

VAPOR DETECTOR SYSTEM

This write up details the EC/HCL control room vapor detector system as updated in June 1985.

EQUIPMENT DESCRIPTION

VAPOR DETECTOR CABINET - The cabinet housing the vapor detector modules, switches, and lights is divided into three sections. Each section will be referred to as a cabinet.

Cabinet 1A houses the following:

- a. Vapor detector modules for the EC process area and the EC/VDCM storage area. Those are numbered 1A-1 through 1A-14.
- b. Trip switches and bypass switches for the EC process sprinklers, EC water curtain and EC/VDCM storage area sprinklers.
- c. Lights for each bypass switch in cabinet 1A.
- d. Lamp/horn test button for all bypass and furnace shutdown lights and the audible alarm.
- e. Reset button for all vapor detectors. This will reset any vapor detector that is in the high or low alarm condition.
- f. Acknowledge button for all vapor detector alarms.

Cabinet 1B houses the following:

- a. Vapor detector modules for the 3 detectors located on the west and southwest sides of the VC furnace area. These are numbered 1B-4, 1B-8, 1B-19.
- b. Trip switches and bypass switches for the VC water curtain, the north-south piperack and the VC process sprinklers.
- c. A light for each bypass switch in cabinet 1B.
- d. Lights and a switch associated with the vapor detector/furnace shutdown system.

Cabinet 1C houses the following:

- a. Vapor detector modules for detectors in the VC storage and VC loading rack areas. These are numbered 1C-1 through 1C-21.

- b. Trip switches and bypass switches for the VC day tanks, VC spheres and VC loading rack sprinklers.
- c. A light for each bypass switch in cabinet 1C.

VAPOR DETECTORS - The vapor detectors themselves are field located units. Each unit consists of a filament. It is at the filament that combustion of the atmospheric vapors occurs. The resistance of the filament changes according to the amount of flammables in the vapors. This is what is seen as the deflection of the meter on the control panel module.

The control panel module is the part of the vapor detector that displays what is taking place. In addition to the meter display the module contains a "trouble" light. This indicates a malfunction in the detector and should be investigated by instrument personnel. A "power" light indicates power is supplied to the detector. The "trouble/power" pushbutton is a lamp test for the module and a calibration check on the meter. There is also a "high" alarm light and a "low" alarm light for the two alarm levels. This "high/low" pushbutton is a reset for the alarm condition on the individual detector.

PRINTER - The printer output is a hard copy printout of events that occur concerning the vapor detectors. The printout includes times, instrument identification numbers, the item involved (i.e., vapor detector location, bypass switch, shop alarm, trip switch sprinkler system) and the condition that occurred (i.e., low alarm, low clear, bypassed, normal, tripped, etc.).

The printer "on line" and "power" lights should be on at all times and paper should be kept available for it. The printer has standard feature of paper advance, reset and error display you should be aware of.

MONITOR - The televideo monitor gives a graphics display of vapor detectors in the area. It also gives the last incident occurring concerning the vapor detector system (similar to the printer). The monitor has four pages labeled 1 = EC process, 2 = VC/furnace, 3 = day tanks, 4 = LDG/spheres for each particular area. Each page shows the vapor detector locations of that area. An asterisk shows the individual locations. When a vapor detector low level alarm is received, this will be displayed as a blinking asterisk. A high level alarm will be displayed as an asterisk overlayed with a shaded rectangle. In addition, the occurrence will be noted at the bottom of the screen. A particular page can be viewed by simply pressing the number of the page desired. In the event of a vapor detector alarm the appropriate screen will automatically be displayed.

The monitor has two other features to be aware of. One is the reinitialize or re-boot procedure. This is done by simply pressing the #8 key. The other is setting the time. This is done by pressing the #9 key and putting in the time in military format.

OPERATING PROCEDURES

The vapor detectors in the area are designed to indicate the presence of vapors approaching the flammable range. This system is also linked to the various sprinkler systems to provide an automatic response that will result in dilution of the vapors, minimizing the explosion or fire potential.

ALARMS - There are two levels of alarm for the vapor detectors. The low or warning level alarm is received if vapors are detected that are 20% of the lower explosive limit (L.E.L.). The high, or action level, alarm is received when vapors are detected at 40% L.E.L. Both levels of alarm are indicated as such on the printer and monitor. On the vapor detector cabinet a low alarm is indicated as a yellow light on the module, and a high alarm as a red light. The needle on the module will deflect to the detected concentration on the scale reading 0-100% L.E.L. The audible alarm received is the same for either alarm level.

Lower Explosive Limits - Here are the lower explosive limits for the major chemicals in the area as volume percent: VCM - 4%, EC - 3.6%, ethylene - 3%, methane - 5.3%, EDC - 6.2%. As an example, a vapor detector in a high alarm condition has detected 40% L.E.L. of vapors. For VCM this would be about .04 x 4% or 1.6% by volume VC vapors. 100% L.E.L. would represent a flammable mixture.

SHOP ALARM - Several of the vapor detectors are tied to an alarm in the VC Maintenance Shop. See Attachment I. This alarm serves to notify the Maintenance personnel working in the shop that flammables are in the area and that sources of ignition should be shut down and evacuation may be necessary. If the vapor detectors tied to the VC shop alarm horn sound an alarm due to malfunction or maintenance work in the area, notify shop personnel at ext. 4750 or ext. 2735. Also notify them when the possibility of false alarms is over.

FRESH AIR BLOWER - There is a vapor detector at the fresh air blower inlet in the motor control center upstairs in the control building. The control module is located there also. If this vapor detector reaches a 40% L.E.L., the air blower will automatically shut down. An alarm for the shutdown sounds on the EC control panel. The module would then need to be reset.

SPRINKLER SYSTEM ACTIVATION - The various sprinkler systems are activated automatically by certain vapor detectors. See Attachment I for the list containing this information. The sprinkler systems are activated only upon reaching the 40% L.E.L. alarm level.

SHUT DOWN FUNCTIONS - Some of the vapor detectors are tied into a shutdown system that involves the VC/EC storage area pumps and isolation valves at the loading rack. The vapor detectors that are involved in this can be noted on Attachment I.

In summary, for the shutdown systems, when a 40% L.E.L. is obtained from a vapor detector tied to that system, the following occurs:

1. For the loading rack vapor detectors:
 - a. VC loading rack shutoff valves close for VC, EC and VDCM lines.
 - b. The EC transfer pumps, VC tank car loading pumps, the VDCM transfer pump and the VC circulating and transfer pumps shut off.
 - c. The VC dock loading pumps shut off.
 - d. Isolation valves on the VCM dock loading pumps, VC tank car, circulating and transfer pumps discharges close.
2. For the VC S-1, S-2 sphere area vapor detectors:
 - a. VC loading rack shut off valves close for VC lines.
 - b. The VC tank car loading pumps and the VC circulating and transfer pumps shut off.
 - c. The isolation valves on the pumps mentioned in (b) close.
 - d. The S-1 and S-2 inlet and outlet lines isolation valves close.

There is also a VC-I furnace shut down system still in service but details will not be discussed here due to its non-use.

BYPASS SWITCHES - The bypass switches are two-position switches. In the "normal" position, automatic activation of the respective sprinkler and/or shutdown system will occur if a 40% L.E.L. is obtained at a vapor detector. In the "bypass" position, automatic activation will not occur. ALL SWITCHES SHOULD BE KEPT IN THE "NORMAL" POSITION TO PROVIDE THIS AUTOMATIC RESPONSE. The bypass mode should be used only:

1. For malfunction of the system or for maintenance repair or proof test purposes.
2. In order to keep a spurious trip of the system from occurring due to a controlled, minimal, environmentally acceptable release of a flammable material that may be near a detector. (An example of this would be clearing the EC catalyst pot.)

Any time the bypasses are used this should be noted in the log book with the area involved, times bypassed and returned to normal, and reason for being bypassed. Also let Shipping, VCM-II personnel, or VDCM personnel know as applicable.

TRIP SWITCHES - The trip switches, when put in the trip mode, will immediately activate the respective sprinkler system and/or shutdown system. The trip switch trip mode will override the bypass mode. You can use this trip switch in the event that

sprinkler and/or shutdown systems have not been activated and need to be. Don't hesitate to use this function in the case of a fire or flammables release in an area.

RESPONSE PROCEDURE - When an alarm occurs the following actions should be taken:

1. Determine by inspection of the vapor detector cabinet, printer and televideo the location of the alarming detector and whether it is a low or high alarm and the magnitude of the flammables detected.
2. Verify that the bypass switch is in the normal mode so that an automatic trip of sprinklers or shutdown systems will occur if needed.
3. Push the alarm acknowledge button if time allows. Do not press any reset at this point.
4. Determine if a leak exists while simultaneously getting VCM-II, Shipping or VDCM personnel involved if their respective areas are involved.
5. If a leak does exist:
 - a. Take proper emergency response actions as required to:
 1. Evacuate and secure the area.
 2. Communicate to others involved the location and nature of the leak.
 3. Isolate and stop the leak.

These steps may require the manual trip of sprinklers and shutdown systems, use of plant or unit evacuation horns and road lights, red phone communications and use of proper respiratory equipment.
 - b. Once the leak is stopped and the area is clear:
 1. The vapor detector(s) can be reset either individually or by using the main reset buttons. The main reset can be used only if no other unrelated alarms were received.
 2. Sprinkler systems may need to be reset.
6. If a leak does not exist and the alarm is determined to be a vapor detector system malfunction:
 - a. Bypass the sprinkler system for the area pertaining to that detector.

- b. Notify VCM-II, Shipping or VDCM personnel of this if th ir area is affected.
- c. If the bypassing affects VC storage or loading areas, this will need attention as soon as possible since the shutdown systems will be affected.
- d. Sprinkler systems may need to be reset.
- e. Record the malfunction in the log book and notify supervision of this.

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ATTACHMENT I

VAPOR DETECTOR SYSTEMVAPOR DETECTORSPRINKLER AND SHUTDOWN SYSTEM ACTIVATEDCABINET 1A

	<u>EC PROCESS</u>	<u>EC WATER CURTAIN</u>	<u>EC/VDCM DAY TANKS</u>
1. SW VDCM DAY TANKS			X
2. SE VDCM DAY TANKS			X
3. SE EC DAY TANKS			X
4. VDCM LOADING PUMPS			X
5. SW EC DAY TANKS			X
6. NW EC DAY TANKS			X
7. EC LOADING PUMPS			X
8. S REACTOR PUMP	X	X	
9. HEAVIES STILL REFLUX PUMPS	X	X	
10. PRODUCT SURGE TANK	X	X	
11. PRIMARY STRIPPER FEED PUMPS	X	X	
12. HEAVIES STILL FEED PUMPS	X	X	
13. CATALYST POT	X	X	
14. N REACTOR PUMP	X	X	

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<u>CABINET 1C</u>		<u>VC DAY TANKS</u>	<u>VC SPHERES</u>	<u>VC LOADING RACK</u>	<u>VC SHOP ALARM</u>
1.	SE EAST LOADING RACK			X	
2.	MID/E LOADING RACK			X	
3.	MID/E LOADING RACK			X	
4.	MID/W LOADING RACK			X	
5.	NE LOADING RACK			X	
6.	NW LOADING RACK			X	
7.	MID/W LOADING RACK			X	
8.	SW LOADING RACK			X	
9.	E VC SPHERE PUMPS		X		
10.	W VC SPHERE PUMPS		X		
11.	NW VC DAY TANKS	X			X
12.	MID/W VC DAY TANKS	X			
13.	SW VC DAY TANKS	X			
14.	SE VC DAY TANKS	X			
15.	MID/E VC DAY TANKS	X			
16.	NE VC DAY TANKS	X			X
17.	VC TRANSFER PUMPS	X			
18.	NE VC SPHERE #1		X		X
19.	SW VC SPHERE #1		X		
20.	NE VC SPHERE #2		X		X
21.	SW VC SPHERE #2		X		

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<u>CABINET 1B</u>	<u>VC WATER CURTAIN</u>	<u>VC PROCESS</u>	<u>N-S PIPE RACK</u>	<u>SHOP ALARM</u>
4. SW VC FURNACE	X		X	X
8. SW VC PROCESS	X	X		X
19. SW VC CRACKERS MAIN ROAD				X

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VAPOR DETECTOR SYSTEM

This write up details the EC/HCL control room vapor detector system as updated in June 1985.

EQUIPMENT DESCRIPTION

VAPOR DETECTOR CABINET - The cabinet housing the vapor detector modules, switches, and lights is divided into three sections. Each section will be referred to as a cabinet. ✓ *

Cabinet 1A houses the following:

- a. Vapor detector modules for the EC process area and the EC/VDCM storage area. Those are numbered 1A-1 through 1A-14.
- b. Trip switches and bypass switches for the EC process sprinklers, EC water curtain and EC/VDCM storage ~~from~~ AREA ✓ *
- c. Lights for each bypass switch in cabinet 1A.
- d. Lamp/horn test button for all bypass and furnace shutdown lights and the audible alarm.
- e. Reset button for all vapor detectors. This will reset any vapor detector that is in the high or low alarm condition.
- f. Acknowledge button for all vapor detector alarms.

Cabinet 1B houses the following:

- a. Vapor detector modules for the 3 detectors located on the west and southwest sides of the VC furnace area. These are numbered 1B-4, 1B-8, 1B-19.
- b. Trip switches and bypass switches for the VC water curtain, the north-south piperack and the VC process sprinklers.
- c. A light for each bypass switch in cabinet 1B.
- d. Lights and a switch associated with the vapor detector/furnace shutdown system.

Cabinet 1C houses the following:

- a. Vapor detector modules for detectors in the VC storage and VC loading rack areas. These are numbered 1C-1 through 1C-21.

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- b. Trip switches and bypass switches for the VC day tanks, VC spheres and VC loading rack sprinklers.
- c. A light for each bypass switch in cabinet 1C.

VAPOR DETECTORS - The vapor detectors themselves are field located units. Each unit consists of a filament. It is at the filament that combustion of the atmospheric vapors occurs. The resistance of the filament changes according to the amount of flammables in the vapors. This is what is seen as the deflection of meter on the control panel module.

The control panel module is the part of the vapor detector that displays what is taking place. In addition to the meter display the module contains a "trouble" light. This indicates a malfunction in the detector and should be investigated by instrument personnel. A "power" light indicates power is supplied to the detector. The "trouble/power" pushbutton ~~itself~~ is a lamp test for the module and a calibration check on the meter. There is also a "high" alarm light and a "low" alarm light for the two alarm levels. This "high/low" pushbutton is a reset for the alarm condition on the individual detector.

PRINTER - The printer output is a hard copy printout of events that occur concerning the vapor detectors. The printout includes times, instrument identification numbers, the item involved (i.e., vapor detector location, bypass switch, shop alarm, trip switch sprinkler system) and the condition that occurred (i.e., low alarm, low clear, bypassed, normal, tripped, etc.).

The printer "on line" and "power" lights should be on at all times and paper should be kept available for it. The printer has standard feature of paper advance, reset and error display you should be aware of.

MONITOR - The televideo monitor gives a graphics display of vapor detectors in the area. It also gives the last incident occurring concerning the vapor detector system (similar to the printer). The monitor has four pages labeled 1 = EC process, 2 = VC/furnace, 3 = day tanks, 4 = LDG/spheres for each particular area. Each page shows the vapor detector locations of that area. An asterisk shows the individual locations. When a vapor detector low level alarm is received, this will be displayed as a ~~bunking~~ asterisk. A high level alarm will be displayed as an asterisk overlayed with a shaded rectangle. In addition, the occurrence will be noted at the bottom of the screen. A particular page can be viewed by simply pressing the number of the page desired. In the event of a vapor detector alarm the appropriate screen will automatically be displayed.

The monitor has two other features to be aware of. One is the reinitialize or re-boot procedure. This is done by simply pressing the #8 key. The other is setting the time. This is done by pressing the #9 key and putting in the time in military format.

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PARAGRAPH 4. on next line*

OPERATING PROCEDURES - The vapor detectors in the area are designed to indicate the presence of vapors approaching the flammable range. This system is also linked to the various sprinkler systems to provide an automatic response that will result in dilution of the vapors, minimizing the explosion or fire potential.

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ALARMS - There are two levels of alarm for the vapor detectors. The low or warning level alarm is received if vapors are detected that are 20% of the lower explosive limit (L.E.L.). The higher, or action level, alarm is received when vapors are detected at 40% L.E.L. Both levels of alarm are indicated as such on the printer and ~~teletype~~ *teletype*. On the vapor detector cabinet a low alarm is indicated as a yellow light on the module, high alarm as a red light. ~~Also~~ the needle on the module will deflect to the detected concentration on the scale reading 0-100% L.E.L. The audible alarm received is the same for either alarm level.

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Lower Explosive Limits - Here are the lower explosive limits for the major chemicals in the area as volume percent: VCM - 4%, EC - 3.6%, ethylene - 3%, methane - 5.3%, EDC - 6.2%. As an example, a vapor detector in a high alarm condition has detected 40% L.E.L. of vapors. For VCM this would be about $4 \times 4\%$ or 1.6% by volume VC vapors. 100% L.E.L. would represent a flammable mixture.

SHOP ALARM - Several of the vapor detectors are tied to an alarm in the VC Maintenance Shop. See Attachment I. This alarm serves to notify the Maintenance personnel working in the shop that flammables are in the area and that sources of ignition should be shut down and evacuation may be necessary. ~~off, due to malfunction or maintenance work the vapor detectors tied to the shop alarm may alarm, notify shop personnel at ext. 2735 or 4750 of this.~~ Also notify them when the possibility of false alarms ~~are over.~~ *are over.*

FRESH AIR BLOWER - There is a vapor detector at the fresh air blower inlet in the motor control center upstairs in the control building. The control module is located there also. If this vapor detector reaches a 40% L.E.L., the air blower will automatically shut down. An alarm for the shutdown sounds on the EC control panel. The module would then need to be reset.

SPRINKLER SYSTEM ACTIVATION - The various sprinkler systems are activated automatically by certain vapor detectors. See Attachment I for the ~~(2??)~~ containing this information. The sprinkler systems are activated only upon reaching the 40% L.E.L. alarm level.

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2. and*

SHUT DOWN FUNCTIONS - Some of the vapor detectors are tied into a shutdown system that involves the VC/EC storage area pumps and isolation valves at the loading rack. The vapor detectors that are involved in this can be noted on Attachment I.

In summary, ~~of~~ the shutdown systems, when a 40% L.E.L. is obtained from a vapor detector tied to that system, the following occurs:

1. For the loading rack vapor detectors:
 - a. VC loading rack shutoff valves close for VC, EC and VDCM lines.
 - b. The EC transfer pumps, VC tank car loading pumps, the VDCM transfer pump and the VC circulating and transfer pumps shut off.
 - c. The VC dock loading pumps shut off.
 - d. Isolation valves on the VCM dock loading pumps, VC tank car, circulating and transfer pumps discharges close.
2. For the VC S-1, S-2 sphere area vapor detectors:
 - a. VC loading rack shut off valves close for VC lines.
 - b. The VC tank car loading pumps and the VC circulating and transfer pumps shut off.
 - c. The isolation valves on the pumps mentioned in (b) close.
 - d. The S-1 and S-2 inlet and outlet lines isolation valves close.

There is also a VC-I furnace shut down system still in service but details will not be discussed here due to its non-use.

BYPASS SWITCHES - The bypass switches are two ^{bypass} position switches. In the "normal" position, automatic activation of the respective sprinkler and/or shutdown system will occur if a 40% L.E.L. is obtained at a vapor detector. In the "bypass" position, automatic activation will not occur. ALL SWITCHES SHOULD BE KEPT IN THE "NORMAL" POSITION TO PROVIDE THIS AUTOMATIC RESPONSE. The bypass mode should be used only ~~when~~ ^{unduh}

1. ~~A~~ malfunction of the system ~~occurs~~ or for maintenance repair or proof test purposes.
2. In order to keep a spurious trip of the system from occurring due to a controlled, minimal, environmentally acceptable release of a flammable material that may be near a detector. *(An example of this would be cleaning the EC catalyst pot.)*

Any time the bypasses are used this should be noted in the log book with the area involved, times bypassed and returned to normal, and reason for being bypassed. Also let Shipping, VCM-II personnel, or VDCM personnel know as applicable.

TRIP SWITCHES - The trip switches, when put in the trip mode, will immediately activate the respective sprinkler system and/or shutdown system. The trip switch trip mode will override the bypass mode. You can use this trip switch in the event that

sprinkler and/or shutdown systems have not been activated and need to be. Don't hesitate to use this function in the case of a fire or flammables release in an area.

RESPONSE PROCEDURE - When an alarm occurs the following actions should be taken:

1. Determine by inspection of the vapor detector cabinet, printer and televideo the location of the alarming detector and whether it is a low or high alarm and the magnitude of the flammables detected.
2. Verify that the bypass switch is in the normal mode so ~~that the~~ automatic trip of sprinklers or shutdown systems will occur if needed.
3. Push the alarm acknowledge button if time allows. Do not press any reset at this point.
4. Determine if a leak exists while simultaneously getting VCM-II, Shipping or VDCM personnel involved if their respective areas are involved.
5. If a leak does exist:

- a. Take proper emergency response actions as required to:

1. Evacuate and secure the area.
2. Communicate to others involved the location and nature of the leak.
3. Isolate and stop the leak.

These steps may require the manual trip of sprinklers and shutdown systems, use of plant or unit evacuation horns and road lights, red phone communications and use of proper respiratory equipment.

- b. Once the leak is stopped and the area is clear:

1. The vapor detector(s) can be reset either individually or ^{by} using the main reset buttons. The main reset can be used only if no other unrelated alarms were received.
2. Sprinkler systems may need to be reset.

6. If a leak does not exist and the alarm is determined to be a vapor detector system malfunction:

- a. Bypass the sprinkler system for the area pertaining to that detector.

- b. Notify VCM-II, Shipping or VDCM personnel of this if their area is affected.
- c. If the bypassing affects a VC storage or loading area this will need attention as soon as possible. ~~THE SHOT DOWN SYSTEMS WILL BE AFFECTED.~~ J/NUC *
- d. Sprinkler systems may need to be reset.
- e. Record the malfunction in the log book and notify supervision of this.

ATTACHMENT I

VAPOR DETECTOR SYSTEMVAPOR DETECTORSPRINKLER AND SHUTDOWN SYSTEM ACTIVATEDCABINET 1A

	<u>EC</u> <u>PROCESS</u>	<u>EC</u> <u>WATER</u> <u>CURTAIN</u>	<u>EC/VDCM</u> <u>DAY</u> <u>TANKS</u>
1. SW VDCM DAY TANKS			X
2. SE VDCM DAY TANKS			X
3. SE EC DAY TANKS			X
4. VDCM LOADING PUMPS			X
5. SW EC DAY TANKS			X
6. NW EC DAY TANKS			X
7. EC LOADING PUMPS			X
8. S REACTOR PUMP	X	X	
9. HEAVIES STILL REFLUX PUMPS	X	X	
10. PRODUCT SURGE TANK	X	X	
11. PRIMARY STRIPPER FEED PUMPS	X	X	
12. HEAVIES STILL FEED PUMPS	X	X	
13. CATALYST POT	X	X	
14. N REACTOR PUMP	X	X	

ADD
LINE *
OR
DOUBLE
ALL LINES

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<u>CABINET 1C</u>		<u>VC DAY TANKS</u>	<u>VC SPHERES</u>	<u>VC LOADING RACK</u>	<u>VC SHOP ALARM</u>
1.	SE EAST LOADING RACK			X	
2.	MID/E LOADING RACK			X	
3.	MID/E LOADING RACK			X	
4.	MID/W LOADING RACK			X	
5.	NE LOADING RACK			X	
6.	NW LOADING RACK			X	
7.	MID/W LOADING RACK			X	
8.	SW LOADING RACK			X	
9.	E VC SPHERE PUMPS		X		
10.	W VC SPHERE PUMPS		X		
11.	NW VC DAY TANKS	X			X
12.	MID/W VC DAY TANKS	X			
13.	SW VC DAY TANKS	X			
14.	SE VC DAY TANKS	X			
15.	MID/E VC DAY TANKS	X			
16.	NE VC DAY TANKS	X			X
17.	VC TRANSFER PUMPS	X			
18.	NE VC SPHERE #1		X		X
19.	SW VC SPHERE #1		X		
20.	NE VC SPHERE #2		X		X
21.	SW VC SPHERE #2		X		

ADD
LINES
OR
REMOVE
SIGNAL
LINES

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<u>CABINET 1B</u>	<u>VC WATER CURTAIN</u>	<u>VC PROCESS</u>	<u>N-S PIPE RACK</u>	<u>SHOP ALARM</u>
4. SW VC FURNACE	X		X	X
8. SW VC PROCESS	X	X		X
19. SW VC CRACKERS MAIN ROAD				X

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