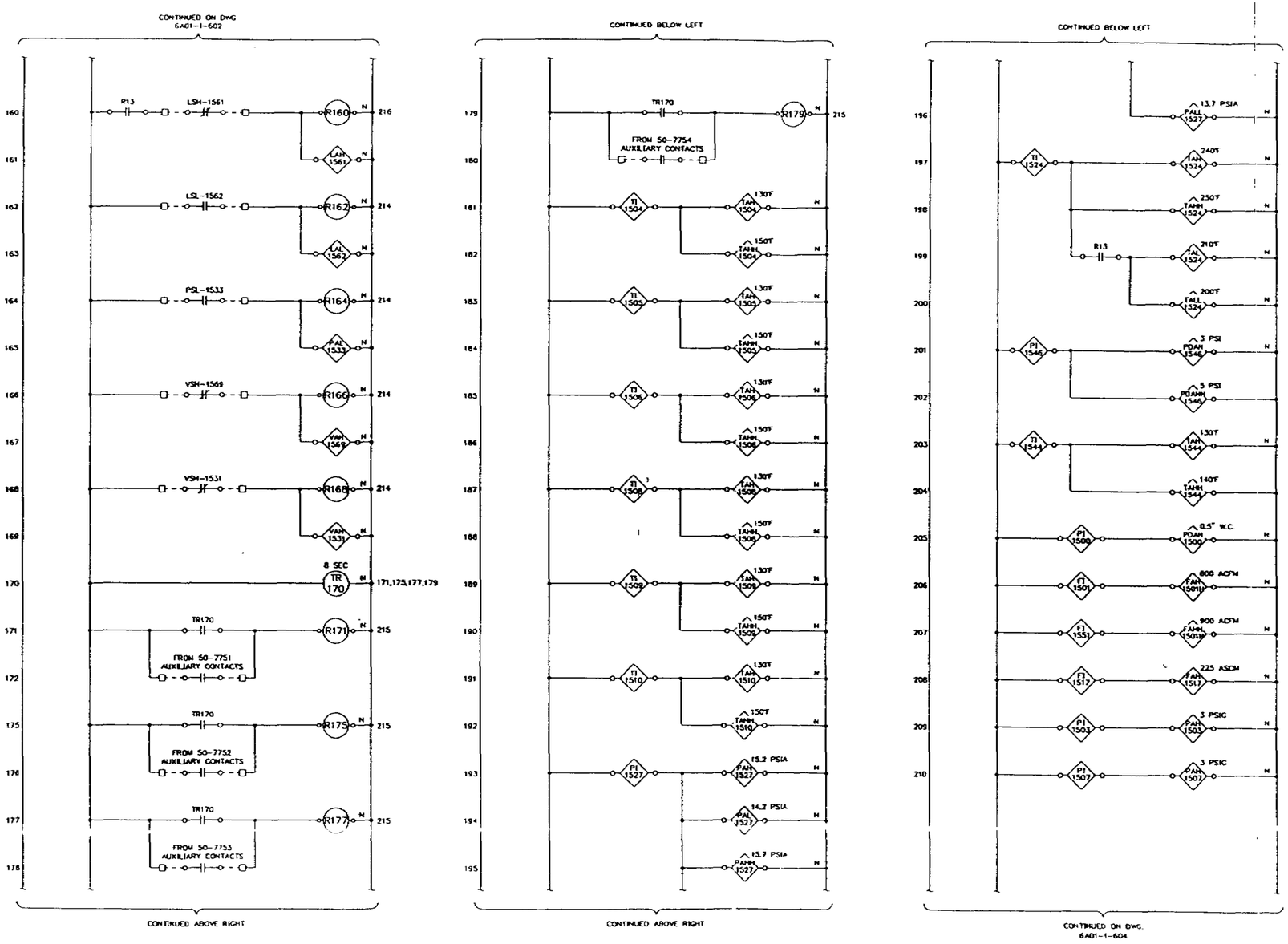
DRAWING NUMBER	DRAWING TITLE	CLIENT APP'D	DRAWN BY	DESIGN BY	CHK'D	ENGR	REV	REVISED	DATE
			K.M.	B.C.	T.J.F.	B.C.	1	REVISED LOGIC	11/31/92
			K.M.	B.C.	T.J.F.	B.C.	0	FOR CONSTRUCTION	10/2/92
	REFERENCE DRAWINGS								

AWD TECHNOLOGIES, INC.
AWD TECHNOLOGIES

INSTRUMENT
LOGIC LADDER DIAGRAM
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES INC. JOB NUMBER 6A01

SCALE NONE | DRAWING NUMBER 6A01-1-604 | REV 1



SL 085711

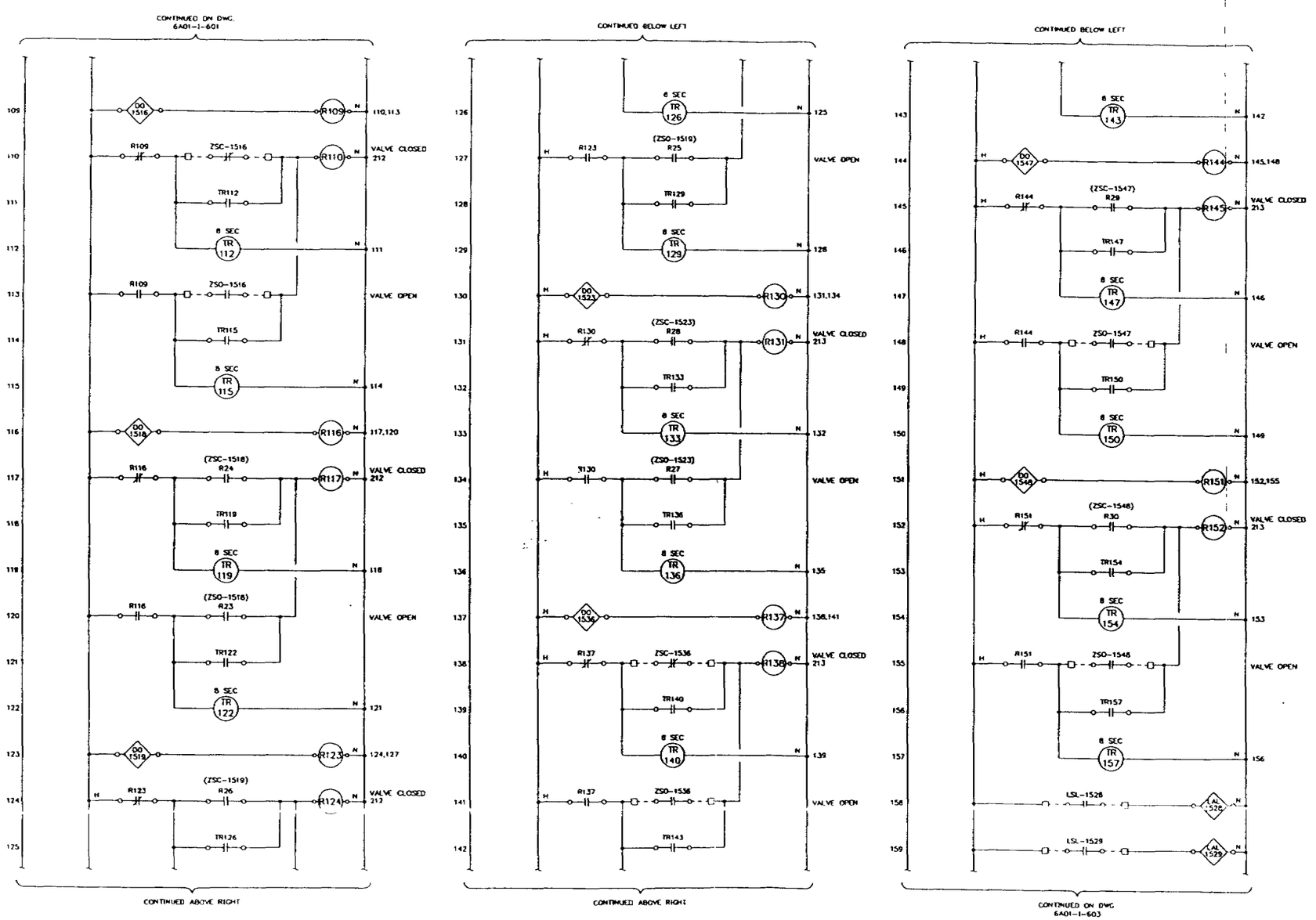
DRAWING NUMBER	DRAWING TITLE	DRAWN	DESIGN	CHECK	APPR	REV	REVISION	DATE
		K.M.	B.C.	T.J.F.	B.C.	1	REVISED LOGIC	11/11/92
		K.M.	B.C.	T.J.F.	B.C.	0	FOR CONSTRUCTION	10/2/92

AWD TECHNOLOGIES, INC.

AWD

INSTRUMENT
LOGIC LADDER DIAGRAM
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES INC. JOB NUMBER 6A01



NOTES:

1. LIMIT SWITCH CONTACTS ARE SHOWN WITH VALVE IN ITS FAIL POSITION

REFERENCE DRAWINGS

6A01-I-101	VALVE SEQUENCE LOGIC
6A01-I-600	LOGIC LADDER DIAGRAM
6A01-I-601	LOGIC LADDER DIAGRAM
6A01-I-603	LOGIC LADDER DIAGRAM
6A01-I-604	LOGIC LADDER DIAGRAM

SL 085712

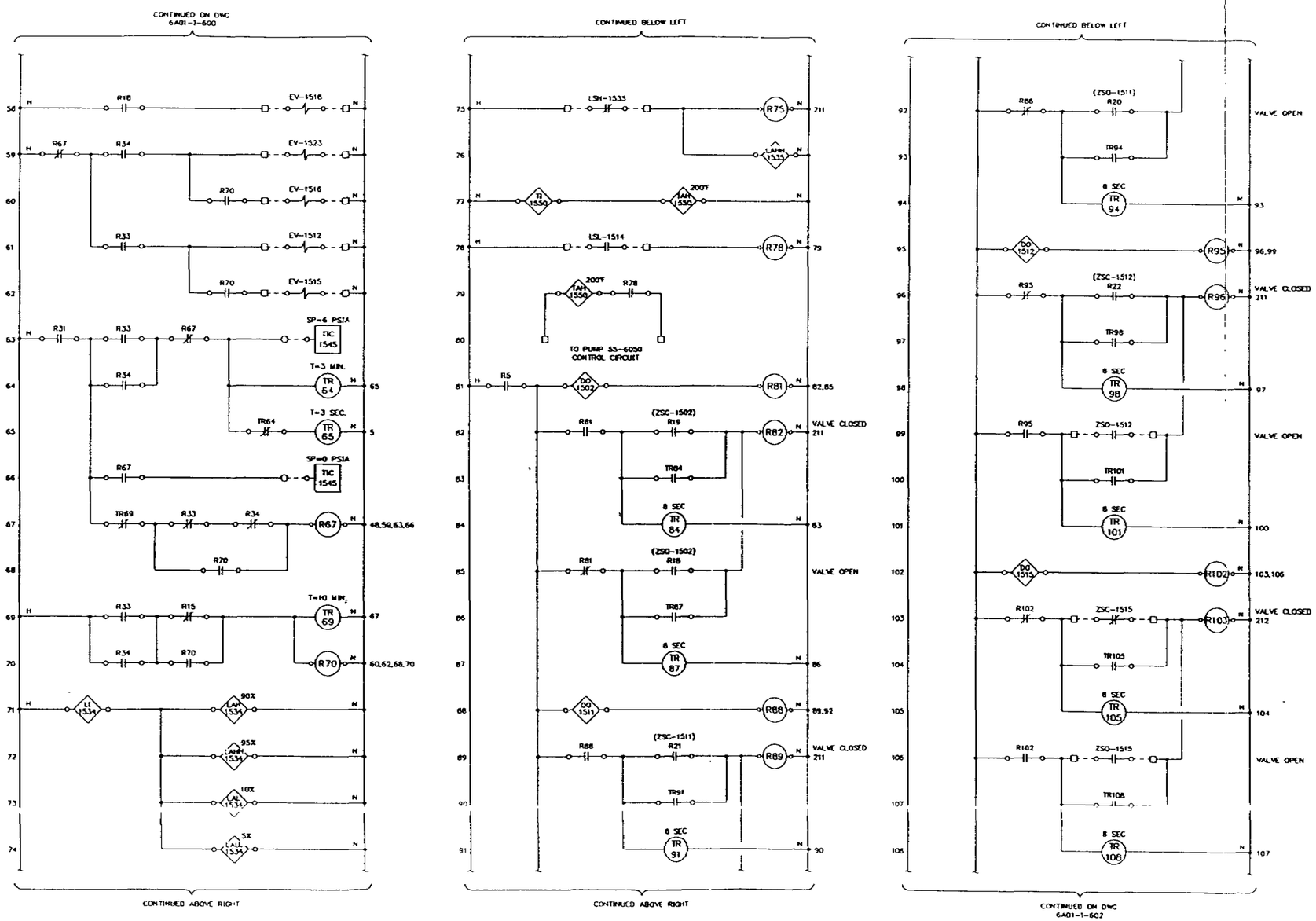
DRAWING NUMBER	DRAWING TITLE	CLIENT	DRAWN	DESIGN				
			K.M.	B.C.	D.J.F.	B.C.	1	REVISED LOGIC 11/11/92
			K.M.	B.C.	K.M.	B.C.	0	FOR CONSTRUCTION 10/22/92

AWD TECHNOLOGIES, INC.

AWD

INSTRUMENT
LOGIC LADDER DIAGRAM
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES INC JOB NUMBER 6A01



LEGEND

- SOFTWARE
- INTERCONNECT
- LOCAL CONTROL ROOM TERMINATION
- FIELD TERMINATION
- XXX XXXX — EXTERNAL DEVICE
- XX XXXX — INTERNAL TO PLC
- RX — RELAY
- TR X — TIMER
- NC CONTACT
- NO CONTACT
- MOTOR/COIL

NOTES:

1. LIMIT SWITCH CONTACTS ARE SHOWN WITH VALVE IN ITS FAIL POSITION

REFERENCE DRAWINGS

6A01-1-101	VALVE SEQUENCE LOGIC
6A01-1-600	LOGIC LADDER DIAGRAM
6A01-1-602	LOGIC LADDER DIAGRAM
6A01-1-603	LOGIC LADDER DIAGRAM
6A01-1-604	LOGIC LADDER DIAGRAM

SL 085713

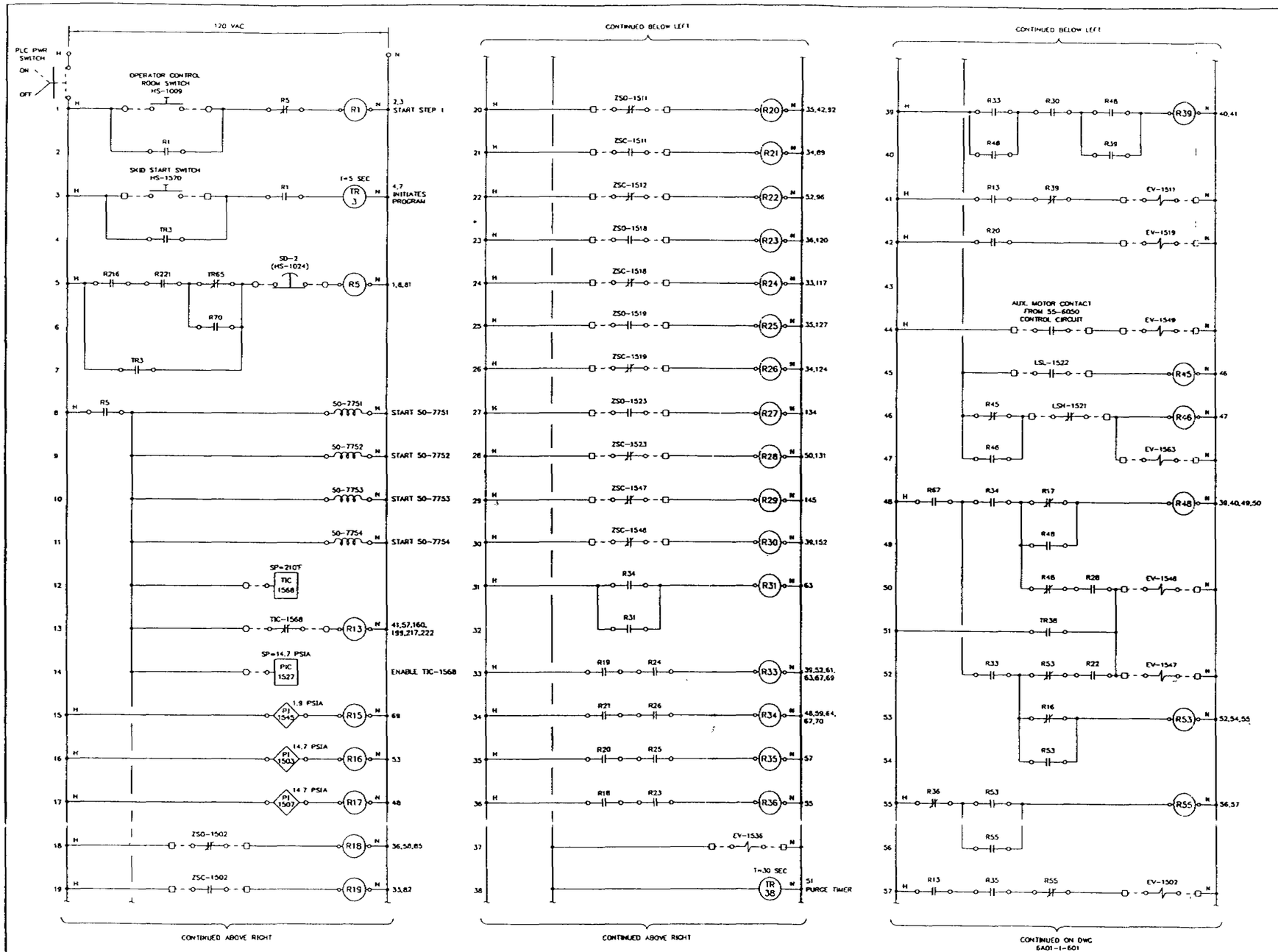
K.M.	B.C.	T.J.F.	B.C.	1	REVISED LOGIC	11/11/92
K.M.	B.C.	T.J.F.	B.C.	0	FOR CONSTRUCTION	10/22/92

AWD TECHNOLOGIES, INC

AWD

INSTRUMENT
LOGIC LADDER DIAGRAM
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES INC. JOB NUMBER 6A01



NOTES:

1. LIMIT SWITCH CONTACTS ARE SHOWN WITH VALVE IN ITS FAIL POSITION.

REFERENCE DRAWINGS

6A01-I-101	VALVE SEQUENCE LOGIC
6A01-I-601	LOGIC LADDER DIAGRAM
6A01-I-602	LOGIC LADDER DIAGRAM
[illegible]	LOGIC LADDER DIAGRAM
6A01-I-604	LOGIC LADDER DIAGRAM

SL 085714

K.M.	B.C.	T.&F.	B.C.	1	REVISED LOGIC	11/11/92
K.M.	B.C.	T.&F.	B.C.	0	FOR CONSTRUCTION	10/22/92

DRAWING NUMBER | DRAWING TITLE

AWD TECHNOLOGIES, INC.

AWD

INSTRUMENT
LOGIC LADDER DIAGRAM
SORBATHENE UNIT

CUSTOMER PPG INDUSTRIES INC. JOB NUMBER 6A01

H

SL 085715

APPENDIX H

ALARMS AND OPERATOR RESPONSE

PPG CHEMICALS
LAKE CHARLES, LA
PROJECT: CLOSED DOME LOADING

ALARMS AND OPERATOR RESPONSE

TAG NO.	SERVICE	OPERATOR RESPONSE:
11A-LAH-1001	BARGE HIGH LEVEL ALARM	DECREASE LOADING RATE OR STOP LOADING. RE-DIRECT FLOW TO ANOTHER COMPARTMENT.
11A-LAHH-1001	BARGE HIGH/HIGH LEVEL ALARM AND SHUTDOWN	STOP LOADING. IF VESSEL NOT FULL, EQUALIZE TANK LEVELS AND RESTART LOADING.
11A-PAL-1002	NITROGEN SUPPLY LOW PRESSURE ALARM AND SHUTDOWN	CHECK VALVE ALIGNMENT ON N_2 HEADER. CHECK FOR EXCESSIVE N_2 USAGE ELSEWHERE ON HEADER. NOTIFY SUPERVISION.
11A-PAH-1004	EDC VAPOR PRESSURE ALARM HIGH	DECREASE LOADING RATE. NOTIFY SUPERVISION.
11A-PAHH-1004	EDC VAPOR HIGH/HIGH PRESSURE ALARM & S/D	NOTIFY SUPERVISION. MANUALLY VENT VESSEL THROUGH VAPOR CONTROL SYSTEM. RESTART LOADING.
11A-PAL-1004	EDC VAPOR LOW PRESSURE ALARM	NOTIFY SUPERVISION OF POSSIBLE BARGE N_2 FAILURE. IF DIRECTED TO SHUT DOWN, MANUALLY ADD N_2 TO BARGE BEFORE RESTART.
11A-PALL-1004	EDC VAPOR LOW/LOW PRESSURE ALARM & S/D	NOTIFY SUPERVISION OF POSSIBLE BARGE N_2 FAILURE. MANUALLY ADD N_2 TO BARGE BEFORE RESTART.
11A-XAH-1004	EDC VAPOR LINE PRESSURE TRANSMITTERS DEVIATION ALARM	REPORT TO INST. GROUP FOR RE-CALIBRATION AND REPAIR.
11A-PAH-1005	EDC VAPOR HIGH PRESSURE ALARM	DECREASE LOADING RATE. NOTIFY SUPERVISION.
11A-PAHH-1005	EDC VAPOR HIGH/HIGH PRESSURE ALARM & S/D	NOTIFY SUPERVISION. MANUALLY VENT VESSEL THROUGH VAPOR CONTROL SYSTEM. RESTART LOADING.
11A-PAL-1005	EDC VAPOR LOW PRESSURE ALARM	NOTIFY SUPERVISION OF POSSIBLE BARGE N_2 FAILURE. IF DIRECTED TO SHUT DOWN, MANUALLY ADD N_2 TO BARGE BEFORE RESTART.
11A-PALL-1005	EDC VAPOR LOW/LOW PRESSURE ALARM & S/D	NOTIFY SUPERVISION OF POSSIBLE BARGE N_2 FAILURE. MANUALLY ADD N_2 TO BARGE BEFORE RESTART.
11A-AAH-1011A	EDC VAPOR HIGH OXYGEN CONTENT ALARM	CHECK N_2 FLOW. VERIFY THAT O_2 ANALYZERS ARE FUNCTIONING AND THAT CONTROLLER IS FUNCTIONING.
11A-AAH-1011B	EDC VAPOR HIGH OXYGEN CONTENT ALARM	CHECK N_2 FLOW. VERIFY THAT O_2 ANALYZERS ARE FUNCTIONING AND THAT CONTROLLER IS FUNCTIONING.

PPG CHEMICALS
LAKE CHARLES, LA
PROJECT: CLOSED DOME LOADING

ALARMS AND OPERATOR RESPONSE

TAG NO.	SERVICE	OPERATOR RESPONSE:
11A-AAHH-1011A	EDC VAPOR HIGH/HIGH O2 CONTENT ALARM & S/D	CHECK N_2 FLOW. VERIFY THAT O_2 ANALYZERS ARE FUNCTIONING. PURGE AND RESTART.
11A-AAHH-1011B	EDC VAPOR HIGH/HIGH O2 CONTENT ALARM & S/D	CHECK N_2 FLOW. VERIFY THAT O_2 ANALYZERS ARE FUNCTIONING. PURGE AND RESTART.
11A-AAX-1011A	OXYGEN ANALYZER A LOSS OF SIGNAL ALARM & S/D	REPORT TO THE ANALYZER REPAIR GROUP FOR RE-CALIBRATION AND REPAIR.
11A-AAX-1011B	OXYGEN ANALYZER B LOSS OF SIGNAL ALARM & S/D	REPORT TO THE ANALYZER REPAIR GROUP FOR RE-CALIBRATION AND REPAIR.
11A-FAL-1011A	O2 ANALYZER A LOW FLOW ALARM AND SHUTDOWN	CHECK THAT SAMPLE PUMP IS OPERATING CORRECTLY. CHECK ALIGNMENT OF VALVES. REPORT RESPONSE TO ANALYZER GROUP.
11A-FAL-1011B	O2 ANALYZER B LOW FLOW ALARM AND SHUTDOWN	CHECK THAT SAMPLE PUMP IS OPERATING CORRECTLY. CHECK ALIGNMENT OF VALVES. REPORT RESPONSE TO ANALYZER GROUP.
11A-XAH-1011	EDC VAPOR LINE OXYGEN ANALYZERS DEVIATION ALARM	REPORT TO THE ANALYZER REPAIR GROUP FOR RE-CALIBRATION AND REPAIR.
11A-LAH-1013	EDC VAPOR LINE KNOCKOUT POT HIGH LEVEL ALARM	FIELD CHECK THE LEVEL. IF HIGH, DRAIN VESSEL. IF LEVEL NOT HIGH NOTIFY INSTR. GROUP FOR REPAIR. IF LEVEL HAS RISEN RAPIDLY OR IF HIGH LEVEL PERSISTS, NOTIFY SUPERVISION OF POSSIBLE LIQUID CARRYOVER.
11A-LAHH-1013	KNOCKOUT POT HIGH/HIGH LEVEL ALARM AND S/D	FIELD CHECK THE LEVEL. IF HIGH, DRAIN VESSEL. IF LEVEL NOT HIGH NOTIFY INSTR. GROUP FOR REPAIR. IF LEVEL HAS RISEN RAPIDLY OR IF HIGH LEVEL PERSISTS, NOTIFY SUPERVISION OF POSSIBLE LIQUID CARRYOVER.
11A-XA-1013	K.O. POT LEVEL XMTR LOSS OF SIGNAL ALARM & S/D	REPORT TO THE INSTRUMENTATION GROUP FOR REPAIR. FIELD CHECK LEVELS.
11A-FAH-1016	NITROGEN INERTING HIGH FLOW ALARM	CHECK VALVE POSITION OF FV-1016. VERIFY SET POINT. CHECK O_2 ANALYZERS FOR O_2 CONTENT. NOTIFY SUPERVISION AND INSTRUMENT GROUP FOR REPAIR.
11A-FAHH-1016	NITROGEN INERTING HIGH HIGH FLOW ALARM & S/D	CHECK VALVE POSITION OF FV-1016. VERIFY SET POINT. CHECK O_2 ANALYZERS FOR O_2 CONTENT. NOTIFY SUPERVISION AND INSTRUMENT GROUP FOR REPAIR. RESTART AFTER SYSTEM OK.
11A-PAH-1025	EDC VAPOR TO SORBATHENE UNIT HIGH PRESS ALARM	CHECK FOR SVRU BLOCKAGE OR VALVE MALFUNCTION. SHUT DOWN AND NOTIFY SUPERVISION AND INSTRUMENT GROUP IF NOT IMMEDIATELY CORRECTED.
11A-PAL-1025	EDC VAPOR TO SORBATHENE UNIT LOW PRESS ALARM	CHECK FOR SVRU BLOCKAGE OR VALVE MALFUNCTION. SHUT DOWN AND NOTIFY SUPERVISION AND INSTRUMENT GROUP IF NOT IMMEDIATELY CORRECTED.

PPG CHEMICALS
LAKE CHARLES, LA
PROJECT: CLOSED DOME LOADING

ALARMS AND OPERATOR RESPONSE

TAG NO.	SERVICE	OPERATOR RESPONSE:
11A-TAH-1027	HEAT TRACING HIGH TEMPERATURE ALARM	SWITCH TO REDUNDANT SYSTEM AND MONITOR. CHECK CONTROLLER AND TRACING FOR MALFUNCTION. CALL FOR REPAIR.
11A-TAL-1027	HEAT TRACING LOW TEMPERATURE ALARM & S/D	SWITCH TO REDUNDANT SYSTEM AND MONITOR. CHECK CONTROLLER AND TRACING FOR MALFUNCTION. CALL FOR REPAIR.
11A-TAH-1029	HEAT TRACING HIGH TEMPERATURE ALARM	SWITCH TO REDUNDANT SYSTEM AND MONITOR. CHECK CONTROLLER AND TRACING FOR MALFUNCTION. CALL FOR REPAIR.
11A-TAL-1029	HEAT TRACING LOW TEMPERATURE ALARM & S/D	SWITCH TO REDUNDANT SYSTEM AND MONITOR. CHECK CONTROLLER AND TRACING FOR MALFUNCTION. CALL FOR REPAIR.
11A-AAH-1031	EDC RECOVERY TANK OXYGEN CONTENT HIGH ALARM	VERIFY THAT O_2 ANALYZER IS FUNCTIONING. CHECK FOR VACUUM PUMP OR SAMPLE PUMP FAILURE. CHECK N_2 PAD INPUT. NOTIFY INSTRUMENT GROUP IF FAULT IS CONTROL FAILURE.
11A-AAHH-1031	EDC RECOVERY TANK OXYGEN CONTENT HIGH HIGH ALARM	VERIFY THAT O_2 ANALYZER IS FUNCTIONING. CHECK FOR VACUUM PUMP OR SAMPLE PUMP FAILURE. CHECK N_2 PAD INPUT. NOTIFY INSTRUMENT GROUP IF FAULT IS CONTROL FAILURE.
11A-AAX-1031	EDC RECOVERY TANK OXYGEN ANALYZER LOSS OF SIGNAL	NOTIFY INSTRUMENT GROUP FOR REPAIR.
11A-FAL-1031	EDC RECOVERY TANK O2 ANALYZER LOW SAMPLE FLOW	CHECK THAT SAMPLE PUMP IS OPERATING CORRECTLY. CHECK ALIGNMENT OF VALVES. REPORT RESPONSE TO ANALYZER GROUP.
11A-FAH-1051	PRODUCT LINE HIGH FLOW RATE ALARM	CHECK MEASURED FLOW AT FIC-1051 VS FIC-1051 SET POINT. NOTIFY INSTRUMENT GROUP OF CONTROL FAILURE.
11A-FAL-1051	PRODUCT LINE LOW FLOW RATE ALARM	CHECK MEASURED FLOW AT FIC-1051 VS FIC-1051 SET POINT. NOTIFY INSTRUMENT GROUP OF CONTROL FAILURE.
11A-FQAH-1051	PRODUCT LINE HIGH TOTALIZED FLOW ALARM	CHECK TOTALIZER SET POINT VS INTENDED LOADING RESET IF NECESSARY. CHECK SET POINT VS TOTAL LOADED SO FAR. IF INSTRUMENT/ALARM MALFUNCTION IS THE CAUSE, NOTIFY INSTRUMENT GROUP.
11A-PDAH-1500	EDC DUST FILTER HIGH DIFFERENTIAL PRESSURE ALARM	CHECK ALL MANUAL BLOCK VALVES FOR PROPER POSITION, FILTER MAY BE PLUGGED. REPLACE FILTER BAG.
11A-FAH-1501H	EDC VAPORS/N2 FROM VESSEL HIGH FLOW ALARM	CHECK N_2 FLOW RATE (FIC-1016) AND O_2 ANALYSIS (AI-1022A/B).
11A-FAHH-1501H	EDC VAPORS/N2 FROM VESSEL HIGH HIGH FLOW ALARM	CHECK MEASURED FLOW RATE (FIC-1051). STOP LOADING. NOTIFY INSTRUMENT GROUP IF INSTRUMENTATION IS MALFUNCTIONING. RESTART AFTER REPAIR.

PPG CHEMICALS
LAKE CHARLES, LA
PROJECT: CLOSED DOME LOADING

ALARMS AND OPERATOR RESPONSE

TAG NO.	SERVICE	OPERATOR RESPONSE:
11A-PAH-1503	EDC ADSORBER 60-2676 HIGH PRESSURE ALARM	CHECK MEASURED FLOW RATE (FIC-1051). STOP LOADING. NOTIFY INSTRUMENT GROUP IF INSTRUMENTATION IS MALFUNCTIONING. RESTART AFTER REPAIR.
11A-TAH-1504	EDC ADSORBER 60-2676 HIGH TEMPERATURE ALARM	STOP LOADING. NOTIFY SUPERVISION. CHECK SVRU BLOCKAGE OR MALFUNCTION. RESTART AFTER CORRECTION.
11A-TAHH-1504	EDC ADSORBER 60-2676 HIGH/HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAH-1505	EDC ADSORBER 60-2676 HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAHH-1505	EDC ADSORBER 60-2676 HIGH/HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAH-1506	EDC ADSORBER 60-2676 HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAHH-1506	EDC ADSORBER 60-2676 HIGH/HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-PAH-1507	EDC ADSORBER 60-2675 HIGH PRESSURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAH-1508	EDC ADSORBER 60-2675 HIGH TEMPERATURE ALARM	STOP LOADING. NOTIFY SUPERVISION. CHECK FOR SVRU BLOCKAGE OR MALFUNCTION. RESTART AFTER CORRECTION.
11A-TAHH-1508	EDC ADSORBER 60-2675 HIGH/HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAH-1509	EDC ADSORBER 60-2675 HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAHH-1509	EDC ADSORBER 60-2675 HIGH/HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAH-1510	EDC ADSORBER 60-2675 HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-TAHH-1510	EDC ADSORBER 60-2675 HIGH/HIGH TEMPERATURE ALARM	STOP LOADING. PURGE SVRU BED WITH N_2. NOTIFY SUPERVISION.
11A-FAH-1517	AIR TO ADSORBERS HIGH FLOW ALARM	ADJUST HCV-1567 TO CORRECT FLOWRATE. CHECK AND FIX LEAKS, CLOSE VENTS OR DRAINS.
11A-TAH-1524	VACUUM PUMP DISCHARGE HIGH TEMPERATURE ALARM	CHECK VACUUM PUMP FOR MECHANICAL OR CONTROL MALFUNCTION. CALL FOR REPAIR IF NEEDED. PUT TV-1568 IN AUTO.
11A-TAHH-1524	VACUUM PUMP DISCHARGE HIGH/HIGH TEMPERATURE ALARM	CHECK VACUUM PUMP FOR MECHANICAL OR CONTROL MALFUNCTION. CALL FOR REPAIR IF NEEDED. PUT TV-1568 IN AUTO.
11A-TAL-1524	VACUUM PUMP DISCHARGE LOW TEMPERATURE ALARM	CHECK VACUUM PUMP FOR MECHANICAL OR CONTROL MALFUNCTION. CALL FOR REPAIR IF NEEDED. PUT TV-1568 IN AUTO.

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TAG NO.	SERVICE	OPERATOR RESPONSE:
11A-TALL-1524	VACUUM PUMP DISCHARGE LOW/LOW TEMPERATURE ALARM	CHECK VACUUM PUMP FOR MECHANICAL OR CONTROL MALFUNCTION. CALL FOR REPAIR IF NEEDED. PUT TV-1568 IN AUTO.
11A-PAH-1527	VACUUM PUMP OIL PRESSURE ALARM HIGH	CHECK VACUUM PUMP FOR MECHANICAL OR CONTROL MALFUNCTION. PUT TV-1527 IN AUTO.
11A-PAHH-1527	VACUUM PUMP OIL PRESSURE ALARM HIGH HIGH	CHECK VACUUM PUMP FOR MECHANICAL OR CONTROL MALFUNCTION. PUT TV-1527 IN AUTO.
11A-PAL-1527	VACUUM PUMP OIL PRESSURE ALARM LOW	CHECK VACUUM PUMP FOR MECHANICAL OR CONTROL MALFUNCTION. PUT TV-1527 IN AUTO.
11A-PALL-1527	VACUUM PUMP OIL PRESSURE ALARM LOW LOW	CHECK VACUUM PUMP FOR MECHANICAL OR CONTROL MALFUNCTION. PUT TV-1527 IN AUTO.
11A-LAL-1528	SEAL OIL POT A LEVEL ALARM LOW	CHECK VACUUM PUMP SEALS AND LINES FOR LEAKS. CALL FOR REPAIR IF NEEDED. ADD OIL AS NEEDED.
11A-LAL-1529	SEAL OIL POT B LEVEL ALARM LOW	CHECK VACUUM PUMP SEALS AND LINES FOR LEAKS. CALL FOR REPAIR IF NEEDED. ADD OIL AS NEEDED.
11A-VAH-1531	EDC RECOVERY COOLER FAN HIGH VIBRATION ALARM	CALL FOR REPAIR NOTIFY SUPERVISION.
11A-PAL-1533	INSTRUMENT AIR LOW PRESSURE ALARM LOW PRESSURE ALARM	CHECK MANUAL VALVES FOR PROPER POSITION. NOTIFY SUPERVISION.
11A-LAH-1534	EDC RECOVERY TANK LEVEL ALARM HIGH	MONITOR LEVEL THROUGH CURRENT LOADING. TRANSFER EDC AFTER LOADING CYCLE PER PROCEDURES.
11A-LAHH-1534	EDC RECOVERY TANK LEVEL ALARM HIGH HIGH	MONITOR LEVEL THROUGH CURRENT LOADING. TRANSFER EDC AFTER LOADING CYCLE PER PROCEDURES.
11A-LAL-1534	EDC RECOVERY TANK LEVEL ALARM LOW	STOP TRANSFER TO TRUCK.
11A-LALL-1534	EDC RECOVERY TANK LEVEL ALARM HIGH	CONFIRM HIGH LEVEL VIA RECOVERY TANK LEVEL INDICATOR. MONITOR LEVEL CAREFULLY THROUGH REMAINDER OF LOADING. AFTER LOADING COMPLETION, ARRANGE FOR RECOVERED EDC TRANSFER.
11A-LAHH-1535	EDC RECOVERY TANK LEVEL ALARM HIGH HIGH	CONFIRM HIGH LEVEL VIA RECOVERY TANK LEVEL INDICATOR. IF NECESSARY SHUT DOWN LOADING IF NOT DONE AUTOMATICALLY TO AVOID OVERFILL. ARRANGE FOR RECOVERED EDC TRANSFER BEFORE RESUMING LOADING.
11A-TAH-1544	EDC RECOVERY COOLER OUTLET TEMPERATURE HIGH ALARM	CHECK AND/OR REPAIR DRIVE BELT. CHECK SEAL OIL TEMP. AND LOWER IF ABOVE 210 °F.
11A-TAHH-1544	EDC RECOVERY COOLER OUTLET TEMPERATURE HIGH HIGH ALARM	CHECK AND/OR REPAIR DRIVE BELT. CHECK SEAL OIL TEMP. AND LOWER IF ABOVE 210 °F.

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TAG NO.	SERVICE	OPERATOR RESPONSE:
11A-PDAH-1546	EDC/OIL SEPARATOR DIFFERENTIAL PRESSURE ALARM HIGH	CHECK OIL DEMISTER, OIL LEVEL AND LBV-1563 FOR PROPER OPERATION. NOTIFY SUPERVISION.
11A-PDAHH-1546	EDC/OIL SEPARATOR DIFFERENTIAL PRESSURE ALARM HIGH HIGH	CHECK OIL DEMISTER, OIL LEVEL AND LBV-1563 FOR PROPER OPERATION. NOTIFY SUPERVISION.
11A-TAH-1550	RECOVERY OIL TANK PUMP BEARING TEMPERATURE ALARM HIGH	NOTIFY SUPERVISION.
11A-LAH-1561	EDC/OIL SEPARATOR LEVEL ALARM HIGH	CHECK SEAL OIL TEMP. CHECK SEAL OIL FOR INTRUSION OF OTHER LIQUIDS. NOTIFY SUPERVISION.
11A-LAL-1562	EDC/OIL SEPARATOR LEVEL ALARM LOW	CHECK VALVE LBV-1563, MAY NOT HAVE OPENED TO DRAIN SEAL OIL BACK TO VAC PUMP. CHECK FOR LEAKS. ADD OIL. NOTIFY SUPERVISION IF LOW LEVEL RECURS FREQUENT.
11A-VAH-1569	OIL COOLER FAN VIBRATION ALARM HIGH	CHECK BEARINGS, MOUNTING, FOR FOREIGN OBJECTS AND FOR BALANCE OF FAN BLADES. NOTIFY SUPERVISION.

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APPENDIX I

EMERGENCY EVENT RESPONSES

EMERGENCY EVENT RESPONSES

PPG CHEMICALS LAKE CHARLES, LA PROJECT: CLOSED DOME LOADING EMERGENCY EVENTS AND OPERATOR RESPONSE	
EMERGENCY EVENT	**OPERATOR RESPONSE**
Hose breaks or leaks	Press the "STOP EDC LOADING OPERATION" button; activate required warning devices; put on Scott air pack, isolate leak; notify supervision. If spill is collected in drip pan, notify shipping shift foreman who will call for the vacuum truck service for removal of the collected liquid.
Bad weather; i.e. lightning	Press the "STOP EDC LOADING OPERATION" button, resume loading when weather clears. Do not load while lightning is occurring.
Fire	Press the "STOP EDC LOADING OPERATION" button. On shore: If the fire is large, sound the evacuation horn in the control room and leave the area. Notify the guards (call 2700). If the fire is small, proceed as follows: sound the necessary alarms; report fire to guards; do not attempt to put out the fire unless otherwise instructed or necessary for personal safety; if safe, isolate leak source and allow fire to burn itself out; try to stay upwind f the fire since this smoke may contain HCl. In the event that a fire extinguisher is used, refer to Section II.B. Offshore: Refer to Section II.B.2, "Rapid Movement of Vessels Threatened by Fire".
Equipment Failure	Press the "STOP EDC LOADING OPERATION" button, call maintenance for equipment repair. If SVRU fails, follow the emergency bypass procedure (Section IV.F).
Water level change caused by passing vessel	Press the "STOP EDC LOADING OPERATION" button. If spill occurs, follow above procedure.