SAFETY CERTIFICATION PROGRAM

VCM PLANT

Interoffice Communication

To Operations Personnel

From G. G. Draper

Date January 25, 1974

Subject Safety Certification

Attached is the material for operator "Safety Certification." The material is divided into six sections covering the Loading Rack, Oxy, R-101 and R-102, Furnaces, BL-501, and Operation of General Safety Equipment.

The material for which you are responsible is listed below:

Chief Operator	-	All
Operator 1st) Operator 2nd)	-	All the material except the section covering the loading rack. (Quizzes are slightly different.)
Pumper/Loader	-	Loading rack section and demonstrated knowledge of operations of general safety equipment.

The quizzes for each area are located directly in front of the material covering that section. All answers to the questions on the quiz can be found in the material.

After an ample time period to study the material, each man will be required to demonstrate to the Shift Foreman and the Process Superintendent that he has a thorough knowledge of the material. A perfect score on the quiz is the only acceptable score for certification. If an employee should fail the quiz, he may take it again whenever he feels that he is ready. A target date of April 1, 1974 has been set for having all operation employees certified.

The purpose of the safety certification is to insure that each operator knows the safety rules that govern his work and understands the purpose and function of critical safety equipment. This material is intended to achieve a higher degree of operating safely by increased knowledge of operators at every level.

G. G. Draper

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SAFETY CERTIFICATION

I have studied the safety rules and the shutdown systems in the safety certification material given me. I have a thorough knowledge of this material and have demonstrated this to my supervisor by discussion of the material in his office and by field check-out.

	Date	Operator	Supervisor
Loading Rack*			
Oxychlorination**			
R-101 and R-102**			
Furnaces**			
BL-501**			
Demonstrated sufficient knowledge of the following: ***			
A. Scott Air Packs			
B. Fresh Air Apparatus			
C. Air Purification Canister			
D. Fire Extinguishers			
E. Fire Monitors			
F. Fire Hose			
G. Underground Fire Piping and Valving Arrangement			
H. Sprinkler System			

* Pumper/Loaders and Chief Operators
** Chief Operators, Operator 1st, and Operator 2nd
*** All Operations Personnel

R-101 and R-102

CHIEF & 1ST OPERATOR

R-101 AND R-102 QUIZ

1) For the following situations give the valve action for the valves listed below:

Situation

Power Failure
Emergency Shutdown
High R-101 Temperature
High R-101 Pressure
Low Cl_2 Gas Pressure
Low Liquid Cl2 Pressure
High R-102 Pressure
High Cl_2 Flow to R-102
Low EDC Flow to R-102
Low Cl_2 Diff. Across FRC-175V

Valves

FRC-101; C_2H_4 to R-101
RRC-102; Gas Cl_2 to R-101
Betus Valve VC-170; Cl_2 to R-101
FRC-104; Trim Gas Cl_2 to R-101
Betus Valve VS-172; Liq. Cl_2 to R-101
FRC-175; Gas Cl_2 to R-102

2) Can R-102 be run while R-101 is down?

3) What are the shutdown set points for each shutdown initiator?

4) Describe the primary dangers resulting from a leak in R-101 or a low level.

5) What is the very last five checks that should be made on R-101 prior to startup?

6) What is the normal H_2O in T-101 and why is this sample critical?

7) What is the relationship between the H_2O and $FeCl_3$ sample in T-101?

8) Why is natural gas added to the top of R-101?

9) Where do R/V's relieve to on R-102, R-101, and T-101? Also, where does PRC-101 vest to?

CHIEF & 2ND OPERATOR

R-101 AND R-102 QUIZ

1) For the following situations give the valve action for the valves listed below:

Situation

Power Failure
Emergency Shutdown
High R-101 Temperature
High R-101 Pressure
Low Cl_2 Gas Pressure
Low Liquid Cl_2 Pressure
High R-102 Pressure
High Cl_2 Flow to R-102
Low EDC Flow to R-102
Low Cl_2 Diff. Across FRC-175V

Valves

FRC-101; C_2H_4 to R-101
KRC-102; Gas Cl_2 to R-101
Betus Valve VC-170; Cl_2 to R-101
FRC-102; Trim Gas Cl_2 to R-101
Betus Valve VS-171; Trim Cl_2 to R-101
Betus Valve VS-172; Liq. Cl_2 to R-101
FRC-172; Gas Cl_2 to R-102

2) Can R-102 be run while R-101 is down?

3) Point out the physical location of each of the above valves and their associated trips.

4) What are the shutdown set points for each shutdown initiator?

5) Describe the primary dangers resulting from a leak in R-101 or a low level.

6) What is the very last five checks that should be made on R-101 prior to startup?

7) What is the normal H_2O in T-101 and why is this sample critical?

8) What is relationship between the H_2O and $FeCl_3$ sample in T-101?

9) Why is natural gas added to the top of R-101?

10) Where do R/V's relieve to on R-102, R-101, and T-101? Also, where is PRC-101 physically located and where does it relieve to?

SAFETY CERTIFICATION FOR R-101 AND R-102

When starting up R-101 after it has been dryed, the following items should be checked:

1) R-101 level at overflow line to T-101
2) R-101 pressure on PRC-101 over 5 psi with N_2 pressure
3) Cooling water on H-101
4) Relief valves unblocked
5) Overflow line to T-101 and balance line open

When R-101 is shut down or automatically trips out, all ethylene and chlorine lines are to be blocked in with at least one block valve to insure that there is no leakage into the reactor or backwards into the lines.

When switching from R-102 to R-101, T-450 or T-101 be certain that R-101 is not lined up to T-101 or T-450 from the line off the bottom of R-101.

Since the reaction in R-101 is exothermic, it is extremely important to insure that the liquid level has been established in R-101 and that cooling water flow has been established in the shell side of H-101. If the liquid level is not high enough to allow for circulation through H-101 via the thermo siphon effect, the reaction mass could heat up and rupture R-101 if the high temperature trip should fail. This same situation could occur if the cooling water to H-101 was blocked in.

Since the reaction in R-101 requires $FeCl_3$ as a catalyst, the reactor walls are utilized as sacrificial metal. The reactor walls are audio gauged periodically for wall thickness; however, it is important to visually check R-101 periodically for pin-hole leaks. EDC leaking through a pin-hole leak could create a serious fire hazard.

A high water content in R-101 or T-101 could be an indication of a leak in H-101. Normally a high water sample will be accompanied by a high $FeCl_3$ reading. High water content in R-101 will increase corrosion rates and would increase the possibility of a leak in R-101 if allowed to operate above 20 ppm for any extended period.

All of the trip solenoids on R-101 and R-102 are on DC power which is supplied by batteries. The batteries are recharged by converters which are tied into the emergency power system.

The PSV and R/D on R-101 are set at 70 psi. The PSV on top of T-101 is set at 80 psi. Both of the PSV valves relieve to the dry vent header along with the vent flow from PRC-101.

Natural gas is added to the top of R-101 to reduce oxygen concentration of R-101 vapor and to enrich the vapor phase to maintain it above the upper explosive limit.

The chlorine analyzer collection pot is to be emptied into the T-103 that is in service.

On BL-502 it is important to check 2nd stage inlet temperatures to keep from burning up compressor. If high temperatures occur, the quenching screens should be cleaned. Always maintain an oil level in BL-502 crankcase and know how to drain oil from H-103 to knockout pot.

When PPG is having operational problems, we often relieve a large amount of inerts which must be vented off to prevent overpressuring R-101 and T-101. When this occurs, the bypass valve around the control valve will need to be opened to maintain the air loading on the control valve within control limits.

Below are the situations and valve actions that occur in an emergency shutdown.

A. When the following situations occur:

1) An A/C or D/C power failure (3 sec. delay on A/C failure)
2) Emergency shutdown switch
3) Low Cl_2 line pressure - 50# at PR 665T

The following valves will close:

a) FRC-101 - C_2H_4 to R-101
b) FRC-102 - Main Gas Cl_2 to R-101
c) Betus Valve VS-170 - Main Gas Cl_2 to R-101
d) FRC-104 - Trim Gas Cl_2 to R-101
e) Betus Valve VS-171 - Trim Gas Cl_2 to R-101
f) Betus Valve VS-172 - Liq. Cl_2 to R-101
g) FRC-175 - Gas Cl_2 to R-102

B. When the following situations occur:

1) High R-101 Temperature - Set at 75°C
2) High R-101 Pressure - Set at 59# on shutdown switch on bottom of R-101 or 36# on PRC-101 (switch has 24 psig static head)
3) Low R-101 Pressure - Set at 29# on shutdown switch on bottom of R-101 or 5# on PRC-101 (switch has 24 psig static head)

The following valves will close:

a) FRC-101 - C_2H_4 to R-101
b) FRC-102 - Cl_2 Gas to R-101
c) Betus VS-170 - Cl_2 to R-101
d) FRC-104 - Trim Gas Cl_2 to R-101
e) Betus VS-171 - Trim Cl_2 to R-101
f) Betus VS-172 - Liquid Cl_2 to R-101

C. When the following situations occur:

1) Low liquid Cl_2 pressure - Set at 65# from PR-106T

The following valve closes:

a) Betus Valve VS-172 - Liquid Cl_2 to R-101

D. FRC-175 will close independently of R-101 when the following situations occur:

1) R-102 High Pressure - 60# Top of R-102
2) High Cl_2 Flow - 8 Units on FRC-175
3) Low EDC Flow - 2.5 Units on FR-207
4) Low Cl_2 Differential Pressure Across FRC-175V - 2 psig Decreasing

Oxychlorination

OXY QUIZ
Chief and 1st Operator

1) What happens when there is a low level in S-301, 2 or 3? (Valve responds) at what level is the shutdown set?

2) What valves are actuated when there is a low HCl flow? Where should the low flow be set?

3) What valves are actuated by low air pressure?

4) What valves are actuated by low ethylene to air ratio?

5) What valves are actuated by a power failure or an instrument air failure?

6) What order are process flows injected at startup? Why?

7) What order are process flows removed at shutdown?

8) When should the manual air operated air valve be used?

9) Describe the purposes of the time delays on the C_2H_4 on S.D..

10) Describe the emergency trip system and the valves associated with it.

11) What are the guidelines on bypassing a S.D. system.

12) When is the emergency shutdown button used?

13) What limits Cl_2 injection to R-304 on startup and during normal operations.

14) What position should the Cl_2 to R-304 valve be in when shutting down?

15) How can you tell from the board that one of the shutdown systems has been by-passed?

16) Define high and low range switches and switching procedure.

17) Give location and settings on all RV's and RD's in oxy.

18) How do we protect BL-301 from overload on startup?

OXY SAFETY CERTIFICATION

General

1) The low level in S-301, 2, 3, 4 shutdown is to prevent overheating and destroying the reactors.

2) The low HCl flow shutdown is to prevent a C_2H_4 air explosion.

3) Low C_2H_4 flow is to prevent C_2H_4 and air from becoming an explosive mixture. Three charts are provided on the control board for both the ethylene and HCl flow. One chart is for the control and the other two are for the alarm and shutdown. The set point for the shutdown should be set at 55% of the control chart reading. The alarm setpoint should be set at 75% of the control chart reading to provide ample warning. During startup be sure to reset these shutdowns as rates are changed.

4) Low air pressure only closes air valves and GC valve to prevent C_2H_4 and HCl from backing into the air header and the DeMag. Close manual air operated shutoff valve located by BL-301 to prevent reactants backing into BL-301.

5) Low C_2H_4 to air ratio shutdown is to prevent C_2H_4 air explosion. The board indication should be near 100%. This indication will drop as the ethylene to air ratio decreases. The alarm is at 34.9% and the shutdown is at 25%.

6) Low Cl_2 flow to prevent reactants from backing into Cl_2 header which could cause an explosion.

7) Pushbutton is for emergency shutdown in the event of a large leak or other problems that require immediate attention or in the event it is impossible to get into the unit.

8) Power failure shutdown actuates complete shutdown system to make unit safe as all valves fail to safe position.

9) Instrument air failure actuates all the shutdown valves as there can be no control without air.

NOTE: The automatic valves can never be trusted as a complete shutoff; therefore, the manual block valve at each location must be closed.

OXY SAFETY CERTIFICATION

STARTUP AND SHUTDOWN

1) Prior to any oxy startup a safety check list should be completed. Cover thoroughly during training.

2) When the oxy train has been dismantled for repairs it should be purged with nitrogen until the oxygen content is below 2% prior to startup.

3) When starting up oxy the process flows should be injected in the following manner.
   a) N_2 flow (Should be reset as soon as possible after flows are established.)
   b) HCl
   c) C_2H_4
   d) Air to R-301
   e) Air to R-302
   f) Air to R-303
   g) Cl_2 to R-304 when rates exceed 50% of design and C_2H_4 in the vent is below 5%.

   NOTE: Cl_2 to R-304 should be blocked in when rates are reduced below 50% of design. A Bettus operator has been installed on the block valve on Cl_2 to R-304. The operator has been tied into the shutdown system and will automatically close under the same circuitry as the butterfly control valve.

4) Under no condition is the oxy unit to be operated with more than one of the shutdown valves bypassed. When a valve is bypassed, a man must be present at the valve full time. He should switch back to the run position immediately if he detects an upset in the reactant flow. The flashing red lights on oxy control panel indicates that one of the SD systems has been bypassed.

5) When shutting down, the reactant flows should be taken out in the following order:
   a) Cl_2 to R-304 (See Note under Item #3)
   b) Air to R-303
   c) Air to R-302
   d) Air to R-301
   e) C_2H_4 (5 second delay to keep reactants above explosive limit)
   f) HCl

   NOTE: Make sure nitrogen flow has been established when low C_2H_4 flow has been reached. Continue nitrogen purge until Chief or Shift Foreman directs it to be cut back or off.

6) Watch H20 level in S-309 closely so as to not let water level get so high it would enter R-304 which would ruin catalyst. The drain valve on the water level control valve is to be open to grade while oxy is down to indicate a high water level in S-309.

7) If the cooling water is to be taken off the Karbates, it should only be done after oxy has been depressured. This is to prevent breakage of the Karbate tubes. When cooling water is to be re-established it should be done by slowly opening the outlet valves until pressured up, then the inlet valves can be opened slowly.

8) High and low range flow transmitters have been provided to enable running at high or low rates. All control valves should be on manual before attempting to switch transmitters. The following procedure should be used to permit switching without causing a shutdown.

a) To go from high to low range--
Switch HCl 1st
Switch C_2H_4 2nd
Switch Air to R-301 3rd
Swtich Air to R-302 & R-303 (anytime)
Reset low flow shutdown settings on HCl and C_2H_4

b) To go from low to high range
Reset HCl and C_2H_4 low flow shutdown settings
Switch HCl 1st
Switch Air to R-301 2nd
Switch C_2H_4 3rd
Switch Air to R-302 and R-303 (anytime)
Check and reset HCl and C_2H_4 low flow shutdown settings if needed.

9) BL-301 has 90 second time delay to prevent starting up with guide vanes open which could overload the compressor.

OXY SAFETY CERTIFICATION

EMERGENCY TRIP SYSTEM

The purpose of the emergency DC powered trip system is to shut down the unit if danger exist. The following valves and switches are on the emergency shutdown system.

1. Emergency stop switch
2. HCl Valve
3. C_2H_4 (5 second delay)
4. Air to R-301
5. Air to R-302
6. Air to R-303
7. Cl_2 to R-304
8. N_2 to R-301
9. N_2 to R-302
10. N_2 to R-303
11. HCl from evaporators (FRC-312)
12. C_2H_4 - Air Ratio Computer & Switch
13. Low Process Air Header Pressure (PS-314)
14. GC Sample Shutoff Valve
15. Low Steam Drum Level Switches (S-301, S-302, S-303, S-304)
16. Main Panel Board Status Comps.

The indicating lamps associated with the trip system are:

a) Emergency stop lamp
b) Pre-start ready lamp

The emergency stop lamp lights only when the shutdown button is in the "pull" position.

The pre-start ready lamps are on only if the emergency shutdown switch is in the "push" position and all the primary trip circuits normal.

There is a bypass switch on each of the trip valves but the conditions for bypassing one of these systems must be adhered to according to procedures. There is one light on the oxy panel board to indicate if any of theprocess trip circuits have been bypassed.

Each one of the four steam drums have an independent lamp to indicate the bypass position of the shutdown switch.

OXY SAFETY CERTIFICATION

RV AND RD SETTINGS

Equipment	RV	RD
T-204	225	225
S-210A&B	225	225
S-301	350	
S-302	350	
S-303	350	
S-304	50	
Inlet to Karbates	75	75
C_2H_4 Heater Outlet	275	275
Top R-301 (All reactors have double discs)		140
Feed R-301		140
Top R-302		140
Feed R-302		140
Top R-303		140
Feed R-303		140
Top R-304		75
Feed R-304		75
HCl Feed Heater	150	150

Continental Oil Company
VCM Plant

Oxy Safety Check List

(To be used after each shutdown)

1. Low air pressure: Build pressure to 110# – set solenoids – vent off pressure.

   Shutdown Pressure_____ Valves Function Properly _____

2. Low HC1 Flow: Set shutdown switch below zero (behind panelboard)
   Set solenoids – raise shutdown setting.

   Valves function properly_____.

3. Low Ethylene Flow: Set shutdown switch below zero (behind panelboard)
   Set solenoids – raise shutdown setting.

   Valves function properly_____.

4. Panic Button: Set solenoids – pushbutton.

   Valves function properly_____.

5. Low Steam Drum Level: Latch solenoids and blow down the float chamber without using the bypass switch.

   R-301_____ R-302 _____ R-303_____.

Prior to starting, the shutdown check must indicate **that safety systems conform to appropriate action.**

Fifteen minute nitrogen purge or oxygen analysis less than 2% prior to startup _____.

Startup rate	_____% of design
HC1 shutdown setting	_____% of scale
HC1 low flow alarm setting	_____% of scale
Ethylene shutdown setting	_____% of scale
Ethylene low flow alarm setting	_____% of scale.

6. Steam On: H-308_____ H-309_____ H-304_____ H-310 _____

7. Water on: H-303's _____H-305_____H-302 _____

8. N_2 to Oxy Reset after Start-up _____

9. Set the ethylene to air ratio shutdown switch in the run position.

Note: To check if values function properly use the following procedures.

1. With the control valve blocked in and the controller on manual, set controller output for mid-stroke of the valve.
2. With the green ready light on, the solenoid valve can be latched in and the control valve observed to see that it moves to the mid-stroke position.
3. When the shutdown function is actuated, the valve should be checked to insure that it moves from its mid-stroke position to its shutdown position.

Date _____

Foreman _____

2nd Operator _____

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BL-501

CHIEF & 2ND OPERATOR
BL-501 QUIZ

1) What are the seven things that can cause the propylene compressor to shut down?

2) What will start the auxiliary oil pump?

3) Describe a propylene vapor release.

4) Describe operation of propylene blowdown drum.

5) Describe acceptable clearing procedure and acceptable levels of propylene, air, and moisture.

6) What are the shutdown set points on the propylene machine?

7) Describe an oil cooler switch.

8) What is the propylene and steam PSV setting and where are they located?

CHIEF & 1ST OPERATOR
BL-501 QUIZ

1) What are the seven things that can cause the propylene compressor to shutdown?

2) What will start the auxiliary oil pump?

3) What are the shutdown set points on the propylene machine.

4) Describe an oil cooler switch.

5) What is the propylene and steam PSV setting?

SAFETY CERTIFICATION
BL-501 PROPYLENE COMPRESSOR

Shutdown System

The propylene compressor is a centrifugal compressor with a steam turbine driver. The steam turbine breaks 600 psig steam down to 150 psig steam. The following seven items will shut the propylene compressor down:

a) High discharge temperature (275°F)
b) Low seal oil differential pressure (20 psi)
c) Low turbine oil pressure (5 psig)
d) High level in 1st stage knockout pot
e) High level in 2nd stage knockout pot
f) High level in the economizer
g) Overspeed trip (8,700 rpm)
h) Low compressor oil pressure (10 psig)

The compressor is equipped with an electrical driven auxiliary oil pump which will start automatically on low oil pressure to the compressor or turbine and on low differential pressure.

The high pressure oil system is equipped with two oil coolers which are alternated periodically on the run when one becomes fouled. To make sure that the compressor doesn't shutdown on low oil pressure when making the swap, fill the cooler being put on the line with oil. This will prevent a loss in pressure when putting the cooler on the line.

Propylene Vapor Release

Since propylene is a highly flammable material, any uncontrolled release to the atmosphere poses a serious problem. Propylene is heavier than air and will hug the ground and build up concentration. A water spray or steam may be used in dispersing the vapors. It is important to set up a water or steam barrier between any propylene leak and the furnaces. A fire monitor would be utilized for providing a water barrier.

Propylene Blowdown Drum

All of the propylene knockout pot drains are tied into the propylene blowdown drum S-313 which is equipped with steam coils for vaporizing the propylene. The propylene vaporized in S-313 goes overhead to the 1st stage knockout pot. Oil in the propylene bled down to S-313 can be drawn off in buckets.

Entry Clearing Procedure For Propylene System

To clear the propylene system, it must first be hot gassed. This is accomplished by passing hot propylene from the compressor discharge through the system to vaporize any liquid propylene. As the propylene is vaporized out of the system, it is condensed and transferred to the propylene receiver. At the completion of hot gassing, all liquid propylene will be stored in the propylene receiver. When hot gassing is complete, BL-501 is placed on slow roll. After BL-501 is on slow roll, the propylene system is depressured through a 2" line from the compressor discharge to vent at top of C-202. Start N_2 into compressor 1st stage suction and purge to vent. Block in 2nd stage suction and third stage suction. Pur N_2 in on economizer and purge through sub-coolers H-204, H-306 and back to 2nd stage knockout pot and vent off through vent to top of C-202. Put N_2 in at propylene condenser and purge backwards to compressor discharge and out vent. Purge until propylene is $<$1,000 ppm.

Startup Cleaning Procedure For Propylene System

It is important to insure that the oxygen concentration is low enough in the propylene system so that it cannot support combustion. The following procedure should be used in clearing the propylene system:

1) Establish Nitrogen Sequence

   a) T-504, second stage knockout pot with bleed at level glass.

   b) BL-501, small purge out 2" vent line on 4th stage discharge.

   c) H-204, bleed out S-311 oil knockout pot.

   d) T-503, N_2 will back flow from BL-501 into vessel, establish bleed at L.G.

   e) T-506, economizer, N_2 will enter via 8" line and exit level glass.

   f) H-502, N_2 will flow from T-503 and T-506 economizer. Exit 1" vent on shell side H-502.

   g) H-306, close LC-315 V and allow nitrogen to back flow from T-503 take bleed exit at L.G.

NOTE:

H-501 should not have to be depressured nor should T-502.

2) When all check points show less than 1,000 ppm oxygen, depressure system to 2 psig. By using hot N_2 to purge, the propylene system can be dried at the same time. To prevent freezing of the water and possibly blocking propylene flow, the system should be dried to a -40^{o}F dew point.

3) After work has been completed on the propylene system, propylene is brought back into system via the normal route bleeding off inerts (nitrogen) while establishing a propylene atmosphere. Purge to less than 1% N_2.

4) After BL-501 is started up, H-501 propylene condenser will have to be bled off to get rid of non-condensibles. Watch discharge pressure of BL-501 closely. The PSV-601 on propylene receiver T-502 is set for 275 psig.

Propylene System Relief Valves

Location	Relief Valve Set Pressure, psig
Economizer	275
Propylene Receiver	275
1st Stage Knockout Pot	275
2nd Stage Knockout Pot	275
H-501 C.W. Side	75
H-501 Process Side	280
BL-501 Discharge Steam	175
S-312	280
B -501 Discharge Process	275
S-313	275
H-204	75

CHIEF & 1ST OPERATOR

FURNACE QUIZ

1) When the furnace emergency shutdown is pulled, what happens?

2) When the furnace shutdown is pulled, what happens?

3) What valves are actuated by high furnace discharge temperature? What is the shutdown temperature?

4) What is the set pressure of the low fuel gas shutdown? What valves are actuated by this shutdown?

5) What valves are actuated by a power failure?

6) What valves are actuated by an instrument air failure?

7) Describe the action of the emergency quench. (What happens as the temperature rises?)

8) What shutdown interlock is associated with an AC power failure, furnace feed pump, and shutdown system?

9) Describe in detail the decoking procedure and critical precautionary measures.

10) What is proper furnace draft?

11) Describe the furnace feed pump "auto-start" system.

12) What are the settings for the PVS's and RD (cracking section) and maximum permissible operating pressures?

13) What type of inlet nozzle is on T-451 and why?

14) What is minimum furnace feed rate and why?

15) What is a "hot spot?"

16) What is the maximum allowable furnace outlet temperature?

17) What is the maximum allowable temperature that monel outlet lines should be subjected to?

18) Describe the operating principle of fuel gas control valves. What is the purpose of the orifice responses?

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19) What are rules governing bypass system?

20) What instruments are on emergency power supply?

21) How can a flammable vapor release be prevented from reaching the furnaces?

22) What is PSV settings on C-202, T-204, and HCl vapor?

23) What is explosive range of air and VCM; air and EDC mixture?
What are acceptable purge limits?

24) Where are the remote air operated shutoff valves located for the HCl system?
Where are the controls located.

25) Where are the controls located for the remote air operated valves for the vapor inlet to the quench column and quench from C-201 to the furnaces?
Who is responsible for opening or closing these valves?

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CHIEF & 2ND OPERATOR

FURNACE QUIZ

1) When the furnace emergency shutdown is pulled, what happens?

2) When the furnace shutdown is pulled, what happens?

3) What valves are actuated by high furnace discharge temperature & where are they located? What is the shutdown temperature?

4) What is the set pressure of the low fuel gas shutdown? What valves are actuated by this shutdown & where are they located?

5) What valves are actuated by a power failure & where are they located?

6) What valves are actuated by an instrument air failure & where are they located?

7) When do you wear goggles?

8) Describe the action of the emergency quench. (What happens as the temperature rises?)

9) What shutdown interlock is associated with an AC power failure, furnace feed pump, and shutdown system?

10) What is critical about "dumping" the convection section?

11) In decoking what blinds are required and where are they located?

12) What is the last critical step before lighting fires?

13) What is the proper fire lighting procedure?

14) What is proper furnace draft?

15) Describe the furnace feed pump "auto-start" system.

16) Where are PVS's and RD and what are settings and maximum permissible operating pressures?

17) What type of inlet nozzle is on T-451 and why?

18) What is a "hot spot?"

19) What is the maximum allowable furnace outlet temperature?

20) What is the maximum allowable temperature tht monel outlet lines should be subjected to?

21) Describe the operating principle of fuel gas control valves. What is the purpose of the orifice responses?

22) What are rules governing bypass system? Describe operation of "local" boxes.

23) What instruments are on emergency power supply?

24) How can a flammable vapor release be prevented from reaching the furnaces?

25) What is PSV settings on C-202, T-204, and HCl vapor?

26) What is explosive range of air and VCM; air and EDC mixture?
What are acceptable purge limits?

27) Where are the remote air operated shutoff valves located for the HCl system?
Where are the controls located?

28) Where are the controls located for the remote air operated valves for the vapor inlet to the quench column and quench from C-201 to the furnaces?
Who is responsible for opening or closing these valves?

A

SAFETY CERTIFICATION FOR FURNACES

Furnace Shutdown System

The D-C trip circuit allows for a dip in power without shutting the furnace down. If the loss of power from Gulf States exceeds 2 minutes, the furnaces will automatically trip out.

The trips are not to be bypassed unless it is an emergency for repairs. If the trip is bypassed then someone must be standing by to take the trip off of bypass in the event of an emergency.

If the trip is bypassed, a red light on the control board will light up to indicate the system being bypassed.

The local trip boxes located in the unit are equipped with a trip button which can be pushed to trip it out. They are also equipped with reset buttons for latching the trip up. A green light is on when all conditions are correct for operation. Unless the green light is on the solenoids cannot be energized to complete the pneumatic circuit to the control valves. The red light (when on) indicates that the bypass is in service.

The following situations result in the D-C trip circuit shutting a furnace down:

Situation

I. Emergency Shutdown

1) Pull shutdown button on control board.

Closes MC-203; fuel gas to furnace
Closes FRD-215; steam to vaporizer
Closes LRC-225; EDC to vaporizer
Closes V-225; EDC to convection coil
Opens V-201; convection vent to storage

The V-201 stays blocked in and also the nitrogen to convection coil stays blocked in. These two valves will have to be opened by hand and operator stay there until you get nitrogen at V-201 then shut off nitrogen and block valve in. The reason for this operation is to keep from over pressuring T-451 and blowing the roof off. The convection section must be emptied or it may over pressure and rupture the tubes. T-451 has a distribution, nozzle on inlet line to spread the hot material when dumping the convection section.

Situation

II. Furnace Shutdown

1) Pull red button on control board marked furnace shutdown. This shutdown only closes MC-203, fuel gas to furnace. Other valves in safety shutdown system make no change.

Situation

III. High Discharge Temperature

1) You will get a high temperature alarm at 540°C.

2) Fuel gas will shut off at 560°C but the other valves in the safety shutdown will make no change.

3) The maximum normal operating furnace temperature is 520°C.

4) A hot spot is a week spot in a tube which results from overheating. This can be caused by burners flaming and licking a tube or coke buildup in the tube.

5) The maximum temperature that the outlet monel piping can be subjected to is 1275°F.

Situation

IV. Low Fuel Gas Pressure

1) Low fuel gas pressure shutdown is set at 5 lb. When the fuel gas pressure reaches 5 lbs., MC-203, fuel gas to the furnace will close. There will be no change on the other valves in the shutdown system.

If you can't find the cause immediately you will have to shut down or you will receive too much uncracked EDC.

2) The fuel gas control system is set up to step down the pressure from 315 psig to 60 psig through PC-218. The gas then goes to PRC-217 valve which steps the pressure from 60 psig to 20-30 psig. PRC-217 valve is the main gas pressure regulator on the control board. The fuel gas header then divides to feed R-201 A&B. After the line divides there is a trip valve, MC-203, (one to each furnace) which is tied into the automatic shutdown system to isolate fuel gas to each furnace individually.

There are four TRC's on each furnace to control the temperature on each bank by regulating fuel gas pressure. These are board mounted controllers. If any of the TRC's close for any reason, a minimum flow orifice in the bypass will keep the burners lit.

Situation

V. Power Failure

1) MC-203; fuel gas will close
FRC-215; steam to vaporizer will close
LRC-225; EDC to vaporizer will close
V-205; EDC to convection coil will close

The primary plant electrical source is Gulf States power. If Gulf States should drop the load we would be transferred automatically to emergency power which is supplied by the CONOCO Refinery. Emergency power is supplied to the following items:

1) Lighting in key areas (control room locations in the unit, etc.)
2) BL-502 controls and oil pump.
3) Instruments; readouts in control room
4) BL-301 Annunciator
5) GAI-TRONICS
6) NH_3 Injection
7) Fire Whistle
8) BL-501 Alarms
9) Cooling Tower pH
10) Fire Pump Relay
11) Oxy G.C.
12) Om guard System
13) Charging Batteries For D-C System

As soon as Gulf States' power has been restored the load would automatically switch back to Gulf States. The furnace feed pumps (P-451 A&B) are interlocked with Gulf States and would trip out on AC power failure (they have a 7-second delay). The reset for MCC "E" would have to be reset before pumps could be started again.

V-201 convection vent valve is in the shutdown system, but stays blocked in and nitrogen to convection stays blocked in so that T-451 will not be over pressured. In all situations, when fuel gas is shut off to the furnaces, never start lighting fires until fire box has been purged out with steam to prevent the possibility of an explosion. In a power failure, open the nitrogen valve into instrument air header immediately so you don't lose instrumentation.

Situation

VI. Instrument Air Failure

1) MC-203; fuel gas will close
FRC-215; steam to vaporizer closes
LRC-225; EDC to vaporizer closes
V-205; EDC to convection coil closes
V-201; convection vent to storage opens

This type of situation and a power failure doesn't only affect the furnaces but shuts the rest of your unit down.

Nitrogen is used as a backup for instrument air. The low pressure instrument air alarm PLA-308 comes on at 85 lb. You also have a low instrument air header pressure alarm that comes on at 20 lb.

Situation

VII. High After Quench Temperature

1) When quench starts getting hot you will get a high temperature alarm at 175°C.

2) When you get to 180°C the emergency quench will partially open. It takes 5 lbs. air loading on emergency quench valve to open and it is set on 7 lb. air loading at all times. If this much emergency quench doesn't cool the quench temperature on furnaces, you raise the air loading to what you need to lower the temperature. You have control of the emergency quench up to 250° after which the emergency quench valve goes wide open.

3) At 225°C you get an alarm and fuel gas to furnaces is shut off.

4) At 250° an alarm is sounded and the emergency quench valve automatically goes wide open, if you don't have it wide open already. This doesn't affect any other shutdowns on furnace except the fuel gas.

A

FURNACE STARTUP PROCEDURE

The last critical step before lighting fires is to purge fire box with steam until you have a plume of steam coming out furnace stack. Also, check burner valves to make sure they are closed before opening gas valves.

To light furnace burners, the following procedure should be utilized;

1) Make sure you have plenty of map gas.
2) Check torch to make sure it works properly.
3) Light torch.
4) Close shutter on burner.
5) Put torch in hole beside burner.
6) Open gas valve to burner.
7) Make sure burner is lit.
8) Do not light one burner off the burner that is lit.

The furnace draft should be adjusted to give 0.1 inches of water on the control board indicator.

The EDC charge pumps, P-451 A&B, are on an automatic start system which works off of the discharge pressure. An alarm sounds at 210 psig and the second pump kicks on automatically when the pressure reaches 200 psig. The minimum feed rate to the furnaces are three units of flow. At any lower rate there is a possibility of losing flow.

A

REMOTE AIR OPERATED SHUTOFF VALVES

1) There are two air operated valves on vapor inlet to the quench column (C-201) that can be closed from the control room or by the east end of Block II on cement column on road just east of stairway of R-301. These valves are to be used in emergencies or on shutting down. Shift Foreman is the only one that can close or open these valves.

2) Quench from C-201 to R-201 A&B has an air operated valve at quench outlet. It is located on first landing on east side of C-201. This valve is also closed from control room and at east end of Block II in the same box that the vapor valves are operated from. The following remote operated valves were installed to prevent a major HCl leak. The HCl storage tank and the seal tray can be secured with the valve listed in the event of a line rupture.

a) HCV-278 HCl gas equalizing line is located on top of T-204.

b) HCV-277 HCl liquid to storage is located on top of T-204.

c) HCV-276 HCl knockout pot is located just before going into evaporators' feed line.

d) HCV-275 evaporators' feed line located on bottom at north end of T-204 storage.

e) HCV-274 located on HCl column at seal tray.

CRACKING SECTION RELIEF VALVE & RUPTURE DISK SETTINGS

Location	Relief Valve Setting, psig	Rupture Disk Setting, psig
R-201A	300	-
R-201B	300	-
H-201A	200	200
H-201B	200	200
H-201A Cond. Pot	290	-
H-201B Cond. Pot	290	-
Fuel Gas K.O. Pot	120	-
C-201	150	150
C-202	154	154
T-202	140	140
T-204	225	225
HCl Evaporators	225	225
H-211	140	140

A

FURNACE DECOKING PROCEDURE

1) Remove outlet thermocouple and thermowells first. Blind openings.

2) Remove the quench fittings from the outlet of the furnace. The quench fitting will contain a deposit of coke. The deposit must be removed with hand tools.

3) Connect the decoking manifold to the vapor inlets of the furnace. Install the decoking fitting for each coil outlet and open the slide valves to the vertical manifolds.

4) The following lines are to be blinded off to prevent their contamination with moisture:

   a) The liquid quench line where it connects to the quench fitting.
   b) The vapor line going to the quench column at the flange where it connects to the quench fitting.

5) Close the block valve in the vapor feed line to each coil.

6) Start a small flow of steam through each process coil and preheat coil. Once live steam has been obtained at the furnace outlet, open the steam throttle valves. The restriction orifice in each line will limit the flow to the amount required.

7) Purge the firebox with sniffing steam and then start lighting burners in the bottom row.

8) While holding the fuel gas pressure at 10-12 psi, light additional burners as necessary to raise the outlet temperature to the rate of 100°C per hour. (The fuel gas pressure is to be kept low so as to spread out the heat input.)

9) When the outlet temperature reaches 550°C, stop adding burners. Then <u>slowly</u> start the addition of air. When air is first added, the outlet temperature should be watched closely. Keep the outlet temperature below 600°C until the air valve in line with the restriction orifice is full open. DO NOT open the bypass around the restriction orifice at this stage.

10) Adjust the burner configuration and total heat input so as to obtain the following temperatures in each coil.

a)	Convection Section	(TI 202-4 & TI 202-20)	380-400°C
b)	Radiant Section	(TI 202-11 & TI 202-27)	580-600°C
c)	Outlet	(TI 202-39 & TI 202-42)	640-650°C

The above temperature levels should be held for 4 hours with the required amount of steam and air flowing through each tube. At the end of four hours, slowly open the bypass around the air restriction orifices and watch for an increase in furnace temperature. If an increase in temperature is noted, close the bypasses and wait for another hour. Continue the sequence of adding extra air and watching for an increase in temperature every hour until an increase is not noted with the additional air. After this point has been reached, wait one additional hour at the specified temperature levels and then start to reduce the outlet temperature at the rate of 100°C/hour.

10) When the outlet temperature of the furnace reached 300°C, shut off all burners and then shut off the steam flow to each coil. The air flow should be continued through each coil until the outlet temperature drops to 200°C.

11) Remove the decoking spools on the outlet of the furnace and reinstall the quench fitting.

12) If the quench column is to be hot-air dried, do not remove the decoking spools on the inlet until that operation is complete.

13) Before feeding EDC to the furnace, purge the furnace coils with nitrogen until the oxygen content is 2% or less.

14) Fully open the block valve on each vapor inlet. Then car seal the valve handles.

GENERAL BLOCK II SAFETY

1) After any shutdown purge furnaces, lines, towers, pumps, and all equipment down to 2% oxygen or less before putting EDC in unit.

2) Pressure check unit with nitrogen for leaks. Check all bleeders to make sure they are all closed and not plugged.

3) A flammable vapor release can be prevented from reaching the furnace with a water spray (firewater monitors) or steam blanket between furnace and release.

4) If you have a product leak always wear goggles or if bad enough wear Scott air pack and try to stay up wind of leak to secure it.

5) Always wear goggles when catching samples.

6) Check all relief valves before a startup to make sure block valves under relief valves are sealed open.

7) The following are the explosive ranges for VCM and EDC:

	Lower Limit % VCM By Vol.	Upper Limit % VCM By Vol.
Air & VCM	4.0	22.0

	Lower Limit % EDC By Vol.	Upper Limit % EDC By Vol.
Air & EDC	6.2	15.9

8) The vinyl column is purged to less than 1,000 ppm to eliminate polymer formation.

OP-15

A

FURNACE SAFETY CHECK LIST

(To be used prior to a furnace startup)

1. Emergency shutdown switch

   Valves function properly_____

2. Furnace shutdown switch

   Valves function properly_____

3. Tube failure shutdown switch

   Valves function properly_____

4. Low fuel gas pressure--bleed out pressure transmitter at the fuel gas pressure control station.

   Pressure_____Valves function properly_____

5. Quench valve open at C-201_____

6. Gate valve to quench column open _____

7. EQ-1 latched up and unblocked A or B _____

8. EQ-2 latched up and unblocked A or B _____

9. EQ-3 latched up and unblocked A or B _____

Furnace A or B

Date_____

Foreman_____

RDG-BS
3-7-71

VALVE	SITUATION: EMERGENCY SHUTDOWN PULL TO STOP	FURNACE SHUTDOWN PULL TO STOP	HIGH DISCHARGE TEMPERATURE (SET @ 560°C)	LOW FUEL GAS PRESSURE (SET @ 5#)	POWER FAILURE	INSTRUMENT AIR FAILURE	EQ-3 EMERGENCY QUENCH AT 225°C	
MC-203 FUEL GAS TO FURNACE	C	C	C	C	C	C	C	
FRC-215 STEAM TO VAPORIZER	C	NC	NC	NC	C	C	NC	
LRC-225 EDC TO VAPORIZER	C	NC	NC	NC	C	C	NC	
V-205 EDC TO CONVECTION COIL	C	NC	NC	NC	C	C	NC	
V-201 CONVECTION VENT TO STORAGE	O	NC	NC	NC	O	O	NC	

V-204 EMERGENCY QUENCH @ 180°C	V-204 OPENS PARTIALLY EQ-2 (A&B)
" @ 225°C	FUEL GAS SHUTS OFF (V-203)
" @ 250°C	V-204 OPEN 100%

Loading Rack

A

CHIEF OPERATOR & PUMPER LOADER

LOADING RACK QUIZ

1) What is the blue flag law?

2) What protective gear is required when hooking up or unhooking a chlorine car?

3) What two items should be on track five when a chlorine car is hooked up?

4) Why is wind direction relative to unhooking a chlorine car?

5) Situation: A chlorine car has gone empty. There is another full car next to the empty. There are four empties on track 5. How will you remove the empty and hook up the full car?

6) What protective equipment is worn while loading a TEL car?

7) What is the main hazard to a man in loading a TEL car?

8) Why is personal hygiene so important during and after loading a TEL car?

9) How is the effects of handling TEL cars monitored in our plant?

10) Describe acceptable fittings and hoses for steam, air, nitrogen, chemicals used in our plant.

11) What is the rule concerning conversion adaptors on hoses?

12) What are the effects of high oxygen content in VCM?

13) Describe proper car purge procedure.

14) What is the most serious error involving a relatively minor injury you might commit? (As a CONOCO employee.)

15) What is the lower explosive limit of vinyl? EDC?

16) What effect does breathing chlorine fumes have on the body? (>1,000 ppm)

17) What effect does vinyl have on bare skin?

18) What possible effect could come from inhalation of EDC vapor?

19) Describe effects of caustic splash on body. In eyes.

20) What is the immediate first aid for any splash on body or eyes by any chemical?

21) What is the car limits for our trackmobile load? Why?

22) What is the rule concerning track signals you do not understand?

23) If you are in doubt about any safety rule, what should you do?

A

SAFETY CERTIFICATION

LOADING RACK

1) Before connecting any lines to a tank car, the wheels of the car must be securely chocked and the ground cable firmly attached.

2) Before connecting any lines the derail must be in service and the blue flag up. This should be on any track where there is connected cars.

3) Know the blue flag law. No traffic on the rails past a blue flag.

4) The blue flag should be on the north rail, east of derail and so positioned that it can be read by west bound traffic.

5) All road block chains and signs must be up when loading, unloading or purging is in progress.

6) Before a chlorine car is connected, the derail and blue flag must be in place and the gate on track five closed. The chlorine car must be disconnected before derail and sign are removed and gate opened.

7) The rated capacity of the Trackmobile is 300 tons. Do not move more than three loaded cars or four empties.

8) The trackmobile should be operated in low gear for our purpose. The possible exception to this is when spotting cars on track 5. This is uphill and does require a running start.

9) Do not hump cars or make flying switches. In other words, do not unhook a moving car.

10) Do not go between moving cars under any circumstances.

11) Do not move trackmobile unless person acting as switchman is accounted for.

12) Do not jump from cars.

13) Operator of Trackmobile should stop if he does not understand signals.

14) Attached is a work procedure for loading TEL cars. This procedure is to be strictly adhered to.

15) When sampling, connecting or disconnecting caustic, acid, chlorine or other corrosive chemical lines, Mono-goggles or face shield and chemical gloves must be worn. If the possibility of a splash exists, a rain suit must also be worn.

16) Before disconnecting any lines, bleed all pressure off and drain.

17) Never lean over the dip tube gauging device, as it is under pressure and could rise rapidly causing injury to head or body.

18) No loading, unloading or purging of tank cars or trucks is to be done if hot work is going on or vehicles are operating in the area. Either shut down the work or delay the loading as instructed by Shift Foreman.

19) All fittings, hoses and other equipment are to be kept in place and neatly stored when not in use. Loaders must check this at the start and end of each shift. It is a violation of safety practices to leave equipment laying around when not in use.

20) It is the responsibility of every employee to ask his supervisor for job safety instructions on every new job assignment or on any job assignment where he may not be completely familiar with the hazards involved.

21) Utility hose standards are as follows: The use of converting adaptors is strictly prohibited except, possibly, on a "one shot" basis specifically authorized by your supervisor

Service	Press. Rating	Color & Size	Type Conn.
Water	150 psi	Blue 3/4"	Air King
Air	300 psi	Green 3/4"	Thor
Nitrogen	250 psi	Green 1"	Cleco Series E
Chemical (Press)	Min. 100 psi	Black or SS	4 Bolt Flange or Quik Lok
Chemical (Non-Press.)	100 psi	Yellow 3/4"	Ever-Tite Quik Lok SS
Fire Hose	500 psi	Gold 1½ & 2½"	NST
Wash Down	-	Black 1½"	IPT
Steam or Condensate	300 psi @ 450°F	Black 1"	Boss Style GJ

22) In the "VCM Plant Safety Manual," there is a chapter on chemicals, produced or used in our plant, starting on Page 47. These should all be studied carefully. The following is some information you will be most concerned with at loading rack.

A) Vinyl Chloride Monomer (VCM)

Explosive Limits - 4 to 22% by volume
Fires should be controlled with water spray and treated as a pressure fire. (Cut off at source.) Burning vinyl gives off HCl vapor.

Breathing high concentrations of vinyl vapor causes dizziness.

Avoid all bodily contact and inhalation of vinyl. It causes burns by frostbite. Goggles and gloves should be worn when sampling, disconnecting loading lines, etc.

B) Ethylene Dichloride (EDC)

Explosive Limits - 6.2 to 15.9% by volume.
Inhalation of large amounts of EDC vapor may cause injury to internal organs.

Gloves and goggles are required in sampling and unhooking lines.

Spills and splashes on skin should be flushed with large amounts of water.

C) Chlorine (Cl_2) Liquid or Gas

Non-explosive and non-flammable.

Gloves and goggles are required in sampling, disconnecting, etc.

Chlorine is a strong irritant to the mucous membranes of the eyes and respiratory system. High concentrations can cause damage to the lungs and possibly death. Low concentrations are immediately detectable 3-5 ppm--and give warning that breathing apparatus is necessary. Avoid breathing chlorine fumes. Use breathing equipment.

Chlorine gas can form explosive mixtures with ethylene and other hydrocarbons.

D) Caustic Soda (NaOH) Either Liquid or Flake

Very corrosive to the body and causes severe chemical burns. Contact with the eye causes burns that are difficult to wash out. Speed in flushing caustic from eyes or skin is of primary importance. Removal of contaminated clothing is also necessary.

Rubber gloves, goggles, and face shield are required in hooking up and unhooking caustic cars. If real possibility of splash or leak exists, slicker suit is also required.

Caustic is not flammable, but gives off heat when being diluted with water.

E) Hydrogen Chloride (HCl)

Non-flammable - highly toxic.
Much the same as chlorine, but more irritating to exposed skin areas.
Goggles, gloves, slicker suits are required where there is a danger of leaks. Use large amount of water for flushing skin and eyes.
Masks and breathing equipment are required where inhalation is possible.

These basic rules should be remembered. Every liquid except pure water should be kept from contact with the skin. Do not inhale any gas or vapor except pure air.

23) Vinyl should not be admitted to a vessel with O_2 above 1,000 ppm for product purity reasons, and the possibility of creating an explosive mixture. Excess O_2 causes polymerization. This polymer causes cloudiness and other "off spec" byproducts and contaminated vessels and tank cars. Lower level O_2 content is required for tank cars that have been purged (< 100 ppm O_2) to insure the elimination of any air pockets.

24) The storage spheres T-411A, T-411B, T-411C and T-411D, and the check tanks are equipped with flow shutoff valves. These valves can be shut off from the control room either individually or all at once. The valves are located at the bottom of each sphere. There are two valves (inlet and outlet) on bottom of R-411D. The valves are equipped with Micro-switches that shut down the loading or transfer pumps when any one of all valves are closed. Pumps cannot be restarted until all valves are open.

25) The spheres are equipped with deluge sprays. These deluge systems may be activated by remote switches on the control room outside west wall and at remote locations in tank farm area. The switches are also equipped so that excessive temperature activates them (T-411D excepted). If any or all are activated, due to a malfunction, they will have to be manually blocked in.

26) The rupture disks and relief valves on all the spheres are the dual type. One can be taken out of service for maintenance work while the other remains in service. All sphere RD's and RV's are set for 100 psig.

27) All vinyl product for shipment must pass through, first the caustic bed (S-401), then through the bauxite bed (S-402). These insure a dry clear product. S-401 has an RV set at 310 psig. S-402 has an RV set at 200 psig. In addition there is a high pressure shutdown switch attached to S-402. It is set at 175 psig. When pressure reaches 175 psig the pumps shut down and can't be started until the pressure has been bleed down to approximately 125 psig. Product must be checked at exit of S-402 for clarity while loading.

28) Cars (vinyl atmos. only) to be inspected must first be depressured to the vent recovery system. They are pressured up to 35 to 40 psig with nitrogen three to four times and vented. When a car shows $< 3\%$ vinyl (below explosive limit) it is purged with plant air to 20% O_2. It is then ready for inspection.

When purging cars for loading, pressure up to 80 psig with nitrogen. Leak check with "snoop." Depressure and repressure to 35 to 45 psig. Do this four to five times each time checking O_2. Continue until O_2 content is ≤ 100 ppm.

29) EDC car loading. Car is grounded, chocked, etc. (normal for all cars that are being worked on at the rack). If the car already has an EDC atmosphere the loading hose is hung down inside the open dome. A heel of 8 to 12" is put in the car and sampled. If the sample meets or is near to shipment specs (H_2O color HCl), go ahead and load. If it is "off spec" pump off to wet storage and repeat until OK. Your supervisor will instruct on next step after each sample. All safety rules pertaining to handling EDC are to be strictly adhered to.

30) The following are a few rules that are to be strictly followed.

1) All cars being loaded, unloaded, or purged must be chocked and grounded.

2) Proper protective gear must be worn.

3) Non spark tools must be used at loading rack. (Brass hammers)

4) Blue flags and derails must be in position when loading, unloading, or purging cars.

5) Report all injuries no matter how minor.

General Safety Equip.

A

ORGANIC LEAD HAZARDS AND CONTROLS

Tetraethyl and tetramethyl lead (TEL and TML) are organic lead compounds used as an additive in gasoline to improve the antiknock quality. Both of these chemicals and any mixtures or blends containing them present certain serious health hazards if handled without specific engineering and protective equipment controls. It is the purpose of this writeup to outline the potential hazards of these compounds and to familiarize those involved with the protective controls necessary.

Health Hazards

Antiknock compounds, as they are used in refineries never contain pure TEL or TML. In addition to TEL and TML, these compounds contain EDC (ethylene dichloride), EDB (ethylene dibromide), kerosene, and toluene. They are in liquid form and are handled in totally enclosed systems.

Organic lead, to affect health must get inside the body. Inhalation of vapors, ingestion into the digestive system, and direct absorption of the liquid through the skin are the methods by which entry into the body is possible. The main concern in our plant will be the residual vapors in the empty tank cars we will be filling with EDC.

The effect of organic lead on the human body will depend on the exposure. This material is a powerful poison and can produce mild lead intoxication or death depending on the amount taken into the system. It can cause disability to the central nervous system and degeneration of the brain and other internal organs.

Protective Controls Necessary

In order to prevent the entry of lead into the body, there will be specific safety precautions and practices established. Due to the hazardous nature of the material, there will be no deviation from the prescribed procedure or protective equipment required.

The residual vapor in the car will be the main hazard associated with this operation. Physical equipment in the form of an elevated vent stack will take care of the bulk of these vapors. The required use of full face breathing air masks by all personnel in the area during loading will assure that inhalation of organic lead vapors will not occur.

It must be understood by all concerned that cannister type gas masks or pocket respirators are not a substitute for hose line breathing equipment in providing the necessary protection. This protective requirement applies not only to the operators doing the actual loading but to any observers or visitors who might be in the immediate area.

A

LOADING PROCEDURE

EDC INTO DUPONT CARS

The purpose of this procedure is to outline the method and steps to be followed by Operating personnel in safely and efficiently loading EDC into DuPont's organic lead cars. All work in loading these cars must be done with breathing air masks and PVC gloves.

1) Light weight all DuPont cars before loading starts. Record weight on loading sheet.

2) Spot car on Track 4, disconnect trackmobile, chock wheels and attach bonding clamp to car.

3) Before opening dome, check supply of breathing air, hose and breathing air masks. Also have clean PVC gloves and string barricades on loading rack.

4) Using breathing air mask and PVC gloves, open dome, remove blind and install the loading adaptor on the liquid line valve. Do not open valve on car.

5) Still using protective equipment, remove blind and install vent adaptor on the vapor valve. Do not open the car valve.

6) Screw the "dip stick" packing gland bushing into the vent adaptor, leaving the dip tube high enough to clear the vent valve ball.

7) Position the loading arm and make up the flange connection to the liquid line adaptor.

8) Close all valves on the vent adaptor and dip leg and then open ball valve on car vent. Once open, the dip leg can go through the valve and enter the car. Negative pressure should show on the compound gauge.

9) Line up EDC loading pump properly. Start pump and open car liquid valve. Then, open the loading rack valve slowly.

10) Most cars come to us with a slight vacuum. Keep all vent and dip leg valves closed until a slight pressure is indicated by the compound gauge on the vent adaptor.

11) Open the 3/4" ball valve on the vent adaptor once pressure is established so that displaced vapor from the car goes to the vent stack.

12) Hook up the small tubing from the small KO pot to the connection on the end of the dip leg tube. The block valve on the dip stick should be left closed.

13) Set dip stick approximately 6" below the final outage point.

14) By throttling the valve on the vent adaptor, set it such that approximately 5 to 7 psig is maintained on the car. Any higher pressure will reduce the loading rate.

15) By judgement and calculations from the pumping rate, the level should be checked when nearing the initial dip leg setting. Checking is done by opening the dip stick valve and observing the sight glass. At the first sign of liquid, close the valve and raise the dip stick to the final outage. Measurement should be from the top of the packing gland bushing to the ring near the top of the dip stick, and should be 13 3/4".

16) With the dip stick set at the final outage, open the dip stick valve. As soon as the EDC level in the car reaches the bottom of the dip stick, liquid will be observed in the sight glass. Immediately close the dip stick valve, close the valve in the EDC line on the loading rack and shut down the EDC loading pump.

17) Leave the vent valve on the vent adaptor open and allow the car to pressure through the vent system. Also leave the two valves on the car open.

18) When the car is depressured, open the dip stick valve and allow all liquid in the KO pot to flow back through the sight glass and into the car. The dip stick should be raised slightly to clear the liquid surface in the car.

19) Once depressured, the EDC remaining in the loading arm will flow into the car also.

20) Pull up the dip stick enough to clear the car vent valve seat and close the car vent valve.

21) Close the car loading valve after EDC in the line is drained into the car.

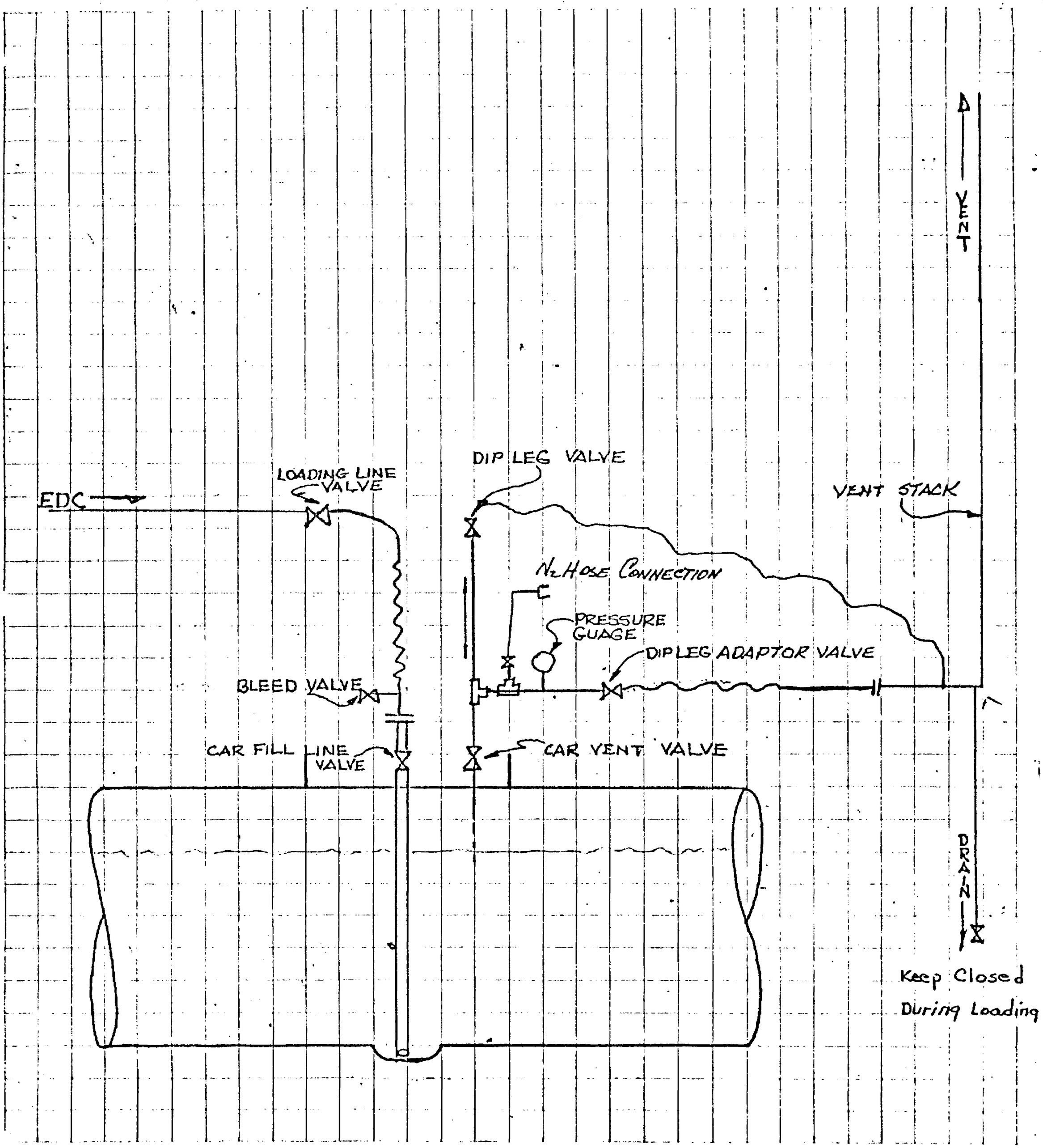
22) Disconnect each of the adaptors from the car and vent system and replace the original blinds.

23) Put EDC placards on the car, close and seal the dome, and disconnect the bond cable.

24) Remove the compound gauge from the vent adaptor and place the adaptor in the steam pot for decontamination. Adaptor should be steamed at least 30 minutes.

25) Before moving car, check the loading arm, hose and walkway to make sure they clear the car.

26) Weigh the loaded car and complete the loading report. New weight must be 275,000 pounds.



CONTINENTAL OIL COMPANY

CALCULATION SHEET

MADE BY

CHECKED BY

DATE

PAGE OF

TITLE

JOB NO.

FIELD

STATE

13-231-R9

VAB.0001150268

A

OFFICE

WELDING BAY

SHOP

ELECTRICAL SUB-STATION

COOLING TOWER

SHELL ROAD

LABORATORY

CONTROL ROOM

T-401A T-401B T-401C

VALVE STATION

T-410 T-411A T-411B T-411C T-453 T-450 T-45 T-423 T-421 T-422 T-452 T-440 T-405 T-402

VENT RECOVERY

VALVE STATION

WAREHOUSE

CHLORINE DETECTOR AREA

T-401B

RAIL LOADING AREA

SCALE HOUSE

FLAMETEK

HYDRANT & HOSE REEL

MONITOR

ISOLATING VALVE

FIRE WATER SYSTEM

FIGURE

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