Vaporsaver 1

Installation Manual – ATEX

99-50510 09APR2009

ATTENTION INSTALLER:

READ AND UNDERSTAND THIS IMPORTANT SAFETY INFORMATION BEFORE BEGINNING WORK

This product is to be installed and operated near the highly combustible environment of a gasoline storage tank and gasoline dispensing. It is essential for your safety and the safety of others that you carefully read, understand, and follow the warnings and instructions in this manual. Failure to do to so could result in danger to life and property including death, serious injury, explosion, fire or electric shock.

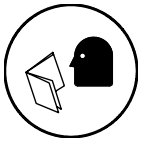
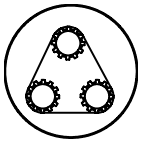
Failure to install this product in accordance with the instructions and warnings in this manual as well as failure to follow the requirements of the National Electric Code, national, state, and local codes will result in voiding warranties of this product.

Only OPW trained and certified technicians are to install and start-up the system. An OPW trained and certified technician shall start-up the system only after careful inspection of the installation, and completion of the start-up check list.

It is your responsibility to install this product in accordance with the instructions and warnings in this manual.

Safety Symbols

The following safety symbols may be used throughout this manual to alert you to important precautions and safety hazards that may arise during the installation and operation of this product.

	**ELECTRICITY** A potential shock hazard exists. High voltage is supplied to and exists in this device.		**TURN POWER OFF** Turn power off to the device and its accessories when installing and servicing the unit. Live power creates a potential spark hazard.
	**EXPLOSIVE** Gasoline and its vapor are extremely explosive if ignited.		**NO POWER TOOLS** Sparks from electric power tools can ignite gasoline and its vapors.
	**FLAMMABLE** Gasoline and its vapors are extremely flammable.		**NO PEOPLE IN THE AREA** Unauthorized people in the work area during installation and service of the device create a potential for personal injury.
	**NO SMOKING** Gasoline and its vapors can be ignited by sparks and embers of burning cigarettes.		**READ ALL RELATED MANUALS** Read, understand and follow all instructions, warnings and requirements before you begin work.
	**NO OPEN FLAMES** Open flames from sources like lighters, matches, etc. can ignite gasoline and its vapors.		**USE SAFETY BARRICADES** Unauthorized people or vehicles in the work area create a potential for injury and danger to property. Always isolate your work area by using safety cones, barricades, etc.
	**PINCH RISK** Stay clear. Keep hands and tools away from rotating machinery and moving parts.		**ROTATING MACHINERY** Stay clear. Keep hands and tools away from rotating machinery.

Declaration of Conformity

We, OPW Fueling Components, hereby declare that the product listed below, to which this Declaration of Conformity relates, is in conformity with Directives, Standards and other Normative Documents as listed.

- Potentially Explosive Atmospheres Directive 94/9/EC
- EN 13617-1:2004
- EN 1127:1998

EC Type-Examination Certificate: SIRA 03ATEX9535

Notified Body: SIRA Notified Body No. 0518

Equipment marking: ε_x II 2G

Type of Product: Tank Pressure Management System

Product Name: Vaporsaver 1

Model/Part number: 00-50003 - ATEX/TuV 60hz
00-50004 - ATEX/TuV 50hz

Manufacturer: OPW Fueling Components
P.O. Box 405003
Cincinnati, OH 45240
USA

Place/Date of issue: Cincinnati, Ohio 2/19/08
Signed:

Brandon Grote
Product Manager, Dispensing Systems

OPW Fueling Components

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ISO 9001
CERTIFICATION NO.
12 100 5037

Quality Statement

OPW Fueling Components will provide defect-free products and services meeting the requirements of our customers and each other.

Table of Contents

1.0 Introduction

WARNING: Only OPW trained and certified technicians are to start-up the system. An OPW certified technician shall start-up the system only after careful inspection of the installation, and verification and completion of the start-up check list.

Do not power up the system unless a complete start-up inspection is completed by an OPW certified technician.

1.1 Control System Description

The OPW Vaporsaver reduces hydrocarbon emissions from a gasoline refueling facility by controlling the storage tank pressure. Tank pressure management is achieved by releasing air from the storage tanks, while recycling the gasoline vapor. The recycling that takes place accomplishes three benefits. First, by returning vapor to the storage tank in a supersaturated form, evaporative emissions are greatly reduced. Second, during the recycling process, liquid gasoline is created and returned to the storage tank. Third, by releasing the air (and saving the gasoline), the pressure in the storage tank is reduced, and vapor emissions to the atmosphere due to venting or fugitive emissions become insignificant.

Pressure in the storage tank will rise due to thermal and pressure affects of the day, by the introduction of air from filling vehicles (larger pressurization occurs with ORVR equipped vehicles), or from Stage I deliveries.
Without the OPW Tank Pressure Management System:

- Ingested air from vehicles can evaporate the liquid product, and cause an increase in UST pressure.
- Increased pressure from all sources will be released from the UST's to the atmosphere through leaks in the vapor piping, components, and P/V vents.

1.2 Normal Operating Conditions (What the System Does)

1. The Control System turns on when the UST pressure increases to approximately +0.4 mbar gage (+0.15 inches of water column) pressure.
2. It turns off in the following conditions
    a. When UST pressure is reduced to approximately -2.5 mbar gage (-1.0 inches of water column) vacuum.
    b. The Control System is also designed to only operate 10 minutes continuously. After a 10 minute run, the Control System shuts down for 2 minutes, and will start again if tank pressure requires it. This allows the separator to drain returning liquid product to the storage tank. As well as not allowing the Control System to run excessively if the vapor space has significant leaks.
3. The Residue is the fresh air being released from the Control System. It is continuously monitored for the presence of hydrocarbons to ensure it is below the allowable limit.
4. The Vaporsaver, when installed and operated as designed, is approved by TUV (minimum 97% efficiency); it also will allow any Stage II Vapor Recovery System to meet both the ORVR compatibility and the CARB emission requirement with the nominal A/L = 1.00 (Maximum A/L = 1.10).

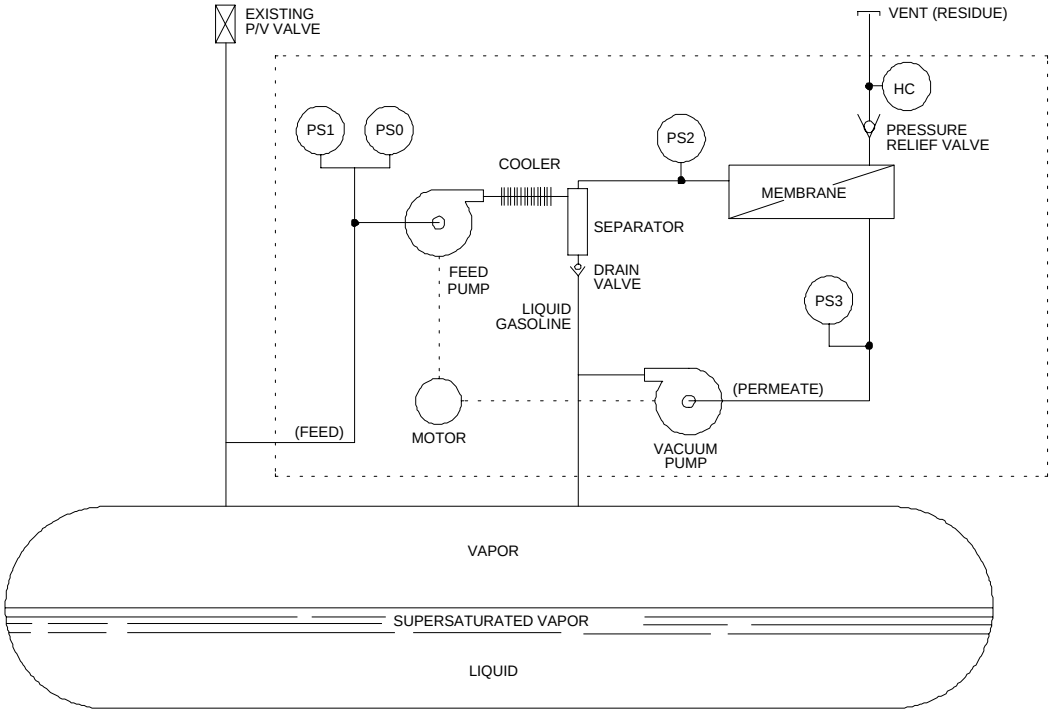
5. The Permeate being returned to the UST after vapor/air separation will consist of super saturated vapor and some condensed gasoline liquid.
6. There are many variables that influence how long the Vaporsaver will operate per day at any given site. These variables would include:
    a. station dispensing volume
    b. number and duration of drops
    c. fuel vapor pressure
    d. fuel temperature
    e. barometric pressure and temperature
    f. vapor tightness of the Stage I and Stage II Systems
    g. storage tank ullage
7. The amount of operating time per day can vary from station to station, as well as from day to day at the same station. A seemingly significant variation from day to day should not be a concern. The Vaporsaver is self-monitoring; if a fault arises, an alarm will sound.

2.0 Operation (How It Works)

As pressure in the storage tank rises, the pressure sensor monitoring the tanks will start the Vaporsaver Control System.

1. The feed pump draws the vapor/air (saturated vapor) mixture from the storage tank.
2. The vapor/air flow is pressurized.
3. Increasing pressure within the same volume causes the vapor stream temperature to rise.
4. The heated vapor stream passes through a heat exchanger.
5. The heat exchanger reduces the vapor stream to ambient temperature.
6. The cooling process causes liquid gasoline to condense.
7. The vapor/air mixture and liquid gasoline go to a separator.
8. The liquid gasoline is separated, removed from the vapor/air mixture, and stored for later removal and return to the storage tank.
9. The remaining vapor/air flow proceeds to the membrane.
10. The membrane material has two sides, a pressure (feed) side, and a vacuum (permeate) side.
11. As hydrocarbon molecules pass along the membrane pressure side, they absorb into the membrane material.
12. Air molecules are repelled by the membrane surface on the pressure side, and continue on until released from the Control System as clean air (residue).
13. The pressure differential between the pressure side and the vacuum side cause the hydrocarbon molecules to be drawn through the membrane material.
14. The vacuum pump returns the supersaturated gasoline vapor (permeate) to the storage tank where some of it will condense into liquid gasoline.
15. When the pressure in the storage tank is reduced a preset level, the Control System is shut down and put into stand-by mode waiting for the pressure to rise again.
16. The separator valve is then opened, and the stored gasoline liquid in the separator is released to the UST.

VAPORSAVER 1 CONTROL SYSTEM
OPERATION SCHEMATIC



NOTE: ONLY VAPOR LINES SHOWN

MD-VR020

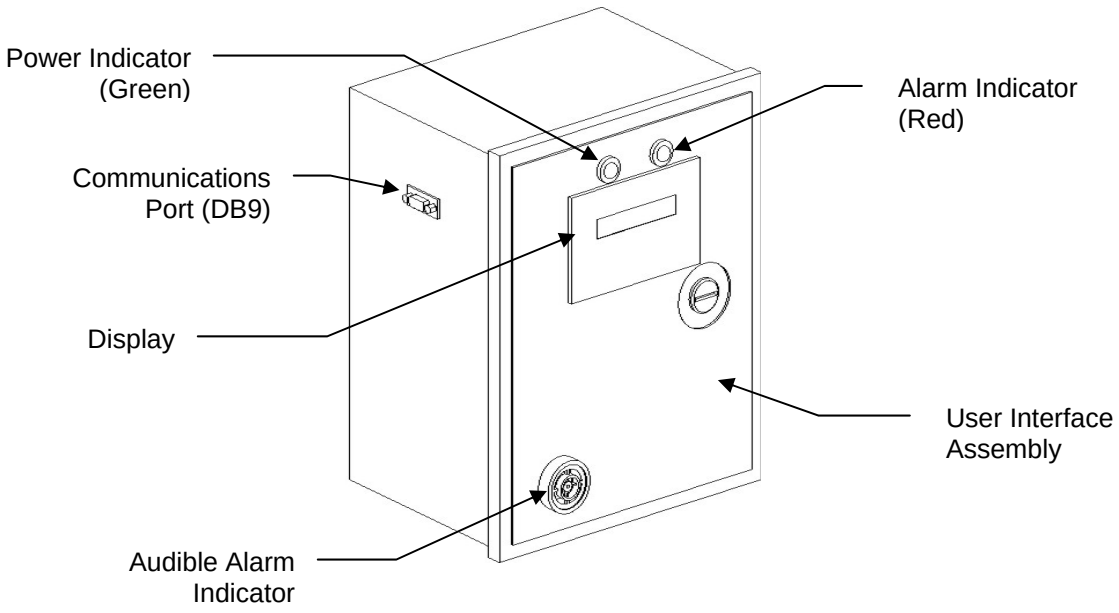
3.0 Component Identification

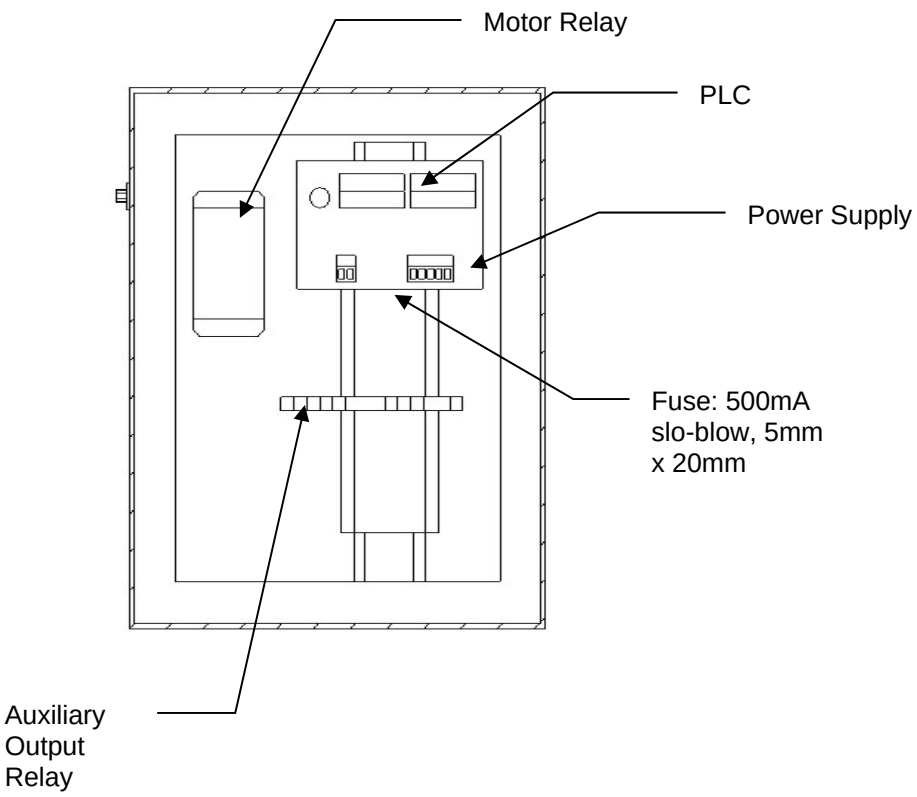
The Vaporsaver 1 consists of two major components: The User Interface and the Control System. The User Interface is the logic center of the system. It allows for interaction with the system for monitoring system status information, setting initial site configuration, and accessing recorded system history. The Control System is the active tank pressure management component which houses the pumps, motor, monitoring sensors and the membrane.

3.1 User Interface

The User Interface incorporates the following features:

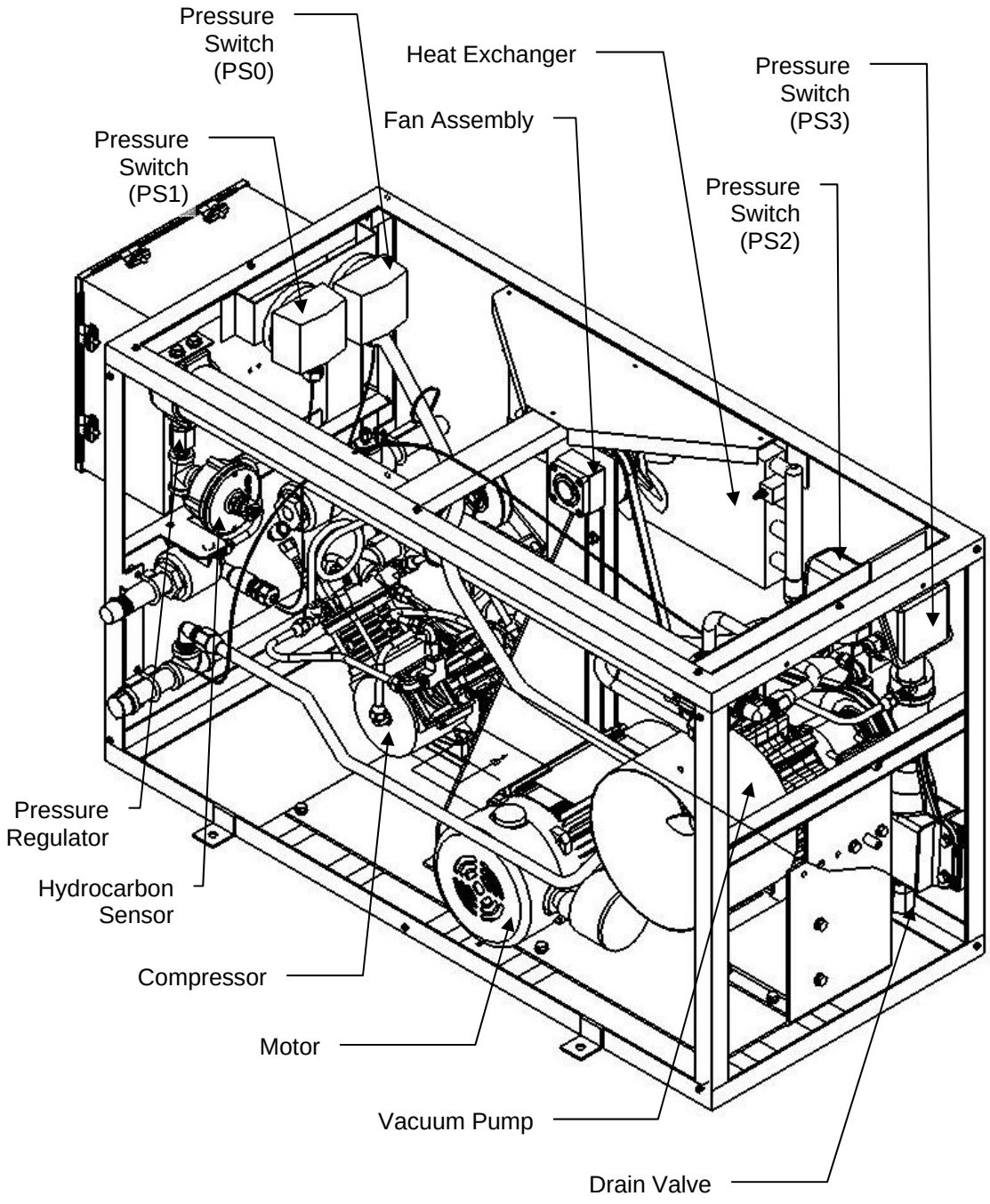
- Indicator lamps (Green - Power, Red – Alarm / Warning)
- Liquid crystal display (2 lines x 16 characters per line)
- A four button key pad
- Audible alarm indicator
- Auxiliary output alarm relay
- Port for serial communications (DB9, local or remote access)
- Operating temperature range: 0°C to 40°C (32° F to 104°F)

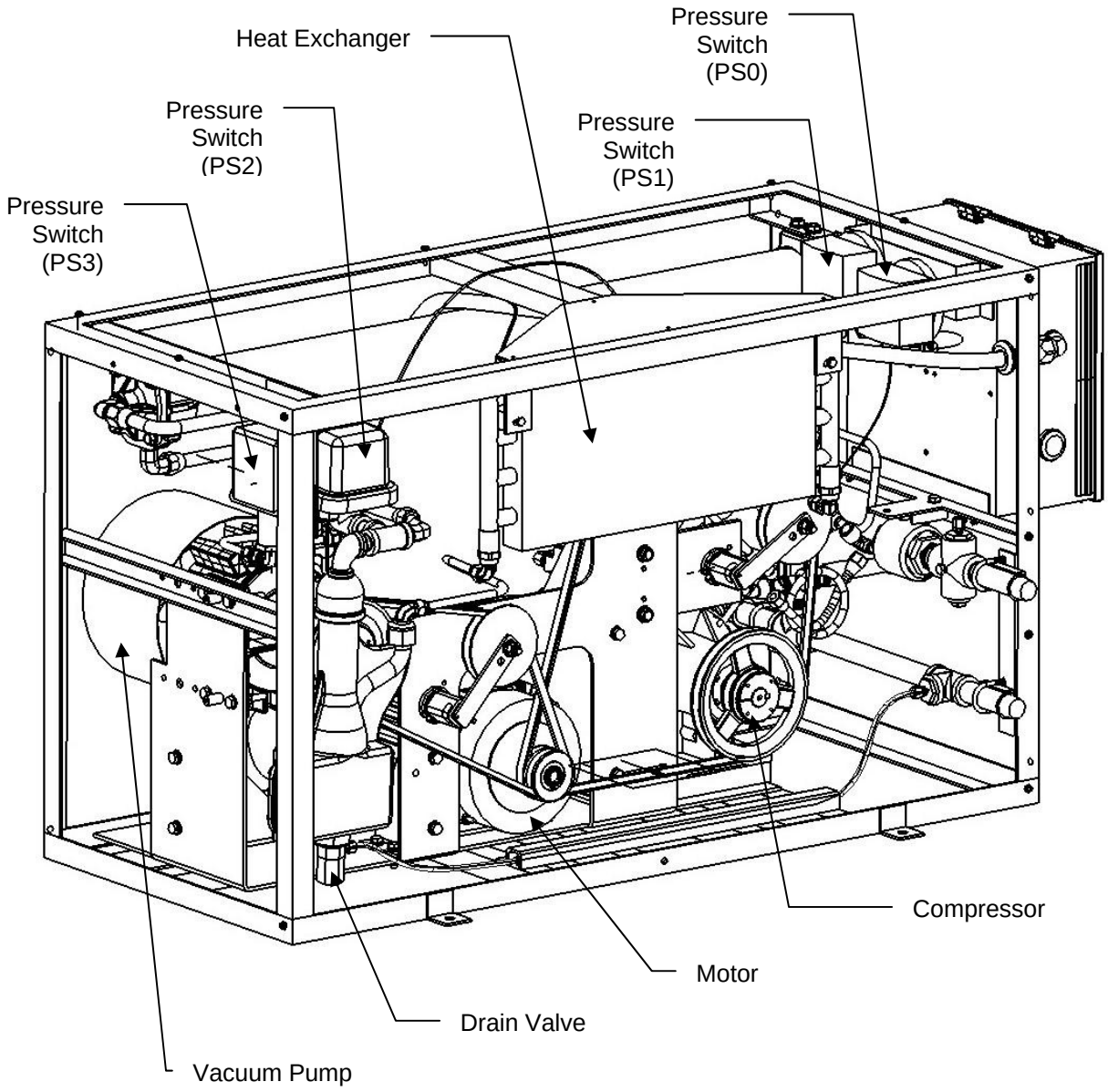



Motor Relay
PLC
Power Supply
Fuse: 500mA
slo-blow, 5mm
x 20mm
Auxiliary
Output
Relay

3.2 Control System

Nominal operating temperature range: -20°C to 50°C (-4° F to 120°F). Occasional and short-term excursions beyond this nominal range are acceptable, and will not cause damage to the unit.




Heat Exchanger
Pressure Switch (PS0)
Pressure Switch (PS2)
Pressure Switch (PS1)
Pressure Switch (PS3)
Compressor
Motor
Drain Valve
Vacuum Pump

4.0 Component Location

4.1 User Interface Location

	**WARNING: Installation of this product must comply with the National Electric Code, federal, state and local codes, as well as other applicable safety codes.**

WARNING

The User Interface enclosure must be installed in a non-Hazardous location. Explosion or fire resulting in serious injury or death, or property loss or damage could occur if the User Interface is installed in a Hazardous location.

Do not install User Interface enclosure in a combustible or explosive atmosphere (Class IIA, Zone 0, Zone 1, or Zone 2; Class 1, Division 1 or Division 2).

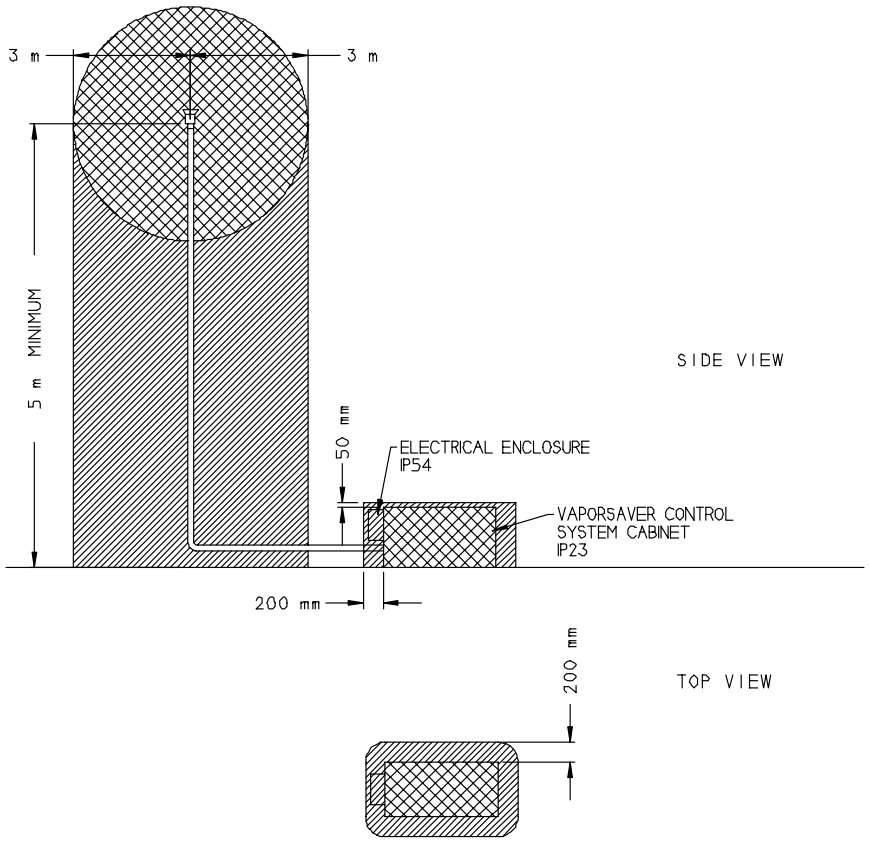
1. User Interface electrical enclosure must be installed indoors and protected from the weather.
2. The enclosure must be installed so station personnel can hear the audible alarm.
3. There must be clear access to the enclosure so station personnel can interact with it.
4. All conduit connections must be made through the factory provided knockouts in the bottom of the enclosure. All unused knockouts must be plugged. Use only rigid conduit.
5. There is a serial port on the side of the enclosure for downloading data to a computer locally or via modem.
6. There are no end user serviceable parts within the User Interface enclosure.
7. The User Interface enclosure is 250 mm (10 inches) high, 200 mm (8 inches) wide, and 150 mm (6 inches) deep.

4.2 Control System Location

WARNING: Installation of this product must comply with all Nationally recognized standards, federal, state and local codes, as well as all other applicable safety codes for the country of installation.

1. A Hazardous Location is created by the Vaporsaver Control System.
2. Hazardous Location: Zone 2 within 200 mm of all sides of the equipment cabinet, and 50 mm above the cabinet.
3. The clean air Residue vent must be installed a minimum of 5 meters above grade, and creates a Zone 1 Hazardous Location within 3 meters in all directions and Zone 2 below the Zone 1 location down to grade.
4. The Hazardous Location shall not typically extend beyond a solid floor, wall, roof, or other partition that has no communicating openings.
5. Vapor Processing Equipment shall be installed at least 6 meters from dispensing devices unless approved by local authority.
6. The Vaporsaver Control System **cannot** be installed within a Zone 1 area created by another device or location.
7. If the Control System is located where vehicle or pedestrian traffic has access, measures must be taken to protect the Control System and exposed piping from damage or vandalism.
8. Installation of vehicle bumper posts or fenced enclosures may be necessary. Use POMECO/OPW pipe guards (POMECO SPG, 6PGU, or 6PGR series guards).

Hazardous Location



NOTE:

ALL DEVICES INSTALLED WITHIN THESE HAZARDOUS ZONES MUST COMPLY WITH ALL APPLICABLE CODES FOR SPECIFIC ZONE.

OBTAIN APPROVAL FROM THE LOCAL AUTHORITY HAVING JURISDICTION.

ATTENTION MUST BE PAID TO HAZARDOUS ZONES CREATED BY OTHER EQUIPMENT AT THE FACITLITY.

ZONE 1

ZONE 2

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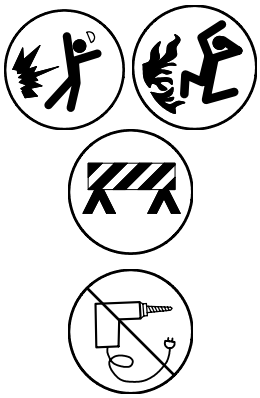
4.3 Control System Mounting

WARNING

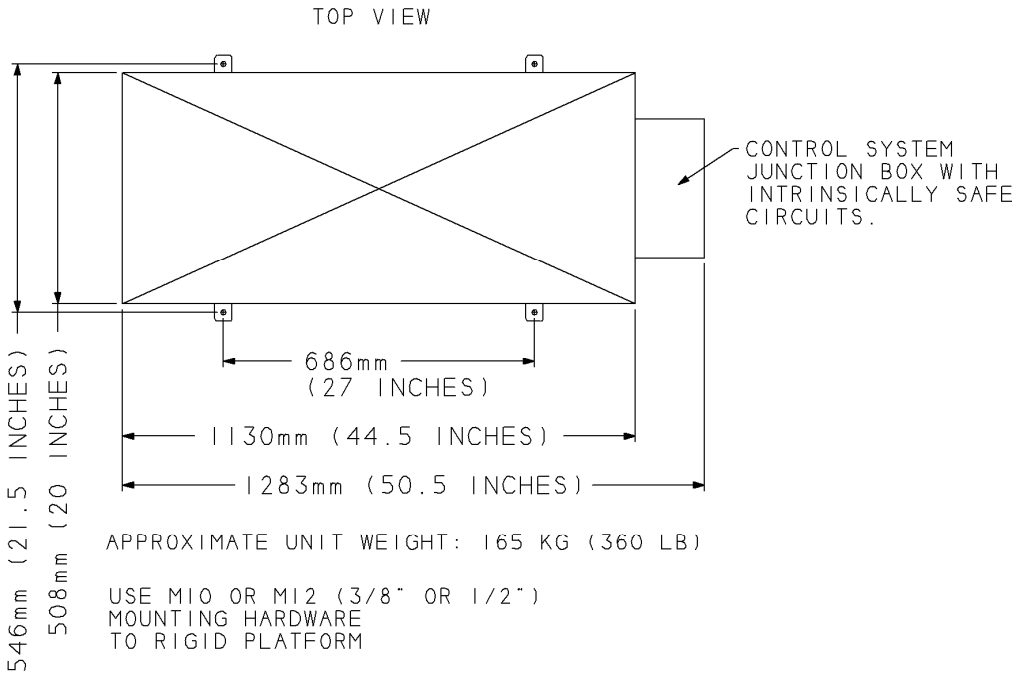


The Control System is to be installed near locations where highly flammable and explosive vapors and liquids may be present. Risk of Fire, injury and Death.

You are working in an area where vehicle traffic may occur. Always block off the work area during installation and service to protect yourself and others.

Do not use power tools that can generate sparks if there is a risk of flammable or explosive vapors or liquids being present.

1. The Control System can be installed directly on grade.
2. It must be permanently anchored to concrete or another solid base, and must be installed level.
3. Minimum clearances for service access (more clearance always makes service easier).
    a. Back: 0.3 meters (12 inches)
    b. Top: 0.3 meters (12 inches)
    c. Front: 0.3 meters (12 inches)
    d. Left: 1.2 meters (48 inches)
    e. Right: 0.3 meters (12 inches)
4. Do not install Control System where snow will accumulate or be placed when clearing lots or forecourt. The above minimum clearances should be maintained at all times during operations.
5. Do not install where irrigation or sprinkler systems can spray water up through the louver vents.
6. If it is necessary to install a concrete pad, a 1 meter by 2 meter (3 foot by 6 foot) reinforced pad is adequate; minimum 100 mm (4 inch) thickness. To ease and speed installation, use a POMECO/OPW island-form (p/n 6013-SFR6W3L6 or 6013-SFR6W3L5).



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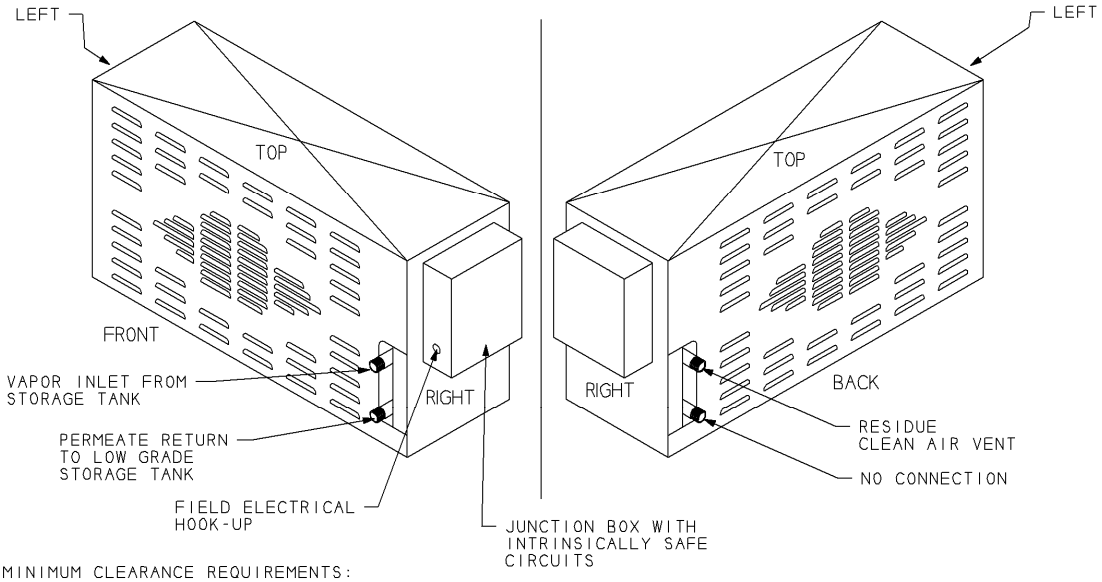


MINIMUM CLEARANCE REQUIREMENTS:
FRONT: 0.3 METERS (12 INCHES)
BACK: 0.3 METERS (12 INCHES)
TOP: 0.3 METERS (12 INCHES)
RIGHT: 0.3 METERS (12 INCHES)
LEFT: 1.2 METERS (48 INCHES)
UNIT TO BE MOUNTED TO CONCRETE PAD DIRECTLY ON GRADE. OR TO RIGID MOUNTING PLATFORM.

ACCESS:
RIGHT: JUNCTION BOX AND I.S. CIRCUITS
LEFT: MEMBRANE MODULE
FRONT/TOP: ALL OTHER COMPONENTS

IM-VR097

5.0 Control System Piping

WARNING

The Control System is to be installed near locations where highly flammable and explosive vapors and liquids may be present. Risk of Fire, Injury and Death.

You are working in an area where vehicle traffic may occur. Always block off the work area during installation and service to protect yourself and others.

Do not use power tools that can generate sparks if there is a risk of flammable or explosive vapors or liquids being present. Open piping to the gasoline storage tank will be emitting dangerous, flammable and potentially explosive vapors. Do not smoke or have open flames in areas near open piping.

5.1 General Piping Guidelines

1. When planning the installation of a Vaporsaver, the main rule for piping is that the Control System should pull from and return to different locations of the vapor system.
2. It is important that return piping connections are separated from the inlet piping connections, so the permeate return vapors cannot be drawn directly back into the inlet piping. This will maximize the vapor and fuel recovered.
3. All aboveground piping must be schedule 40 galvanized; only use pipe that is internally and externally corrosion protected.
4. Follow local requirements for underground vapor piping with regard to secondary containment.
5. All pipes must have slope away from the Vaporsaver Control System directed to the storage tanks. Minimum slope: 10 mm/1 meter (0.5°, 1/8" per foot)
   Recommended slope: 20 mm/1 meter (1°, 1/4" per foot)

5.2 Inlet Piping

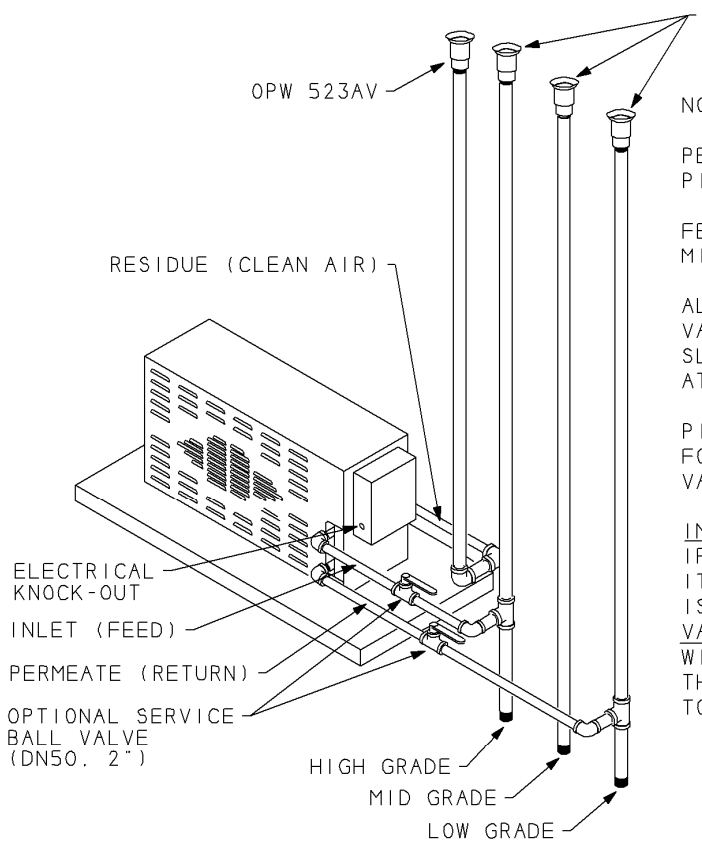
1. The Control System inlet is typically connected to the high-grade gasoline storage tank.
2. Piping should remain a minimum of DN50 (2" NPT) from the Control System inlet connection to the connection to the storage tank (or storage tank vents).
3. For maintenance purposes, it may be desired to install a DN50 (2”) ball valve. Ensure that the valve has a 50mm (2”) flow opening and is approved for gasoline use. NEVER OPERATE THE VAPORSAVER WITH THE SERVICE VALVES CLOSED; damage to the Vaporsaver will occur. It is highly recommended that the valve handle is removed to avoid tampering.

5.3 Clean Air Vent Piping

1. The clean air vent (residue) must be piped so the discharge opening is 5 meters minimum above adjacent grade.
2. Use OPW 523AV for the clean air vent.
3. The clean air vent piping should remain a minimum of DN40 (1-1/2" NPT).
4. The vent creates a Hazardous Location.
    a. Zone 1 within 3 meters in all directions of the vent opening.
    b. Zone 2 below Zone 1 down to grade.
    c. Follow all applicable codes.

5.4 Hydrocarbon Return Piping

1. The Control System hydrocarbon return (permeate) should be connected to the low-grade gasoline storage tank.
2. It is important that return piping connections are separated from the inlet piping connections, so the permeate return vapors cannot be drawn directly back into the inlet piping.
3. The hydrocarbon return piping must slope away from Control System. This pipe will be carrying liquid condensation from the separator, and supersaturated vapor.
   Minimum slope: 10 mm/1 meter (0.5°, 1/8" per foot)
   Recommended slope: 20 mm/1 meter (1°, 1/4" per foot)
4. The hydrocarbon return piping should remain DN40 (1-1/2" NPT) minimum until it returns to the storage tank. Some special installation may allow smaller pipe to be used as long as the internal diameter is not less than DN20 (¾ inch) and the length does not exceed 3 meters (10 feet); for longer pipe runs of DN20 consult OPW Technical Support for installation review.
5. For maintenance purposes, it may be desired to install a DN40 (1-1/2”) or DN50 (2”) ball valve. Ensure that the valve has a 40mm (1-1/2”) flow opening and is approved for gasoline use. NEVER OPERATE THE VAPORSAVER WITH THE SERVICE VALVES CLOSED; damage to the Vaporsaver will occur. It is highly recommended that the valve handle is removed to avoid tampering.



NOTES:

PERMEATE AND RESIDUE VAPOR PIPING TO BE MINIMUM DN40 (1-1/2").

FEED VAPOR PIPING TO BE MINIMUM DN50 (2").

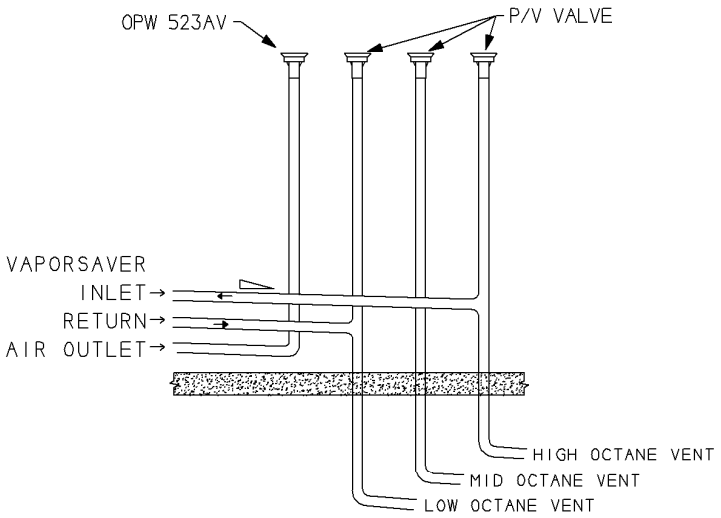
ALL VAPOR PIPING CONNECTING VAPORSAVER TO VENTS MUST SLOPE DOWN TOWARD VENTS AT MINIMUM 10mm/1m (0.5". 1/8"/FOOT).

PIPING CONNECTIONS SHOWN ARE FOR USE WITH UNDERGROUND VAPOR MANIFOLD.

IMPORTANT WARNING!:
IF SERVICE BALL VALVES ARE INSTALLED. IT IS IMPERATIVE THAT THE VAPORSAVER IS NEVER OPERATED WITH THE BALL VALVES CLOSED. DAMAGE TO THE UNIT WILL OCCUR. IT IS HIGHLY RECOMMENDED THAT THE VALVE HANDLES ARE REMOVED TO AVOID TAMPERING.

IM-VR113

VAPORSAVER CONNECTIONS WITH UNDERGROUND VAPOR MANIFOLD



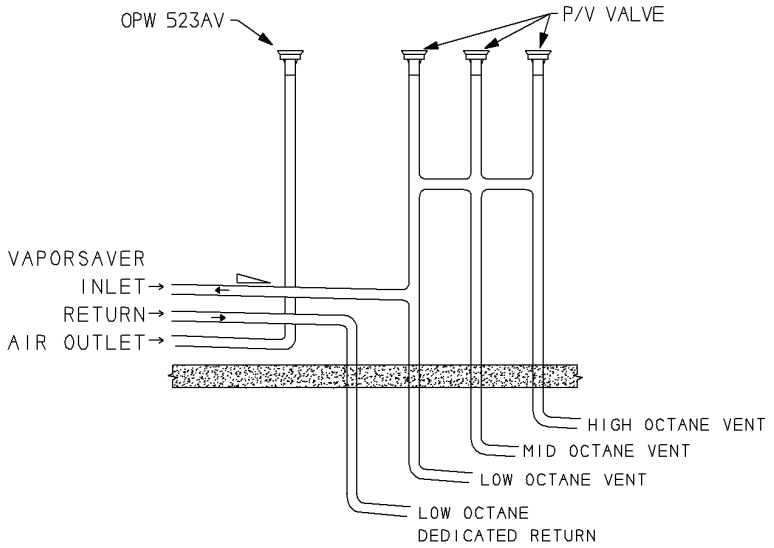
IMPORTANT INSTALLATION NOTES:

FOR BEST PERFORMANCE, AVOID A VAPOR MANIFOLD NEAR THE VAPORSAVER THAT MAY RECIRCULATE THE RETURNED VAPOR DIRECTLY BACK TO THE VAPORSAVER INLET.

IF THE ONLY VAPOR MANIFOLD IS LOCATED AT THE P/V VALVES, THE VAPORSAVER RETURN PIPE SHOULD NOT CONNECT TO THE VENT STACKS, BUT SHOULD HAVE A DIRECT DEDICATED CONNECTION TO THE LOW GRADE TANK.

IM-VR182

VAPORSAVER CONNECTIONS WITHOUT UNDERGROUND VAPOR MANIFOLD

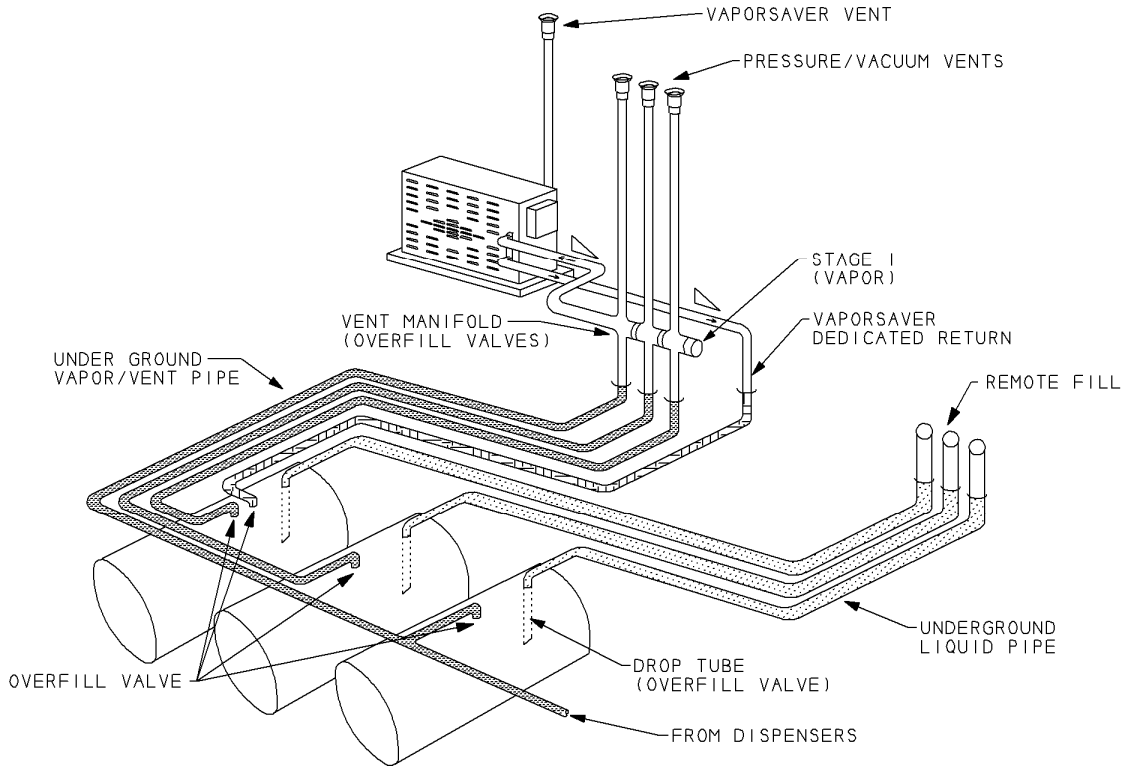


IMPORTANT INSTALLATION NOTES:

FOR BEST PERFORMANCE, AVOID A VAPOR MANIFOLD NEAR THE VAPORSAVER THAT MAY RECIRCULATE THE RETURNED VAPOR DIRECTLY BACK TO THE VAPORSAVER INLET.

IF THE ONLY VAPOR MANIFOLD IS LOCATED AT THE VENT STACKS, THE VAPORSAVER RETURN PIPE SHOULD NOT CONNECT TO THE VENT STACKS, BUT SHOULD HAVE A DIRECT DEDICATED CONNECTION TO THE LOW GRADE TANK.

IM-VR190



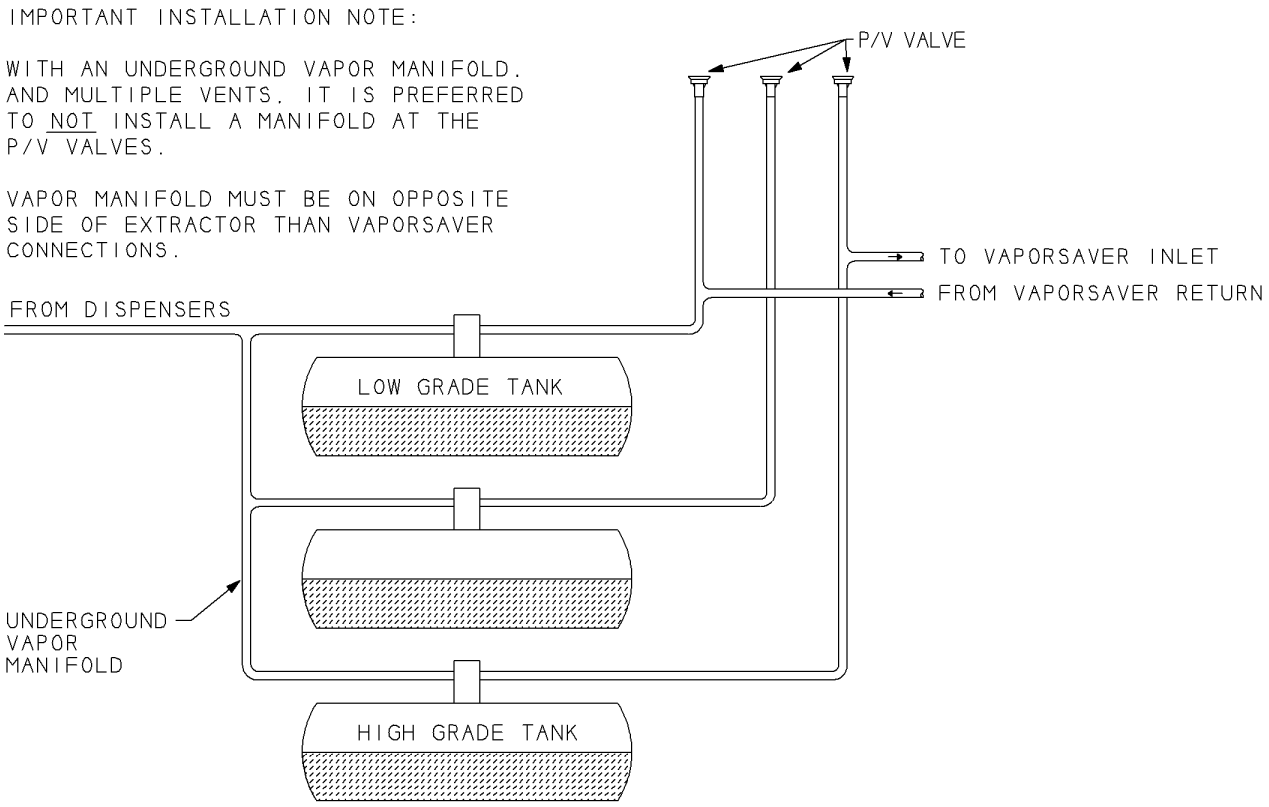
NOTE:

1. SLOPE ALL VAPOR PIPES AWAY FROM THE VAPORSAVER:
   MINIMUM: 10mm/1m (0.5") (1/8" PER FOOT)
   PREFERRED: 20mm/1m (1") (1/4" PER FOOT)
2. VAPORSAVER MUST BE PROTECTED BY USING AT
   LEAST ONE OF THE FOLLOWING.
   A) DROP TUBE OVERFILL VALVE (OPW 61SO. 71SO)
   B) EXTRACTOR FITTING BALL FLOAT (OPW 53V)
   C) VENT MANIFOLD FLOAT VALVE (OPW 320DV)

IM-VR191

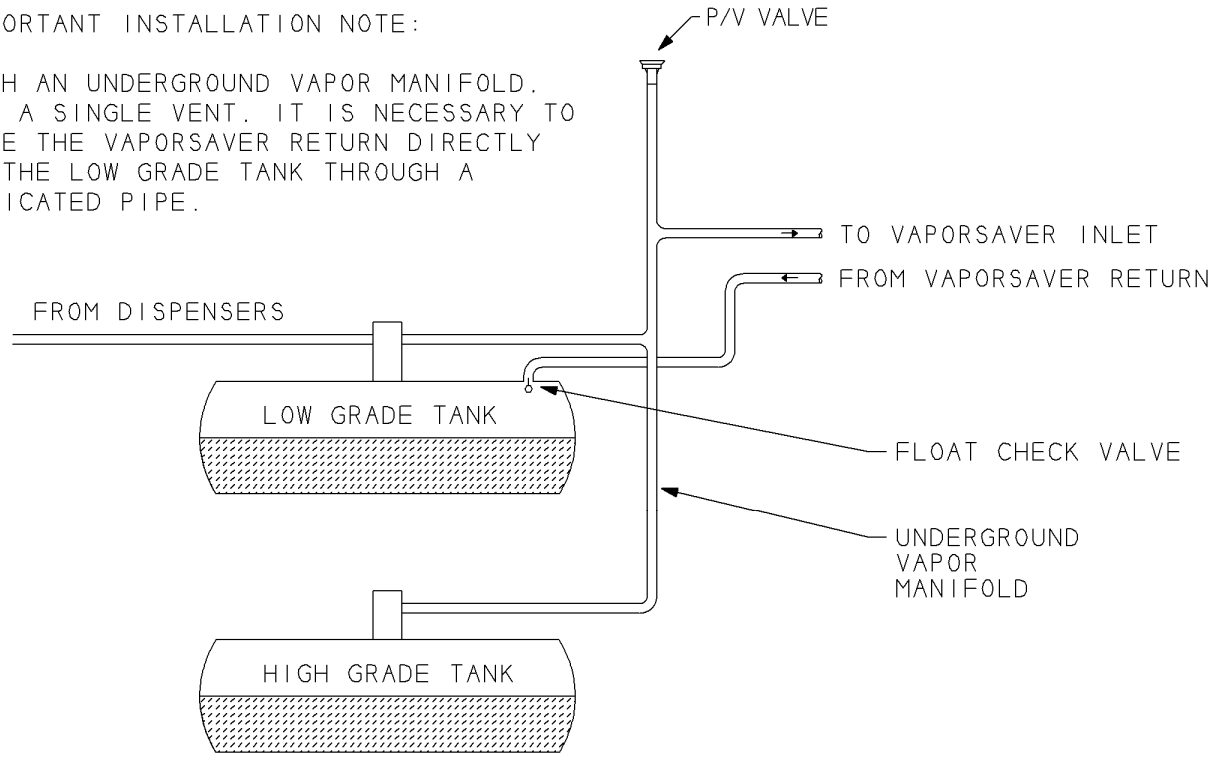
5.5 Storage Tank Vapor Manifolds

1. Storage tanks must be vapor manifolded. The location of the vapor manifold will have an impact on how the Vaporsaver feed and return can be piped.
2. A manifold too close to the Control System may cause recirculation of the permeate return back to the Vaporsaver inlet. Therefore, if the only vapor manifold is an above ground manifold near the Vaporsaver, the permeate should not connect to the vent stacks, but instead should have a dedicated return to the low grade tank.
3. Some local authorities require manifolding in one location or the other; check with the local authority having jurisdiction.
4. Above ground manifolding should be minimum 5 meters above adjacent grade; if it is not, sufficient overfill prevention must be fitted to ensure that liquid cannot cross contaminate tanks nor enter the Vaporsaver.
5. Vent openings must be greater than 5 meters above adjacent grade and have an approved pressure/vacuum valve.
6. All above ground vapor piping must be schedule 40 galvanized steel, and painted to minimize solar heat gain.
5. The vent creates a Hazardous Location.
    a. Zone 1 within 3 meters in all directions of the vent opening.
    b. Zone 2 below Zone 1 down to grade.
    c. Follow all applicable national codes.

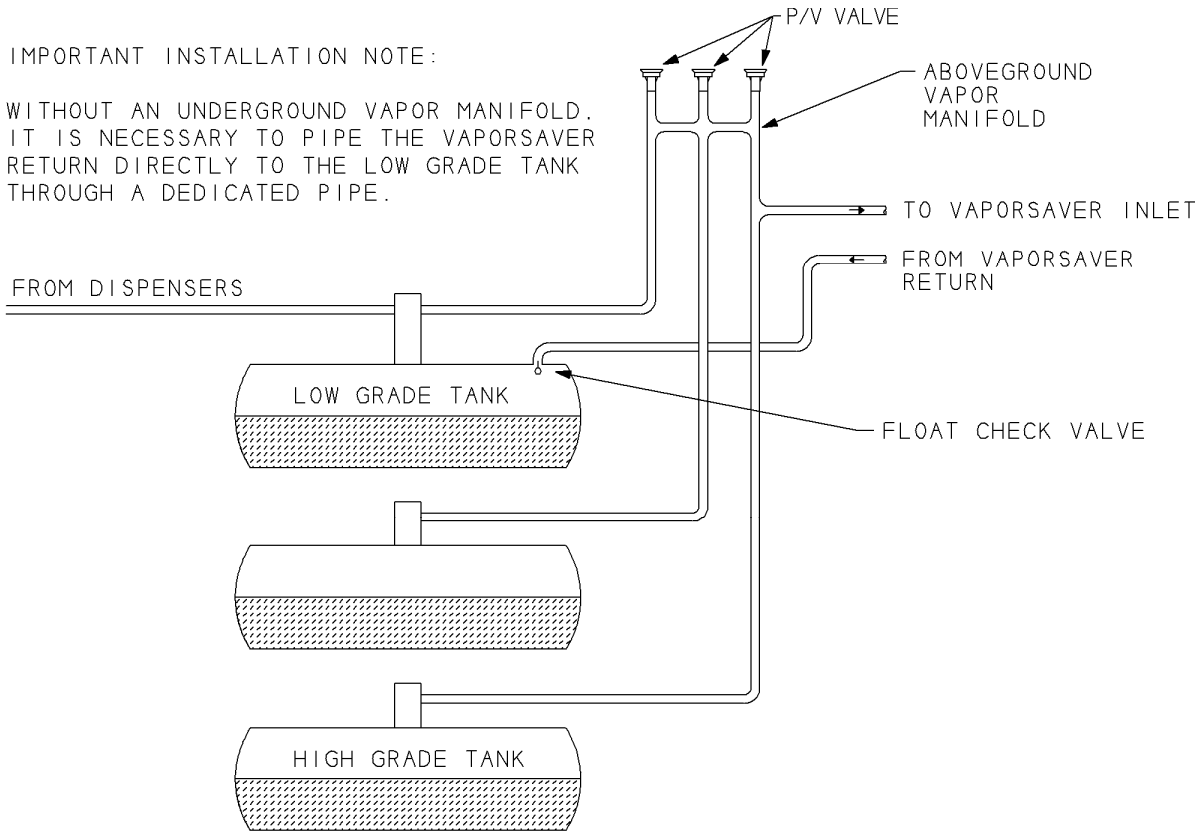


IMPORTANT INSTALLATION NOTE:

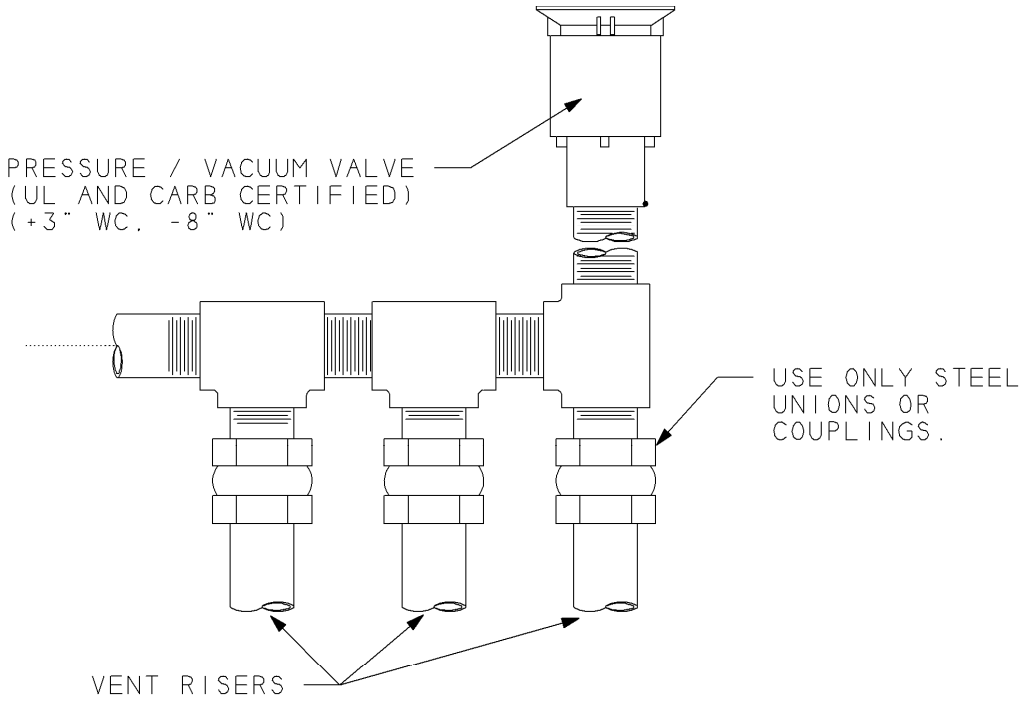
WITH AN UNDERGROUND VAPOR MANIFOLD. AND A SINGLE VENT. IT IS NECESSARY TO PIPE THE VAPORSAVER RETURN DIRECTLY TO THE LOW GRADE TANK THROUGH A DEDICATED PIPE.



IM-VR185


IMPORTANT INSTALLATION NOTE:
WITHOUT AN UNDERGROUND VAPOR MANIFOLD. IT IS NECESSARY TO PIPE THE VAPORSAVER RETURN DIRECTLY TO THE LOW GRADE TANK THROUGH A DEDICATED PIPE.
P/V VALVE
ABOVEGROUND VAPOR MANIFOLD
TO VAPORSAVER INLET
FROM VAPORSAVER RETURN
FROM DISPENSERS
LOW GRADE TANK
FLOAT CHECK VALVE
HIGH GRADE TANK

IM-VR188



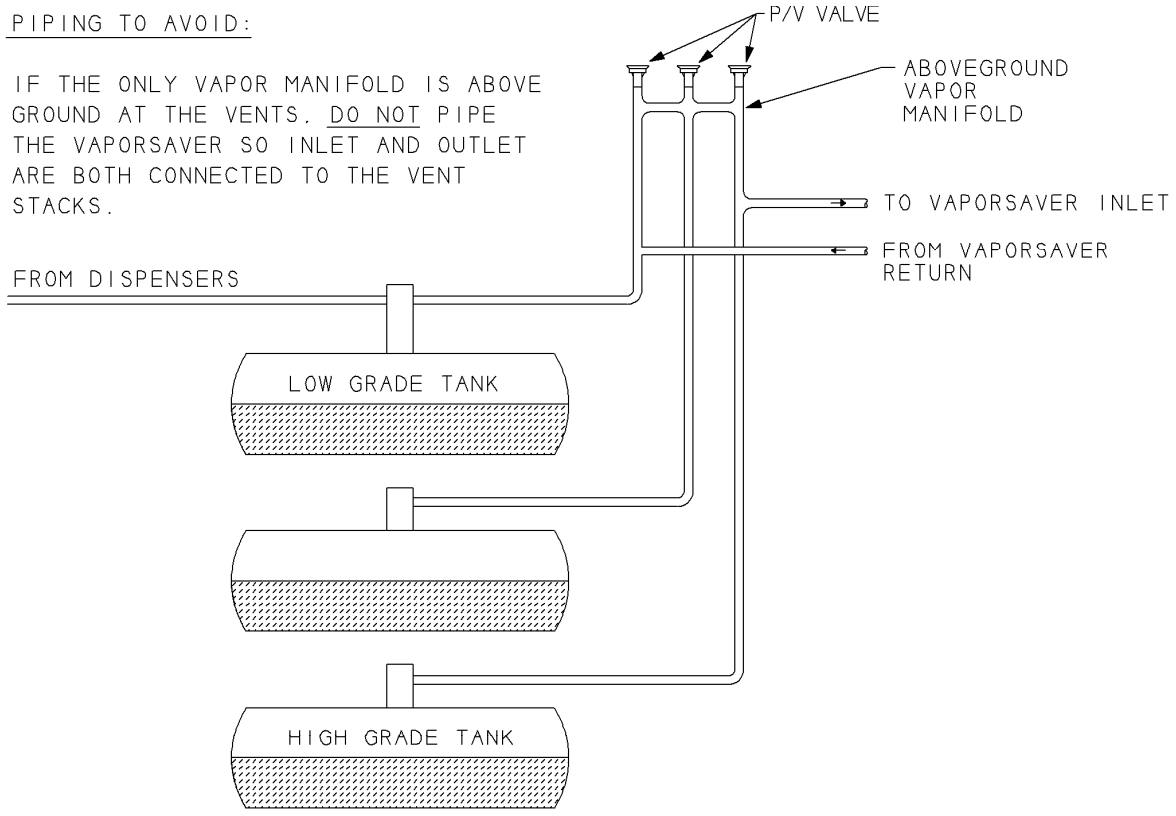
IM-VR009

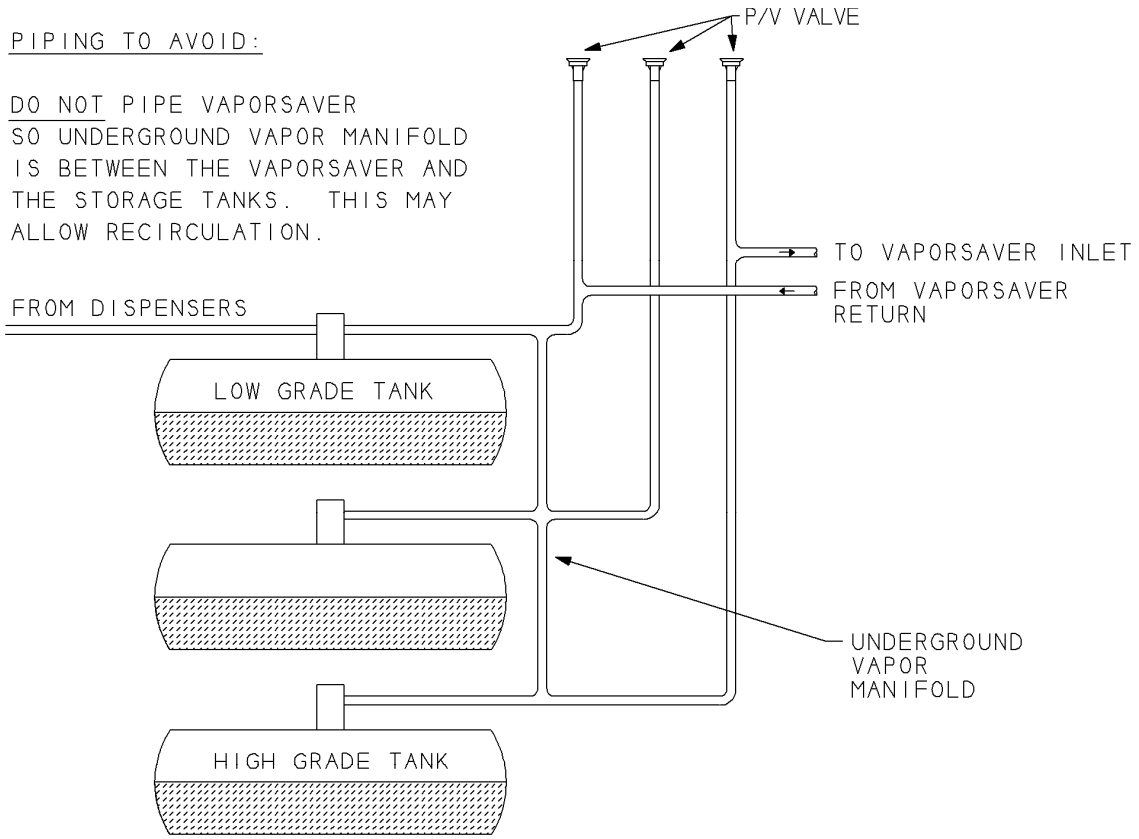
Alternate pressure/vacuum vent valve settings must be preapproved by OPW to ensure that the Vaporsaver's safety and performance are not compromised.

5.6 Piping To Avoid

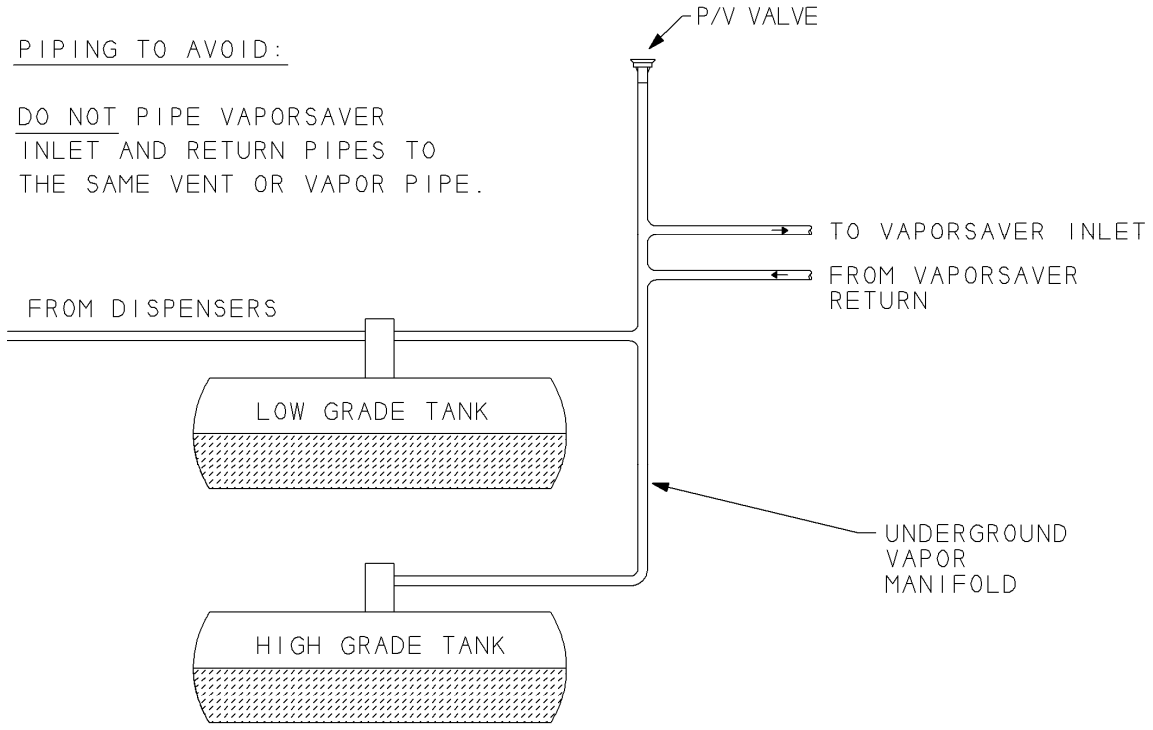
1. To obtain the maximum product recovery, best performance, and longest life of the Vaporsaver, there are several piping configurations that should be avoided.
2. Remember, the main rule for piping is that the Control System should pull from and return to <u>different</u> locations of the vapor system.
3. It is important that return piping connections are separated from the inlet piping connections, so the permeate return vapors <u>cannot</u> be drawn directly back into the inlet piping.
4. Piping must be configured so that permeate return will reach the storage tank before it is recirculated back to the Vaporsaver inlet.

The following drawings show the <u>wrong way</u> to install a Vaporsaver.




PIPING TO AVOID:
DO NOT PIPE VAPORSAVER SO UNDERGROUND VAPOR MANIFOLD IS BETWEEN THE VAPORSAVER AND THE STORAGE TANKS. THIS MAY ALLOW RECIRCULATION.
P/V VALVE
TO VAPORSAVER INLET
FROM VAPORSAVER RETURN
FROM DISPENSERS
LOW GRADE TANK
UNDERGROUND VAPOR MANIFOLD
HIGH GRADE TANK

IM-VR187

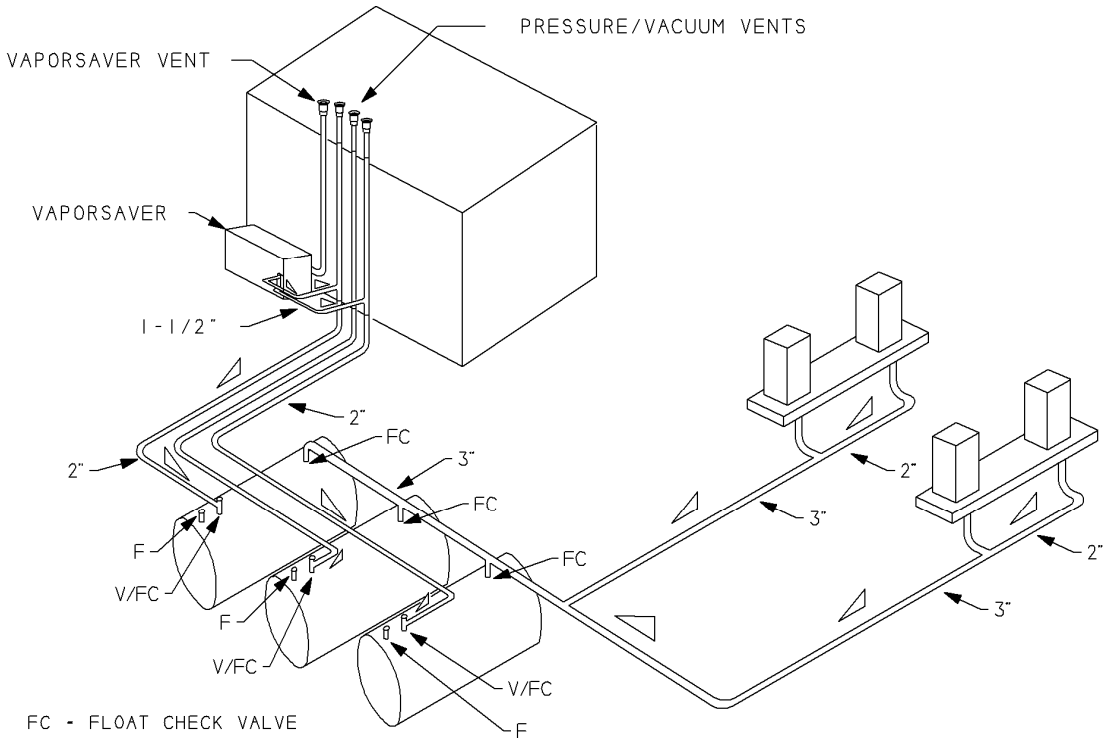

PIPING TO AVOID:
DO NOT PIPE VAPORSAVER INLET AND RETURN PIPES TO THE SAME VENT OR VAPOR PIPE.
P/V VALVE
TO VAPORSAVER INLET
FROM VAPORSAVER RETURN
FROM DISPENSERS
LOW GRADE TANK
UNDERGROUND VAPOR MANIFOLD
HIGH GRADE TANK

IM-VR189

5.7 Stage 2 Station Underground Piping

1. All underground vapor piping must be a minimum of 2” NPT. Always check with local authorities for applicable requirements; larger pipe size may be required.
2. All vapor piping must have slope for drainage to the underground storage tanks.
3. Slope minimum 10 mm per 1 meter (0.5°, 1/8" per foot); recommended 20 mm per 1 meter (1°, 1/4" per foot).
4. Always follow the requirements of the local authorities and the manufacturer of the Stage 2 vapor recovery system.

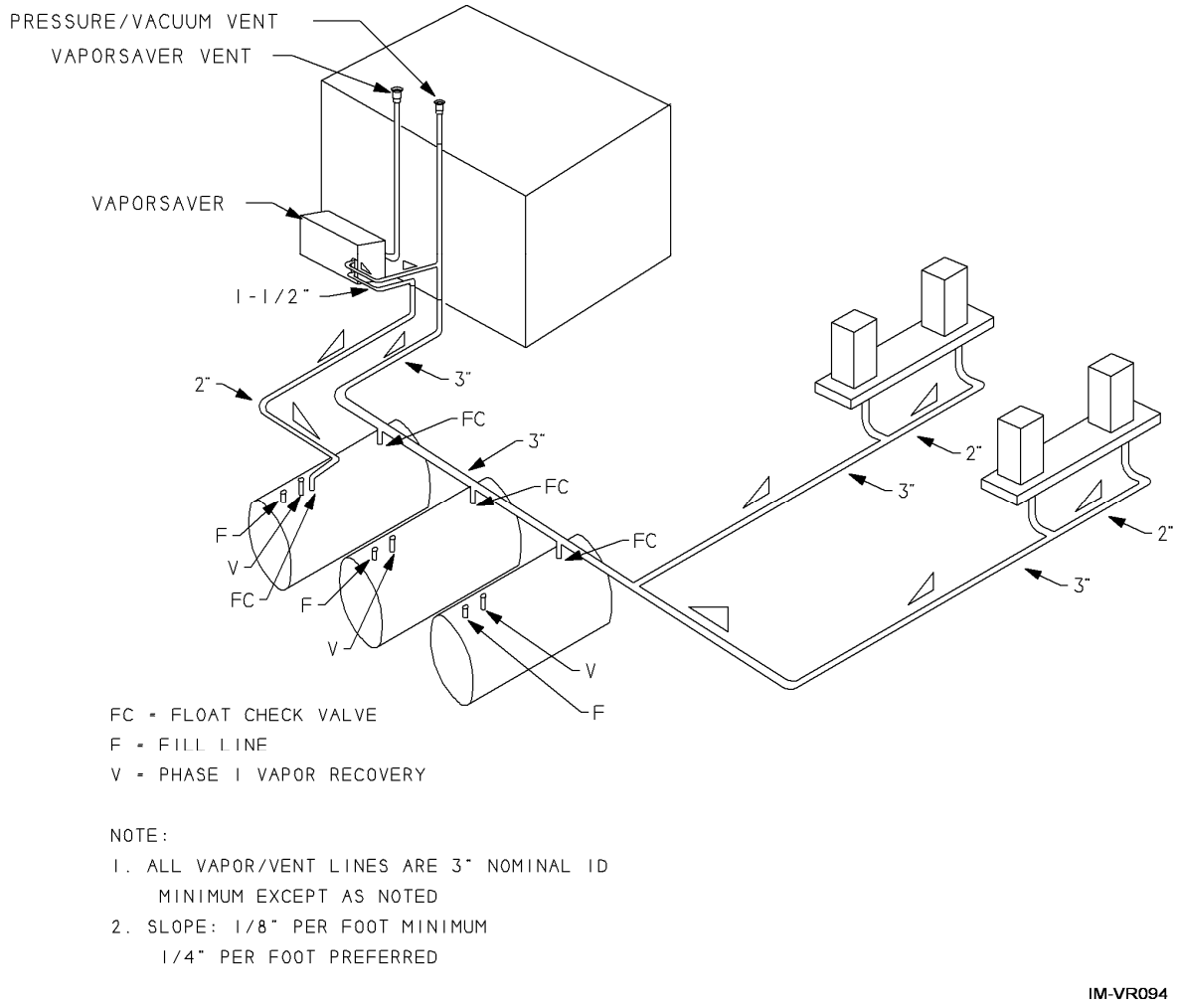
Typical Vapor Piping Layout



Notes:

- Always follow requirements of component and system manufacturers, local, state and national authorities for installation and operation of all equipment.
- Vent piping diameters must comply with applicable codes.
- Feed piping from the Control System to the vents shall be DN50 (2” nominal ID).
- Permeate and Residue piping from the control system to the vents shall be DN40 (1-1/2” nominal ID) minimum.

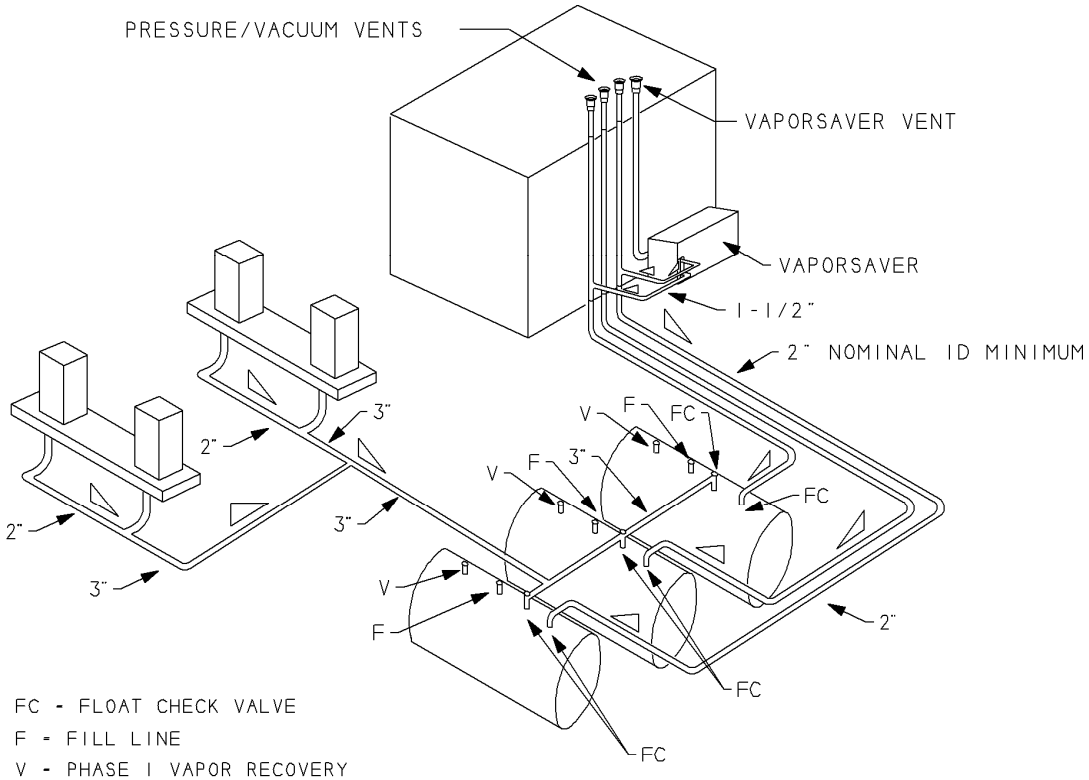
Typical Vapor Piping Layout



Notes:

- Always follow requirements of component and system manufacturers, local, state and national authorities for installation and operation of all equipment.
- Vent piping diameters must comply with applicable codes.
- Feed piping from the Control System to the vents shall be DN50 (2” nominal ID).
- Permeate and Residue piping from the control system to the vents shall be DN40 (1-1/2” nominal ID) minimum.

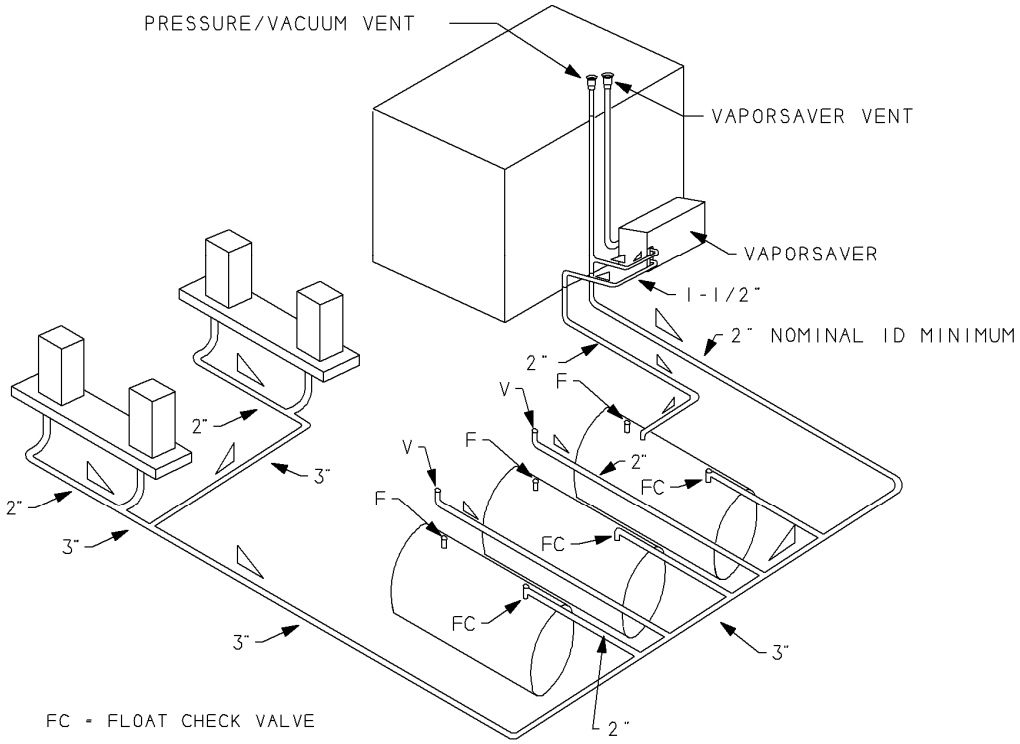
Typical Vapor Piping Layout



Notes:

- Always follow requirements of component and system manufacturers, local, state and national authorities for installation and operation of all equipment.
- Vent piping diameters must comply with applicable codes.
- Feed piping from the Control System to the vents shall be DN50 (2” nominal ID).
- Permeate and Residue piping from the control system to the vents shall be DN40 (1-1/2” nominal ID) minimum.

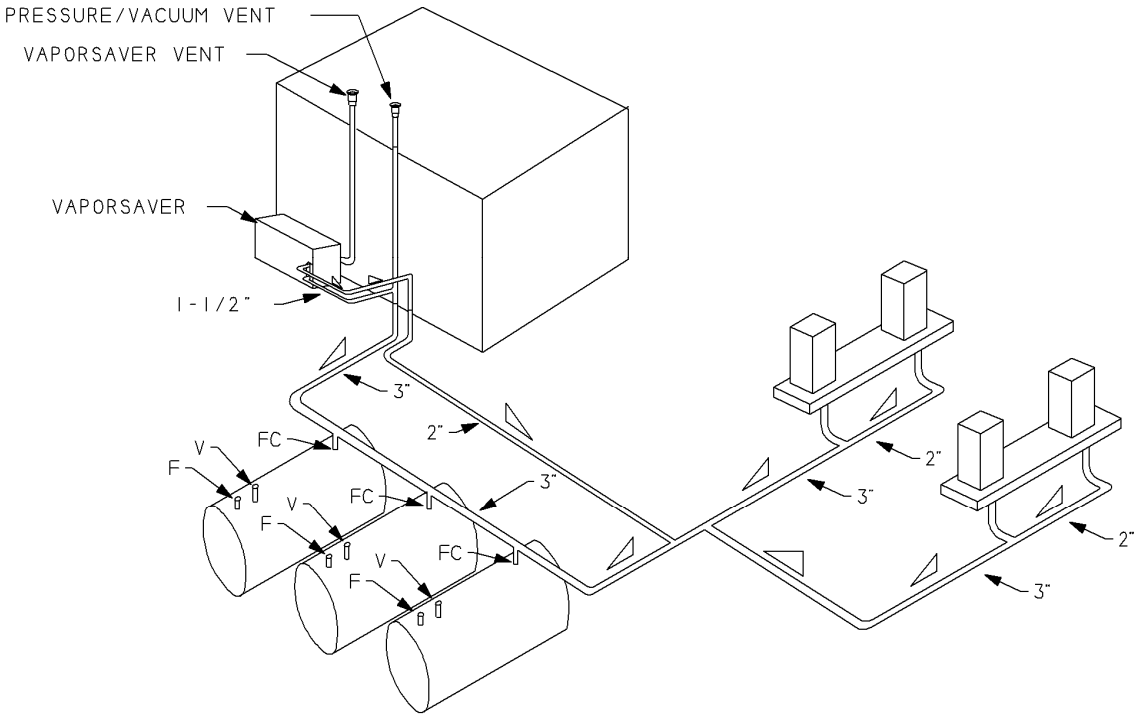
Typical Vapor Piping Layout



Notes:

- Always follow requirements of component and system manufacturers, local, state and national authorities for installation and operation of all equipment.
- Vent piping diameters must comply with applicable codes.
- Feed piping from the Control System to the vents shall be DN50 (2” nominal ID).
- Permeate and Residue piping from the control system to the vents shall be DN40 (1-1/2” nominal ID) minimum.

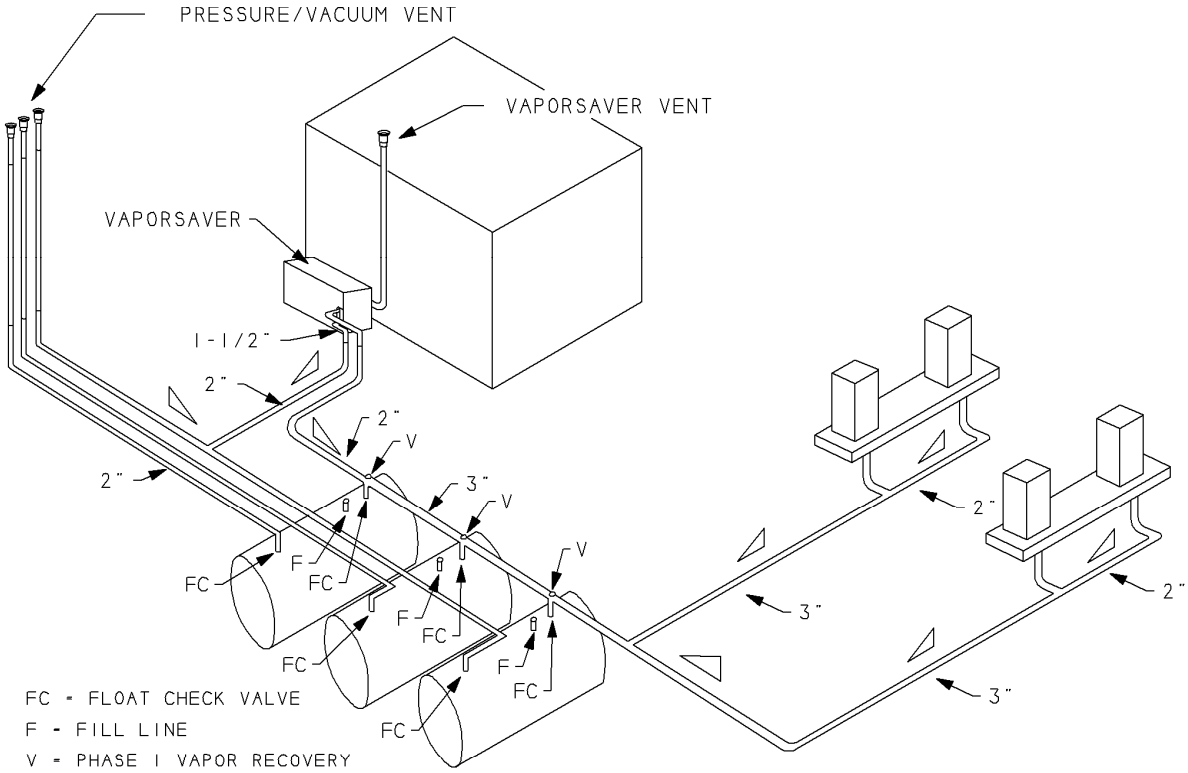
Typical Vapor Piping Layout



Notes:

- Always follow requirements of component and system manufacturers, local, state and national authorities for installation and operation of all equipment.
- Vent piping diameters must comply with applicable codes.
- Feed piping from the Control System to the vents shall be DN50 (2” nominal ID).
- Permeate and Residue piping from the control system to the vents shall be DN40 (1-1/2” nominal ID) minimum.

Typical Vapor Piping Layout



Notes:

- Always follow requirements of component and system manufacturers, local, state and national authorities for installation and operation of all equipment.
- Vent piping diameters must comply with applicable codes.
- Feed piping from the Control System to the vents shall be DN50 (2” nominal ID).
- Permeate and Residue piping from the control system to the vents shall be DN40 (1-1/2” nominal ID) minimum.

6.0 Electrical Requirements

WARNING

This system uses lethal voltages and operates in areas where flammable vapors and liquids may be present.

Serious injury or death from electrical shock, fire, or explosion may result if the power is on during installation.

Turn power off, lockout and tag power to the unit while installing the system.

Read and understand all instructions in this manual and all applicable requirements of the National Electric Code, federal, state and local codes, as well as other applicable safety codes.

6.1 Power Requirements

1. Vaporsaver System
   - User Interface:
     - 100-240 VAC, 50/60 Hz
     - 1-Phase
     - 0.5 amp
   - Control System Motor:
     - 380-415 VAC, 50 Hz / 440-480 VAC, 60 Hz
     - 3-phase (See Special Note for 3-phase motors in Section 6.2)
     - 1.8 kW (2.4 hp) at 50 Hz
   - Motor Contactor:
     - Coil: 220-230 VAC, 50 Hz / 230-240 VAC, 60 Hz; 1-phase
     - Contact Rating: 400 VAC, 3-phase, 4 kW; 480 VAC, 3-Phase, 5 hp
2. A circuit disconnect devise is not included with the Vaporsaver System. A readily accessible three or four pole disconnect device must be incorporated in the installation wiring for the motor.
3. There are no end user serviceable parts in the Vaporsaver System.
4. The User Interface has internal fuse: 500 mA (slow-blow), 250 V, 5mm x 20mm. The fuse is to only be replaced by qualified and certified technicians.
5. An electrical service (breaker) of 15 amp should be used; always follow applicable national regulations and codes regarding sizing of motor circuit breaker. Verify required over-current protection ampacity with requirements for load and conductor ampacity ratings and with the national and local authority having jurisdiction.
6. This product shall be installed in accordance with all applicable national and local regulations for electrical equipment at gasoline dispensing facilities.
7. Equipment connected to this device must not use, store or generate more than 250 V rms or dc with respect to ground.
8. The Vaporsaver 1 main power should be controlled by the facility's main Emergency Shut-Off system.

6.2 Control System Electrical Hook Ups

1. System Breaker shall be sized for power load based on requirements.
2. Wiring between the User Interface and the Control System shall be as follows.
    a. All wiring to be gasoline and oil resistant with 600 V insulation.
    b. Wiring for the 24 VDC control signals shall be minimum 1.0 mm^2 (18 AWG).
    c. Two ground wires shall be run from the Control System junction box to the load center ground; one is for equipment ground, and the second is for a dedicated Intrinsically Safe Barrier ground. Both ground wires must be minimum 3.3 mm^2 (12 AWG). Proper grounding for the Intrinsically Safe Barrier is crucial for safe operation of the Barriers.
    d. Both the motor power wiring and the signal wiring can be routed in the same conduit provided all wiring is only gasoline and oil resistant wiring with 600 V insulation.
    e. Wiring for motor shall be minimum 3.3 mm^2 (12 AWG); sizing must comply with requirements for motor load and wiring distance. **Larger gage wire may be necessary** based on conductor length and voltage supplied by load center.
    f. **SPECIAL NOTE FOR 3-PHASE MOTORS**: ensure that motor rotation is correct the first time the unit is powered. If the motor rotation is incorrect exchange any two of the 3-phase conductors. If reverse rotation is noted, **immediately** power off the unit and correct wiring. Reverse rotation can cause internal damage to the pumps.

Conductor Length and Size Guide

Maximum conductor length is the total length of the conductor from the load center through the User Interface to the motor.

Maximum Conductor Length (1-Phase)

Voltage		208	208	230	230
% Voltage Drop		3%	5%	3%	5%
AWG	mm^2	Feet (meters)			
12	3.3	91(28)	151 (46)	100 (30)	167 (51)
10	5.3	144 (44)	240 (73)	159 (48)	265 (81)
8	8.4	229 (70)	382 (116)	254 (77)	423 (129)

Maximum Conductor Length (3-Phase)

Voltage		200	200	230	230	400	460
% Voltage Drop		3%	5%	3%	5%	3%	3%
AWG	mm^2	Feet (meters)					
14	2.1					506 (154)	671 (205)
12	3.3	139 (42)	231 (70)	178 (54)	297 (91)	805 (245)	1068 (331)
10	5.3	220 (67)	365 (111)	283 (86)	471 (144)	1279 (390)	1697 (517)
8	8.4	351 (107)	585 (178)	450 (137)	751 (229)	2037 (620)	2702 (824)

Notes:

- These tables are based on 140% of nameplate ratings, if national or local authority will allow voltage drop conductor length calculations based on load ampacity rating of 125% of motor nameplate, multiply the maximum length in the table by 1.12 to get the new maximum conductor length.
- For 3-phase voltages over 380 volts, 2.1 mm^2 (14 AWG) can be used if:
    - local electrical regulations allow for it to be used in motor applications and for the motor ratings stated on the motor name plate, and
    - the voltage at the motor and the running amps of the motor are within the limits stated on the motor nameplate, and
    - motor starting difficulties are not present.

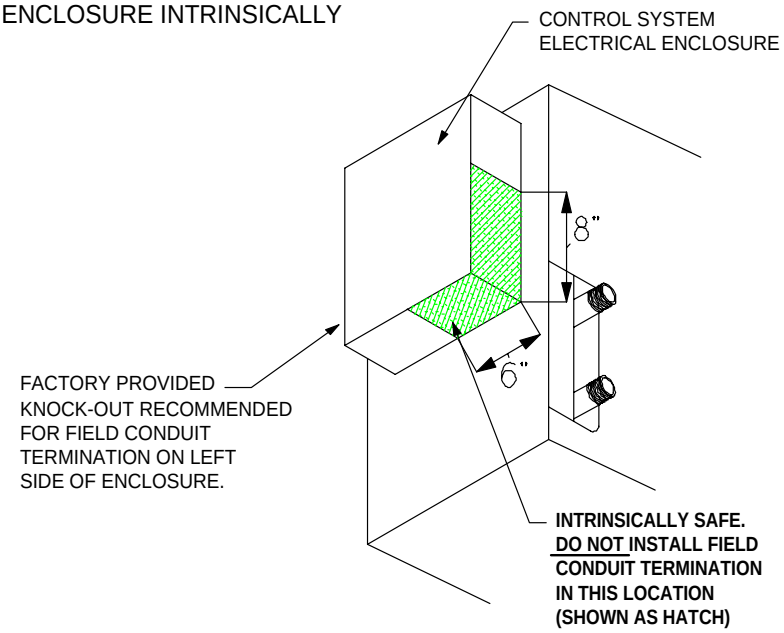
THESE TABLES ARE ONLY TO BE USED AS A REFERENCE.
ALWAYS VERIFY AND FOLLOW NATIONAL AND LOCAL ELECTRICAL REGULATIONS.

7.0 Other Requirements

7.1 Other Electrical Requirements

1. Hazardous Location Seal-offs are generally required for a conduit run leaving a Zone 1 or Zone 2 location to a non-Hazardous Location. Install as required by national and local regulations, codes and authority having jurisdiction.
2. Wiring shall be sized as specified by nationally recognized regulations for the load and conductor length from the load center to the motor.
3. The Control System is supplied with a knock-out for recommended field conduit termination. This knock-out is supplied with a weather tight plug. If an alternate location to terminate the field conduit in the Control System electrical enclosure is chosen, the following must be followed.
    a. Do not remove the factory knock-out weather tight plug.
    b. A field knock-out must never be installed in Control System electrical enclosure into the Intrinsically Safe zone.

DO NOT TERMINATE FIELD CONDUIT INTO THE CONTROL SYSTEM ELECTRICAL ENCLOSURE INTRINSICALLY SAFE ZONE.



7.2 Storage Tank Overfill Devices

Storage tank over fill prevention devices must be used to ensure that in the event of an overfill liquid gasoline does not enter the Control System. Damage may occur, and may result in a hazardous condition.

7.3 P/V Valve

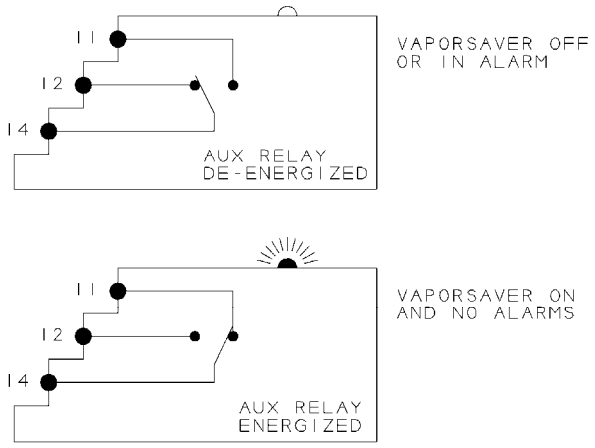
1. Required minimum one per site
2. Use valve approved by CARB, UL, or other nationally approved agency.
3. Typical pressure setting: +3 inwc +/- ½ inwc (7.5 mbar gage +/- 1.25 mbar gage).
4. Typical vacuum setting: -8 inwc +/- 2 inwc (-20 mbar gage +/- 5 mbar gage).
5. Some jurisdictions may allow alternate pressure or vacuum settings. Do not install pressure/vacuum valves with cracking pressures greater than +/- 70 mbar gage.
6. Pressure/vacuum vent valve settings other than +3 inwc/-8 inwc must be preapproved by OPW to ensure that the Vaporsaver's safety and performance are not compromised

7.4 Other Control System Requirements

1. The Vaporsaver should not be used with any flexible vapor or vent piping as there is a risk of liquid blockage of the vapor and vent piping.
2. The Vaporsaver requires that entire vapor system (piping, tanks, valves, dispensers…) be kept vapor tight and able to pass a Pressure Decay Test (CARB TP201.3 or equivalent) (always follow local authority requirements).
3. During a Pressure Decay Test, the Vaporsaver must be powered off.
4. To ensure proper operation of all vapor recovery components and systems (including the Vaporsaver), installations must be able to pass vapor piping blockage tests for **all** underground vapor and vent piping (CARB TP201.4 or equivalent).
5. The Vaporsaver has no impact on the Stage II vapor recovery system, or on the ability of the site to pass A/L testing (CARB TP201.5 or equivalent).

7.5 Auxiliary Output Relay

1. The User Interface is equipped with an Auxiliary Output Relay for external monitoring of the Vaporsaver system. It is located on the main terminal block.
2. When the Vaporsaver is powered and operating normally, the Aux Relay is energized (green LED on Aux Relay is lit). When the Vaporsaver is either powered off, or is in Alarm, the Aux Relay is de-energized.
3. Aux Relay contact rating: 240V, 6A with 4000V isolation.



8.0 Control System Maintenance

The OPW Vaporsaver is designed to require very little scheduled maintenance. The following table is a general guide of what is required.

8.1 Maintenance

1. Every 36 months, the Hydrocarbon Sensor must be returned to OPW for calibration.
2. Every 12 months, check all belts for wear and proper tension. Only replace belts with same size and type as originally installed. See Section 8.2 for belt tension guidelines.
3. Every 12 months, check Control System operating pressure and vacuum readings.
4. Every 12 months, check overall System, piping and fittings should be visually checked for leaks or other wear issues.
5. Every 12 months check total run time (TRT). If approaching or greater than the maximum hours stated in Section 8.3 replace pumps. Verify records to ensure pumps have not already been changed.

8.2 General Rules for Belt Tensioning

1. On units equipped with self adjusting idlers, set the tension so the idler arm arrow is between 15-20 degrees on the idler body reference scale.
2. Ideal belt tension is the lowest tension at which the belt will not slip under peak conditions.
3. Tension the belt when slipping.
4. Over tensioning shortens pump, bearing and belt life.
5. Keep belts free from foreign material that may cause slippage.
6. Never apply belt dressing, as this will damage the belt and cause early failure.
7. Only replace belts with OPW specified belt size and type.
8. Over tensioning belts places extra load on the motor. An overly tight belt can add several amps to the motor loading.
9. IMPORTANT: After changing or adjusting belts, always measure the motor full load amperage; it must be less than the full load rating of the motor.

8.3 Component Replacement

The User Interface has a totalizer (TRT: total run time since first installed) that is part of the continuous scrolling screens. This totalizer shall be used for the following maintenance/replacement items:

a. It is recommended that the compressor pump be replaced at approximately 8,000 hours of operation, and is required to be replaced before 8,500 hours of operation.
b. It is recommended that the Vacuum pump be replaced at approximately 10,000 hours of operation, and is required to be replaced before 12,000 hours of operation.
c. The Membrane Module may need to be replaced at approximately 15,000 hours of operation.

8.4 Spare Parts

14-55000: Membrane module replacement o-ring kit
14-40200: Membrane module replacement assembly (with o-rings)
14-41267: Compressor (ATEX)
14-41268: Vacuum Pump (ATEX)
14-44002: Hydrocarbon sensor
14-44300: Belt, compressor
14-44400: Belt, vacuum pump
14-41034: Motor (ATEX, 50 Hz)
14-41033: Motor (ATEX, 60 Hz)
14-48231: Pressure switch (PS0)
14-48230: Pressure switch (PS1)
14-41121: Pressure switch (PS2)
14-42700: Pressure switch (PS3)
14-40010: Drain valve
14-40015: Fan assembly
14-40300: PLC
14-40350: Display
14-40400: Power supply
14-40401: I.S. Barrier (1 channel)
14-40402: I.S. Barrier (2 channel)
14-40406: I.S. Power supply
14-41225: Pressure regulator

Contact OPW Fueling Components Customer Service or Technical Support for other available spare parts kits.

9.0 Glossary of Terms

A/L	Air to liquid ratio. With any vapor recovery system A/L relates to the volume of air (or vapor) returned by the vapor recovery system (usually measured in Cubic Ft.) divided by the volume of liquid dispensed (7.481 Gallons U.S. = 1 Cubic Ft.).
CARB	California Air Resource Board.
Control System	The enclosure that houses the membrane, motor, pumps and associated hardware that mounts to the vapor space of the UST to control tank pressure. (See Section 3.2)
Feed	Vapor flow which the Vaporsaver pulls from the storage tank, pressurizes, partially condenses and enters the membrane.
ORVR	Onboard Refueling Vapor Recovery refers to vehicles equipped with their own vapor recovery system.
Permeate	Supersaturated vapor flow from the Vaporsaver returned to the storage tank.
Residue	Clean air exhaust from the Vaporsaver.
User Interface	The User Interface is the control panel for the Vaporsaver system. It contains the display and visual and audible indicators that allow personnel to observe the operational information of the Vaporsaver. It also allows end-users to set time/date and acknowledge alarms. (See Section 3.1)
UST	Underground Storage Tank
Voltage Drop	The amount of voltage lost due to any components specific resistance. All components in an electrical circuit have an inherent voltage loss. (See Section 6.0)

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Zertifikat Nr. 97-11.1

Certificate No. 97-11.1

TÜV SÜDDEUTSCHLAND

Die Prüfstelle für Gasrückführungssysteme des TÜV Süddeutschland, Westendstr. 199, D-80686 München, bescheinigt die Prüfung einer Abgasreinigungseinrichtung mit stofflicher Rückgewinnung der Kraftstoffdämpfe an Tankstellen gemäß § 3 Abs. 6 der 21. BImSchV.

The TÜV Süddeutschland Test Body for Fuel Vapor Recovery Systems, Westendstr. 199, D-80686 Munich, hereby confirms testing of an exhaust-emissions cleaning system including fuel-vapor recovery as per Article 3 (6) of the 21st BImSchV (Air-pollution Control Regulation on the restriction of hydrocarbon emissions during vehicle refueling).

Der Reinigungsgrad darf 97 % nicht unterschreiten

Efficiency must not fall below 97 %

- Typ Bezeichnung: Type: **Vapor Saver**
- Hersteller Manufacturer: **OPW Fueling Components Hamilton, Oh USA**
- System:

Stufe 1	**Kondensationsstufe,** bestehend aus: Verdichter und Luftkühler
Stage I:	**Condensation stage** consisting of: compressor and air cooler
Stufe 2	**Semipermeable Membran**
Stage II:	**Semipermeable membrane**

Die Messungen zum Nachweis des Reinigungsgrades erfolgten vom 19. bis 24. 11. 2002, während des Normalbetriebes an einer Tankstelle.

Efficiency measurements were conducted at a fuel station during normal operation between November 19 and 24, 2002.

Die Abgasreinigungseinrichtung entspricht dem Stand der Technik im Sinne der 21. BImSchV (Verordnung zur Begrenzung der Kohlenwasserstoffemissionen bei der Betankung von Kraftfahrzeugen) vom 07.10.1992 zuletzt geändert am 6.5.2002.

The exhaust-emissions cleaning system corresponds to the state of the art as defined in the 21st BImSchV (Air-pollution Control Regulation on the restriction of hydrocarbon emissions during vehicle refueling) of October 7, 1992, last amended on May 6, 2002.

München, 2003-03-10
Munich, 2003-03-10

Technische Überwachung TÜ 12 Bayern

Der Sachverständige
The officially authorized expert
Peter Szalata

USER INTERFACE
POWER:
100-240 VAC
0.5 A
1-PHASE
50/60 Hz

USER INTERFACE
FUSE (FU1):
500 mA. 250V.
SLO-BLO.
5 mm x 20 mm

CONTROL SYSTEM
MOTOR POWER:
380-415 VAC. 50 Hz
440-480 VAC. 60 Hz
1.8 kW (2.4 HP) AT 50 Hz
3-PHASE

MOTOR CONTACTOR:
COIL:
220-230 VAC. 50 Hz. 1-PHASE
230-240 VAC. 60 Hz. 1-PHASE
CONTACTS:
4 Kw. 400 VAC. 3-PHASE
5 Hp. 480 VAC. 3-PHASE

NON-HAZARDOUS LOCATION INDOORS

USER INTERFACE

MOTOR RELAY

CONTROLLER

POWER SUPPLY

FU1
PS0
PS1
PS2
PS3
HC
0V
24V
TS
AUX
T1
T2
L1
L2
GND
GND
GND

3-PHASE MOTOR CONTACTOR

A1 A2
1L1 3L2 5L3 13NO
2T1 4T2 6T3 14NO

L3 L2 L1

GND
BARRIER GND
L2
L1

5 3

9 IF REQUIRED BY LOCAL REGULATIONS, INSTALL SWITCH AND SEAL-OFF (SUPPLIED BY OTHERS). IN ACCORDANCE WITH REGULATIONS.

3 4 2 6

8 VR INTERLOCK

INTERLOCK RELAY SUPPLIED BY OTHERS. RATED FOR LOAD

PUMP EMERGENCY SHUT-OFF (TYP)

(EXISTING EQUIP'T)

POWER FROM LOAD CENTER

SWITCH SHOWN TRIPPED

SWITCHED POWER TO GASOLINE PUMP CONTROLS

3-PHASE
380-415 VAC. 50 Hz
440-480 VAC. 60 Hz

1-PHASE
220-240 VAC
50/60 Hz

LOAD CENTER

HAZARDOUS LOCATION
Ex II 2G (ZONE 2)
OUTDOORS

7 CONTROL SYSTEM JUNCTION BOX

FACTORY WIRING ONLY

NO FIELD WIRING ABOVE TERMINAL BLOCK

I.S. GND	GND	T1	T2	T3	NEU	PS0	PS1	PS2	PS3	HC	0V	24V	TS
1	2	3	4	5	6	7	8	9	10	11	12	13	14

FACTORY WIRING ONLY

NO FIELD WIRING THIS SIDE OF BARRIER

INTRINSICALLY SAFE BARRIER

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INTRINSICALLY SAFE BARRIER

1 FACTORY WIRING ONLY

NOTES:

ALWAYS FOLLOW THE NATIONALLY RECOGNIZED REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION.

1. INTRINSICALLY SAFE WIRING

2. ALL WIRES BETWEEN CONTROLLER ENCLOSURE AND PROCESSOR ENCLOSURE MUST BE GASOLINE AND OIL RESISTANT WITH 600 V INSULATION.

3. I.S. BARRIER GROUND MUST BE MINIMUM 12 AWG (3.3mm^2). RUN SEPARATE CHASSIS GROUND AND I.S. BARRIER GROUND FROM CONTROL SYSTEM ENCLOSURE TO LOAD CENTER. THE RESISTANCE BETWEEN THE I.S. BARRIER GROUND AND THE EARTH GROUND OF THE LOAD CENTER MUST BE LESS THAN 1 OHM.

4. POWER WIRES TO THE MOTOR MUST BE MINIMUM 12 AWG (3.3 mm^2). FOLLOW RECOGNIZED REQUIREMENTS FOR WIRE AMPERAGE CHASCITY FOR THE SPECIFIC LOADING AND WIRE RUN DISTANCE TO DETERMINE IF A LARGER GAGE WIRE IS NECESSARY.

5. LOW VOLTAGE (24 VDC) WIRING MUST BE MINUMUM 18 AWG (0.96 mm^2). GASOLINE AND OIL RESISTANT WITH 600 V INSULATION.

6. ALL WIRING BETWEEN USER INTERFACE ENCLOSURE AND CONTROL SYSTEM ENCLOSURE CAN BE RUN IN THE SAME CONDUIT AS LONG AS ALL WIRES HAVE MINIMUM 600 V INSULATION AND ARE GASOLINE AND OIL RESISTANT.

7. THE CONTROL SYSTEM CREATES A HAZARDOUS LOCATION.
ZONE 1: THE INTERIOR OF THE CONTROL SYSTEM CABINET.
ZONE 2: WITHIN 200 mm OF ALL SIDES OF CONTROL SYSTEM CABINET AND 50 mm ABOVE CONTROL SYSTEM CABINET.

8. IF REQUIRED BY NATIONAL OR LOCAL AUTHORITY OR REGULATIONS, THE POWER TO THE SYSTEM MUST BE INTERRUPTED BY ACTIVATION OF THE PUMP EMERGENCY SHUT-OFF SWITCH.

9. A LOCKABLE THREE OR FOUR POLE DISCONNECT SWITCH SHOULD BE INSTALLED WITHIN SIGHT AND REACH OF THE MOTOR LOCATION. IF INSTALLED WITHIN THE HAZARDOUS LOCATION, IT MUST MEET ALL APPLICABLE LOCAL AND NATIONAL REQUIREMENTS FOR HAZARDOUS LOCATIONS.

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CHANGES

VAPORSAVER I (ATEX) TYPICAL WIRING 3-PHASE

THIRD ANGLE PROJECTION

OPW® A DOVER COMPANY

DRAWN: JMG
APPROVED: JMG
SCALE: NONE
DATE: 4/29/04

DRAWING NO. 99-41002

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