



AMERICAN ENVIRONMENTAL ASSOCIATES, INC.

**UNDERGROUND STORAGE TANK FACILITY
REVISED REMEDIAL ACTION PLAN**

**LEO'S 3 CAR WASH
2938 WEST 26TH STREET
ERIE, PENNSYLVANIA 16506**

FACILITY ID# 25-90615

**CITY OF ERIE
ERIE COUNTY, PENNSYLVANIA**

PREPARED: JULY 2012

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PREPARED FOR:

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2938 WEST 26TH STREET
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PREPARED BY:

AMERICAN ENVIRONMENTAL ASSOCIATES, INC.
1135 BUTLER AVENUE
NEW CASTLE, PENNSYLVANIA 16101



JULY 2012

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REVISED REMEDIAL ACTION PLAN

LEO'S CAR WASH

FACILITY I.D. #25-90615

(1) Summary of Site Characterization Report Conclusions

American Environmental Associates, Inc. (AEA) has been contracted by Leo's 3 Car Wash to provide environmental services pursuant to Underground Storage Tank (UST) corrective action and Land Recycling and Environmental Remediation Standards Act (Act 2) regulations at the subject site. The site is an oil change service and automated car wash located at 2938 West 26th Street, Millcreek Township, Erie County, Pennsylvania.

Corrective actions were initiated in response to a release that was discovered during construction of a new canopy on January 23, 2002. The release was eventually found to be associated with a loose swing joint in the regular unleaded line for the middle dispenser. A minor amount of contaminated soil was removed; approximately five tons, and then the new canopy footers were poured. The swing joint lead was repaired at this time. Clean soil conditions were never obtained and over excavation was not performed at this time due to site restraints. A Notification of Contamination was submitted to the PADEP's Meadville Office on January 23, 2002.

On August 6, 2002, a Geoprobe investigation was conducted by AEA to assess the extent of subsurface soil contamination. Confirmatory soil analysis of samples from the unleaded gasoline UST system area exhibited concentrations in excess of Act 2 Statewide Health Standards (SHS). Corrective actions pursuant to 25 PA Code 245, administered by the Pennsylvania Department of Environmental Protection (PADEP), were implemented.

In November of 2002, February 2003, and April of 2003, twelve monitoring wells were installed at the subject site. Soil samples and groundwater samples were collected and submitted for laboratory analysis of Pennsylvania Department of Environmental Protection's (PADEP)

unleaded gasoline parameters. Results of soil analyses indicated elevated concentrations of Benzene and MTBE and results of groundwater analysis indicated elevated concentrations of Benzene, Toluene, Ethylbenzene, Naphthalene, and MTBE. Separate phase hydrocarbons were detected in two site monitoring wells (MW#3 and MW#4). On June 24, 2003, a dual phase vacuum enhanced extraction test was performed on monitoring well MW-3. The purpose of the test was to characterize the hydraulic and pneumatic properties of the shallow aquifer and vadose zone and to evaluate high vacuum soil vapor extraction (SVE) as a remedial alternative.

Based upon evaluation of the data, a remedial action plan (RAP) involving installation of a dual phase high vacuum extraction (DPE) system was recommended. Monitoring wells MW#1, MW#3, MW#4, MW#5 and MW#6 were utilized as recovery wells.

In October of 2006 3 8000 gallon unleaded gasoline UST's and related piping were removed. Soils from the excavation were put back into the pit.

AEA is now proposing the installation of four additional recovery wells. RW #13, RW #14, RW #15 and RW #16 as illustrated on the attached Field Investigation Map. This is in order to help expedite achievement of the proposed Statewide Health Standard.

(2) Plans Relating to Worker Health and Safety

Attached in Appendix A

(3) Federal, State & Local Permits and Approvals Needed to Conduct Remedial Actions

Permit No. GRP #09-01 for groundwater discharge to City of Erie Wastewater Treatment Facility.

(4) Discussion of How the Remedial Action Will Attain the Selected Remediation Standard for the Site

A Remedial Action Plan was submitted to the PADEP in July of 2003. The plan recommended that American Environmental Associates, Inc. install a system to remediate the

dissolved gasoline contaminants in the groundwater at the site. The system is a dual phase high vacuum extraction (DPE). Monitoring wells MW#1, MW#3, MW#4, MW#5 and MW#6 are utilized as recovery wells.

Site preparation included the installation of below grade recovery piping (2-inch diameter, schedule 40 PVC) and modification of the recovery well heads. Trenching was done for electric, vapor extraction, groundwater recovery piping and a discharge line to the groundwater discharge location.

The remediation system consists of a 7.5 Hp oil sealed liquid ring pump (LRP) to recover liquid and vapor phase fluids. The pump consists of a shrouded rotor which rotates freely within an eccentric casing. There is no metal to metal contact between the rotor and casing. Centrifugal force acting on liquids within the pump causes the liquids to form a ring inside the casing. A fixed port cylinder, concentric with the rotor, directs the gas into the suction ports. Gas is trapped between the blades by the liquid pistons formed by centrifugal force as the liquid recedes from the port cylinder. It is trapped at the point of maximum eccentricity and is then compressed by the liquid ring as it is forced radially inward toward the central port cylinder. After each revolution, the compressed gas and accompanying liquid are discharged. During the pumping cycle, the gas is in intimate contact with the sealing liquid and compression is nearly isothermal. When handling saturated vapor-gas mixtures, the liquid ring acts as a condenser, greatly increasing the effective capacity of the pump. Seal liquid will be oil supplied via a reservoir mounted on the LRP skid.

The recovered fluids are pumped through a vapor/liquid knockout tank. Liquids are then directed, via transfer pump, through liquid phase granular activated carbon absorbers (GACA) to municipal sewage. Vapors are drawn from the knockout tank through the LRP and vapor phase GACA's and discharged to the atmosphere. Treatment of the vapors are conducted through two carbon units.

The system was put into operation in the first quarter of 2005 in order to obtain results to prepare a pay for performance proposal for the Underground Storage Tank Insurance Fund. The

contract has since been executed and the system was put into operation permanently in January 4, 2006. The system was operational throughout the first quarter of 2012. The treatment system pumped approximately 268,733 gallons of water in the first quarter of 2012 and approximately 3,040,447 gallons of water since the system was put into operation.

AEA is now proposing the installation of four additional recovery wells. RW #13, RW #14, RW #15 and RW #16 as illustrated on the attached Field Investigation Map. This is in order to help expedite achievement of the proposed Statewide Health Standard.

A Residential Used Aquifer Statewide Health Standard is chosen for this site.

(5) Results of Pilot Study – Remedial Feasibility Testing

On June 24, 2003, a dual phase vacuum enhanced extraction test was performed on monitoring well MW-3. The purpose of the test was to characterize the hydraulic and pneumatic properties of the shallow aquifer and vadose zone and to evaluate high vacuum soil vapor extraction (SVE) as a remedial alternative.

During the test vapor and water were extracted, separated and monitored. An Atlantic Fluidics A-20 (3 Hp) Liquid Ring Pump (LRP) was employed to extract vapors. In order to facilitate fluid extraction, the recovery well (MW#2) was fitted with an airtight seal. A one-inch diameter drop tube was inserted through the seal, approximately 7.5 feet into the water table. Vapors and groundwater were extracted through the drop tube. After separation, groundwater was discharged through a 200-pound carbon vessel. Flow rates were measured visually.

Remedial Feasibility Testing

The following data was recorded from the extraction well during the test: applied vacuum, water flow rates, vapor flow rate, lower explosive limit (% LEL), photo ionization detector (PID) readings and oxygen (% O₂). Depth to water was recorded in all monitoring wells prior to and after aquifer testing. Vapor and groundwater recovery was performed

simultaneously. Magnahelic gauges were mounted on select monitoring wells and monitored for vacuum response during the test.

Vapor Recovery Data

Testing was initiated by applying a wellhead vacuum of 25 inches of mercury. Airflow was measured through a rotometer mounted on the exhaust port of the LRP. An airflow of 4.0 to 6.0 standard feet per cubic minute (SCFM) was obtained.

Vapor effluent samples were collected and field screened periodically throughout the test. PID readings ranged from 30 to 266 parts per million (ppm). Per cent LEL and O₂ readings were taken in conjunction with the PID. LEL readings ranged from 5 to 28%. O₂ readings ranged from 20.0 to 20.9 %. Table 1 contains a summary of the field screening data.

Hydrocarbon removal rates were calculated using %LEL and airflow obtained from the field measurements. Hydrocarbon removal rates are summarized in Table 1. Vapor recovery rates ranged from 0.05 to 0.27 lbs./hr. Removal rates were calculated using equations developed by the American Petroleum Institute (API). A sample equation is provided below Table 1.

A time-series plot (%LEL, %O₂ and hydrocarbon recovery vs. time) is presented as Chart 1.

A vapor sample was collected at the end of testing. The sample was submitted to Environmental Laboratory Services, Inc. and analyzed for Benzene, Toluene, Ethylbenzene, Xylenes, Methyl-t-butyl ether (MTBE) and Gasoline Range Organics (GRO). The results are summarized below and indicate that appreciable hydrocarbon recovery was still occurring at the end of remedial testing.

Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	GRO
25.8	2.83	3.74	3.78	<0.1	300

Results are reported in ppm.

Hydraulic / Pneumatic Influence

Groundwater was recovered at an average of 1.22 gallons per minute (gpm) following stabilization. Monitoring wells MW#1, MW#2, MW#3, MW#4, MW#5, MW-6, MW#7, and MW#8 were gauged prior to and after testing. Drawdown at recovery well MW#2 corresponds to the bottom of the drop tube. Drawdown ranged from -0.04 (MW#4) to -2.91' (MW#3) feet. Groundwater drawdown data is summarized in Table 2.

Magnahelic gauges were mounted on adjacent monitoring wells (MW#1, MW#3, MW#4, MW#6, MW#7 and MW#8) to measure resultant formation vacuums. A maximum vacuum response of 1.5 inches of water was obtained in MW#1. An induced vacuum of 0.1 inches of water was observed in monitoring well MW#8. Vacuum response data is summarized on Table 3. Vacuum response data from select wells is graphed on Chart 2.

Groundwater drawdown data generated during remedial testing indicates that a cone of depression of approximately 57 feet was created while pumping MW#2 at a relatively low flow rate of 1.2 gpm. Trends in the data suggest the cone of depression will be further expanded with long term pumping. Vacuum response data indicates a zone of influence of approximately 57 feet was achieved during testing. This data suggests that an applied vacuum of at least 23 inches of mercury is more than adequate to create an SVE radius of influence. Charts, graphs and tables of the field tests are attached in Appendix B.

(6) Design and Construction Details

Attached in Appendix C.

(7) Operation and Maintenance Details

The remediation system will be checked twice per month to assure proper working conditions. It is anticipated that effluent water will be sampled once a month as per local sewage authority permit requirements. Flow meter measurements from the effluent water will also be taken monthly. Both water and air activated carbon units will be sampled monthly before and

between activated carbon units to determine the effectiveness of the units. Groundwater samples will be obtained quarterly from monitoring wells MW#2, MW#7, MW#8, MW#9, and MW#12 to determine the effectiveness of the remediation system. Static water levels will be obtained quarterly from all non-pumping monitoring wells. Results of the above referenced sampling will be summarized in a quarterly remedial action status report.

**(8) Site Map Depicting Buildings, Roads, Property Boundaries
And Other Pertinent Information**

The Site Map is attached in Appendix D.

(9) Description of the Media and Parameters to be Monitored & Sampled

The remediation system will be inspected at least once a month to assure proper working condition. Static water levels will be taken from all monitoring wells. Quarterly groundwater samples will be taken for monitoring wells MW#2, MW#7, MW#8, MW#9, MW#10, MW#11 and MW#12 and analyzed for unleaded gasoline parameters (EPA 5030B/8260B).

Before, between and after activated carbon treatment water samples will be obtained monthly and analyzed for Benzene, Toluene, Ethylbenzene, Xylene, Cumene, Naphthalene, and MTBE. Air samples will be taken monthly before, between, and after activated carbon treatment and analyzed for Benzene, Toluene, Ethylbenzene, Xylene, MTBE, and Gasoline Range Organics.

The result of analytical testing during each quarter will be summarized in a Quarterly Remedial Action Progress Report and submitted to the Pennsylvania Department of Environmental Protection.

(10) Description of Analytical Methods to be Utilized

Analyzed for unleaded gasoline parameters (EPA 5030B/8260B).

(11) Description of the Methodology That Will be Utilized to Demonstrate Attainment of the Selected Standard

The remediation system consists of a 7.5 Hp oil sealed liquid ring pump (LRP) to recover liquid and vapor phase fluids. The pump consists of a shrouded rotor which rotates freely within an eccentric casing. There is no metal to metal contact between the rotor and casing. Centrifugal force acting on liquids within the pump causes the liquids to form a ring inside the casing. A fixed port cylinder, concentric with the rotor, directs the gas into the suction ports. Gas is trapped between the blades by the liquid pistons formed by centrifugal force as the liquid recedes from the port cylinder. It is trapped at the point of maximum eccentricity and is then compressed by the liquid ring as it is forced radially inward toward the central port cylinder. After each revolution, the compressed gas and accompanying liquid are discharged. During the pumping cycle, the gas is in intimate contact with the sealing liquid and compression is nearly isothermal. When handling saturated vapor-gas mixtures, the liquid ring acts as a condenser, greatly increasing the effective capacity of the pump. Seal liquid will be oil supplied via a reservoir mounted on the LRP skid.

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from all non-pumping monitoring wells. Results of the above referenced sampling will be summarized in a quarterly remedial action status report.

(12) Description of Proposed Postremediation Care Requirements

N/A

(13) Description of Additional Items Necessary to Develop the Remedial Action Plan

N/A

APPENDIX A: PLANS RELATING TO WORKER
HEALTH & SAFETY

R.A.R. Engineering Group, Inc.

Safety Program

Employee Handbook

Prepared by:
R.A.R. Engineering Group, Inc.
in association with:
U.S. Compliance Systems, Inc.

Disclaimer: This Employee Handbook is not all inclusive. It does reflect selected portions of the safety program belonging to:

R.A.R. Engineering Group, Inc.
1135 Butler Avenue
New Castle, PA 16101

To the best of our knowledge, the information contained herein is accurate. U.S. Compliance Systems, Inc. accepts no responsibility for errors or omissions.

R.A.R. Engineering Group, Inc.

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R.A.R. Engineering Group, Inc.

SAFETY COMMITMENT

We are committed to ensuring that you do not work in an environment that is unsanitary, hazardous, or dangerous to your health or safety. You will be instructed on the recognition and avoidance of unsafe conditions and the regulations applicable to your work environment to control or eliminate any hazards or other exposure to illness or injury.

Using the safety and health training programs provided by the Occupational Safety and Health Administration (OSHA), as well as other reference materials, company safety training, policies, and procedures will be developed and implemented as needed.

Frequent and regular inspections of our facilities, materials, and equipment will be made by the Safety Program Administrator or designated persons.

You may operate equipment or machinery only if you are qualified by training or experience. Machinery, tools, material, or equipment that you find either not in compliance with a particular OSHA standard or that you determine is unsafe will be identified as such by tagging; locking the controls; or physically removing it from its place of operation.

Safety takes a commitment from all persons from senior management to the newest hire. It is expected that you will actively participate in safety training and perform your work in a safe manner.

The primary beneficiary of maintaining a safe work environment is you. You are the person who will not sustain an occupational injury or illness. A safe work site, additionally, protects fellow employees and those with whom we work. Performing tasks in a safe manner allows us to work more efficiently, reduces the possibility of equipment damage, eliminates costly citations, and enhances our opportunities to procure more work. Working safely has nothing but positive benefits to you and the company.

If confronted with a new task for which you do not know the proper safety procedures, ask for instruction from your supervisor before proceeding.

Do not hesitate to point out observed safety deficiencies to your supervisor -- you may prevent an injury to yourself or a fellow employee.

OSHA standards that are applicable to the work you do are readily accessible.

SAFETY CONSIDERATIONS

You should have a working understanding of the below safety principles/topics as they apply in all workplace situations. Safety procedures for specific tasks will be addressed through formal or on-the-job training depending on the task.

On every project, there will be a competent person with the knowledge and authority to stop work should a hazardous condition develop that cannot be immediately resolved.

Regular and frequent inspections will be made to ensure that established safety procedures are being followed.

HOUSEKEEPING

You are to maintain a neat and orderly work area *as far as practical*. Housekeeping and general cleanliness have a direct effect on safety and health. Proper housekeeping can prevent slips and falls, allow unhampered egress in the event of an emergency, prevent falling object injuries, enhance fire safety, and prevent the infestation of vermin. Listed below are general housekeeping rules:

- a. All walking/working surfaces shall be kept clean and dry.
- b. Do not allow debris to accumulate.
- c. All stored materials will be neatly stacked.
- d. All containers, when not in use, will be sealed.
- e. No objects will be left unattended on stairways.
- f. Entrances and exits will be properly marked and not blocked.

EMERGENCY MEDICAL RESPONSE

**DO NOT PROVIDE ANY MEDICAL ASSISTANCE
FOR WHICH YOU ARE NOT QUALIFIED BY
CERTIFIED TRAINING**

Should an injury occur that requires an emergency medical responder, the below listed actions will be taken in the order given:

1. Call the posted emergency response number.
2. Provide any medical assistance you are trained and certified to do.
DO NOT provide any medical assistance you are not trained to do.

3. Designate an individual to direct the emergency responders to the injured party and provide Material Safety Data Sheets if applicable.
4. Notify your supervisor who, in turn, will notify the office.

FIRE PREVENTION

Fire prevention deals not with handling a fire emergency, but rather preventing a fire in the first place. To reduce the likelihood of a fire, you must adhere to the following rules:

1. There shall be no smoking except in designated smoking areas. Smoking materials will be totally extinguished and placed in appropriate receptacles. Under no circumstances will there be smoking during refueling of vehicles or within 50 feet of flammable materials.
2. All chemical products will be handled and stored in accordance with the procedures noted on their individual MSDS.
3. Heat producing equipment will be properly maintained and operated per the manufacturer's instructions to prevent accidental ignition of combustible materials.
4. Precautions will be taken when working with an open flame and those areas will be made fire safe by removing or protecting combustibles from ignition.
5. Combustible liquids must be stored in approved containers.
6. Chemical spills -- particularly combustible and reactive liquids -- must be cleaned up immediately. Damaged chemical containers and cleanup materials must be properly disposed.

[Note: Exercise care! Information on appropriate personal protective equipment; proper disposal; proper cleanup procedures; required ventilation; etc. is found on the product's MSDS.]

7. Combustible liquids and trash must be segregated and kept from ignition sources.
8. Keep clear access to fire hydrants as well as portable fire extinguishers.
9. Practice good housekeeping!

PORTABLE FIRE EXTINGUISHERS

Know the location of fire extinguishers, what class of fire extinguisher is appropriate for what type of fire, and how to safely use a fire extinguisher.

Portable fire extinguishers will be located allowing for ease of accessibility.

Portable fire extinguishers will be distributed as indicated below:

<u>CLASS</u>	<u>DISTRIBUTION</u>	<u>NOTES</u>
A "A" on a green triangle	75 feet or less travel distance between yourself and the extinguisher	Use on wood, paper, trash.
B "B" on a red square	50 feet or less travel distance between the hazard area and yourself	Use on flammable liquid, gas.
C "C" on a blue circle	Based on the appropriate pattern for the existing Class A or Class B hazards	Use on electrical fires.
D "D" on a yellow star	75 feet or less travel distance between the combustible metal working area and the extinguisher or other containers of Class D extinguishing agent.	Use on combustible metals.

Using the wrong fire extinguisher on some fires can actually spread the fire. Portable fire extinguishers suitable for ABC class fires will be available on all job sites – at least one extinguisher will be on each floor of a project, near the stairway.

FIRE PROTECTION

The phone number of the local fire department as well as our facility address will be posted or readily accessible.

If a fire should occur, all personnel and the local fire department will be notified. In all emergency situations, you should:

- a. Remain calm.
- b. Speak clearly and slowly.
- c. Give the exact location.
- d. Describe the situation.
- e. Give the phone number from where you are calling.
- f. Do not hang up until told to do so.

FIRST AID & FIRST AID KITS

Should a medical emergency occur, call 911 or, if 911 service is not available, call the emergency medical response phone number posted at the job site. Explain the situation clearly and follow the emergency response team's instructions.

If an emergency vehicle is being sent to the job site, establish easy access and keep on-lookers away.

Unless trained and licensed in CPR/first aid and a designated first aid provider as an additional job as part of the company bloodborne pathogen program, employees will not expose themselves to blood or other bodily fluids of other employees at any time.

Per OSHA, first aid is limited to:

- a. Using a non-prescription medication, such as aspirin, at non-prescription strength.
- b. Cleaning, flushing or soaking wounds on the surface of the skin;
- c. Using wound coverings such as bandages, Band-Aids™, gauze pads, etc.; or using butterfly bandages or Steri-Strips™.
- d. Using hot or cold therapy.
- e. Using any **non-rigid** means of support, such as elastic bandages, wraps, non-rigid back belts, etc..
- f. Using temporary immobilization devices while transporting an accident victim (e.g., splints, slings, neck collars, back boards, etc.).
- g. Drilling of a fingernail or toenail to relieve pressure, or draining fluid from a blister.
- h. Using eye patches.
- i. Removing foreign bodies from the eye using only irrigation or a cotton swab.
- j. Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means.
- k. Using finger guards.
- l. Using massages.
- m. Drinking fluids for relief of heat stress.

You must know the location and contents of first aid kits. These kits are worthless if not readily accessible. First aid kits will **not** be locked up.

First aid supplies generally include: adhesive bandages, bandage compresses, scissors, tweezers, triangular bandages, antiseptic soap or pads, eye dressing, and other items that are appropriate for the work we do.

First aid kits will be replenished as items are used. Sterile items will be wrapped and sealed and used only once. Other items such as tape or scissors can be reused and should be kept clean. In the absence of plentiful amounts of clean water, eye flush will be available.

FLUIDS

From a safety standpoint, you must not neglect your need for potable (drinkable) fluids.

On job sites, exertion and heat dictate the need for plenty of water.

From a life process standpoint, what fluid intake is doing is keeping you healthy by allowing your body to maintain its core body temperature at its appropriate level as well as transporting, within your body, nourishment, gases, and waste.

Imagine your body as a water based chemical factory that functions only within a narrow temperature range. Sweating (water loss) cools your body and this fluid must be replaced.

Drink plenty of water!

PERSONAL PROTECTIVE EQUIPMENT

A hazard assessment will be to determine what types of personal protective equipment (PPE) are appropriate. A major part of this hazard assessment will be determining what PPE needs can be eliminated through feasible engineering controls or work procedures.

Types of hazard categories that are considered are: impact; penetration; compression; chemical; heat; harmful dust; and light radiation.

The focus of PPE is to eliminate eye, hand, foot, limb, and head injury. Visitors exposed to the identified hazards will be loaned appropriate PPE (and given instruction in its use) prior to hazard exposure.

You must understand the limitations of your PPE; the correct procedure for putting on, adjusting, and removing the PPE; and the proper care, maintenance, and useful life of the PPE.

Cleanliness of PPE is of importance particularly when dealing with eye protection where fogging, scratches, or dirt can render the PPE a hazard rather than protection from a hazard.

An inexpensive pair of safety glasses could save your priceless eyesight.

Unique PPE required for job performance such as respirators, ear plugs, safety goggles, etc. will be supplied to you. You are responsible for maintenance of the equipment issued to you. Items of PPE that are damaged or non-functioning should be turned in to the supervisor for repair or replacement.

Normal PPE generally protects you from an *instant* injury such as a projectile in the eye. Respiratory and hearing protection, while PPE, fall under more stringent standards than hard hats, for example. Respiratory and hearing hazards can take years to present themselves. Hearing protection and respirator selection are more complicated, procedurally, than ordinary PPE (i.e., hard hats, safety glasses, gloves, steel toed boots, etc.). Their uses are governed by specific standards that require in depth training based on objective scientific data.

For personal comfort and to eliminate nuisance noises and nuisance respiratory conditions that are not at or above the threshold level for required protection, dust masks and ear plugs may be used at any time.

LIFTING, PUSHING & PULLING

Back injuries are often caused by the obvious -- putting excessive strain on the lower back by lifting an object that is too heavy or awkward, or by bending and/or twisting while lifting.

However, lifting injuries are also caused by less obvious reasons:

- a. poor physical condition
- b. poor posture
- c. poor judgment (lifting, pulling, pushing an object that is obviously too heavy or awkward without seeking assistance or a mechanical lifting device.)
- d. lack of exercise
- e. excessive body weight

Proper lifting techniques are important for employee safety. Below are lifting techniques that will reduce the likelihood of injury:

- a. lift objects comfortably, not necessarily the quickest or easiest way.
- b. lift, push, and pull with your legs, not your arms or back.

- c. when changing direction while moving an object, turn with your feet, not by twisting at the waist.
- d. avoid lifting higher than your shoulder height.
- e. when standing while working, stand straight.
- f. when walking, maintain an erect posture; wear slip-resistant, supportive shoes.
- g. when carrying heavy objects, carry them close to the body and avoid carrying them in one hand.
- h. when heavy or bulky objects need to be moved, obtain help or use a mechanical aid such as a dolly, hand truck, forklift, etc..
- i. when stepping down from a height of more than eight inches, step down backwards, not forward.
- j. handle heavy objects close to the body -- avoid reaching out.
- k. lift gradually and smoothly. Avoid jerky motions.
- l. maintain a clear line of vision.

SLIPS, TRIPS & FALLS

Slips, trips, and falls are among the most common job site accidents and they are easily preventable. Below are some of the causes of slips, trips, and falls:

- a. running on the job site.
- b. engaging in horseplay.
- c. working off a ladder that is not firmly positioned.
- d. carrying an object that blocks line of vision.
- e. work boots not laced or buckled.
- f. working off a scaffold without safety rails.
- g. using ladders that have oil and grease on the rungs.
- h. not using a handrail on steps.
- i. messy work areas with debris strewn about.
- j. not paying attention to what one is doing.

This list can go on and on, but all the above are easily preventable by adherence to common safety procedures, common sense, and awareness of potential hazards on the job site.

BASIC TOOLS

Much is written about powered tools and the importance of guards and other safety related topics. Seldom addressed are the hazards associated with simple, non-powered tools. Every tool is potentially dangerous if not properly used. Basic tools would include, but not be limited to: hammers, screwdrivers, shovels, shears, utility knives, and wrenches.

Below are five guidelines for basic tool use.

1. Never use a tool for a purpose other than that for which it was designed!
Improper use of a tool will certainly damage it and may result in injury if the tool slips or breaks.
2. Never exceed a tool's design limits.
If a tool cannot do the job being properly used, you've got the wrong tool. Exceeding a tool's design limits will certainly damage the tool and, of course, expose yourself to injury if it slips or breaks.
3. Inspect tools before use.
Cracked or splintered handles, loose heads, "mushroomed" striking surfaces, dull chisels/blades, bent shafts, worn or deformed ends -- all are potentially dangerous conditions for tool use. Either repair or replace damaged tools -- do not use them!
4. Clean tools after use.
It is much easier to clean and/or lubricate tools immediately after use than waiting until the tools become rusty or encrusted with gunk.
5. Store tools properly.
If tools are properly stored automatically, you, over time, save hours not having to look for tools. From a safety standpoint, you will have the right tool at the right time. Additionally, by having tools properly stored, you'll prevent the possibility of rummaging around in a tool box and cutting yourself on an exposed sharp object.

POWERED TOOLS

You may operate powered tools only if authorized. This authorization will be granted after it has been demonstrated that you have the ability to safely operate these items through training or experience.

Seemingly simple powered tools, misused, can cause serious injury. Understand the operator's manual and never bypass any guards.

GROUND FAULT CIRCUIT INTERRUPTERS (GFCI)

When you are using temporary wiring -- extension cords are a form of temporary wiring -- ground fault circuit interrupters must be used. A GFCI is designed to prevent you from receiving a dangerous electrical shock.

Because 115V at 15A is so common, its safety is often taken for granted. The danger is not the voltage, it is the Amps (current). 0.015 Amps is enough current to cause a painful shock. The table below was prepared by the National Safety Council and the Pacific Telegraph Company:

Safe Current Values

Amps		
0.001A	(1mA)	Cannot be felt
0.001 - 0.008A	(1 - 8 mA)	Felt, but not painful: muscle control is not lost.

Unsafe Current Values

Amps		
0.015 - 0.02A	(15 - 20mA)	Painful shock: muscular control lost; cannot let go; not harmful to body organs
0.02 - 0.09A	(20 - 90mA)	Burns; breathing extremely difficult; sore muscles
0.1 - 0.2A	(100mA - 200mA)	*Ventricular Fibrillation (a fatal heart condition)
0.2 - 2A	(200mA - 2A)	Burns; paralysis of the lungs; nerve damaged if above 600V
2A and up frying currents; severe burns of two types:		1. External - caused by arcing on contact 2. Internal - cooking of the organs and flesh. Results in: amputation or destruction of vital organs

*Ventricular Fibrillation is essentially a fluttering of the heart which is useless in circulating blood.

If you do receive a severe shock, you should seek medical evaluation even if there is no apparent damage.

GFCI's are required by all 120-volt, 15-, 20-, and 30-ampere receptacle outlets that are not a part of the permanent wiring of a building. GFCI's provide employee safety by detecting lost current resulting from a short, overheating, and/or ground fault and "tripping" or cutting off the current within as little as 1/40th of a second.

A GFCI **will not** protect one who comes in contact with two hot wires or a hot wire and a neutral wire. A GFCI **will** provide protection against fires, overheating, damage to insulation, and, the most common form of electrical shock hazard -- the ground fault. Always **test** a GFCI before use.

SIGNS & TAGS

You must pay heed to the various signs and tags found throughout our facility. Color coding assists in determining the level of danger:

- red = danger
- yellow = caution
- orange = warning
- white = safety instruction
- fluorescent orange = biological hazard

ADEQUATE LIGHTING

You must see what you are doing. A simple guideline for adequate lighting is this: if you are not sure if you have enough light for your work, you don't!

APPROPRIATE CLOTHING

Wear clothing that is appropriate for your work. You may be exposed to heat, cold, rain, or snow. Wear clothing that provides comfort, yet be sure that it cannot snag on equipment.

PERSONAL HYGIENE

You will have access to restroom facilities as needed. Do not take job site chemicals home with you on your skin or clothing.

DRUGS AND ALCOHOL

With the exception of over the counter drugs such as aspirin or drugs prescribed by a physician, you may have no drugs or alcohol within our facility. Alcohol and drug abuse cause an unacceptable level of safety hazard. If you are found to be under the influence of drugs and/or alcohol, you will be immediately removed from your work assignment by your supervisor and further disciplinary action will be taken by the Safety Director.

If you are taking prescription medication that reduces motor skills, you should report this to your supervisor for appropriate work assignment.

ACCIDENT INVESTIGATION

The purpose of Accident Investigation is to prevent the same type of accident from reoccurring. An accident investigation will begin immediately after the medical crisis is resolved.

Near-miss mishaps, events which result in no injury or damage, will be investigated because, even though the outcomes are different, the causes are the same.

Your responsibility, should you be involved as a witness in an accident investigation, is to fully answer questions that may be asked of you so that future accidents may be prevented.

POSTINGS

There will be a prominently displayed bulletin board or area for postings. You must be aware of the location of the following posted items:

- a. OSHA Form 3165, *It's the law!*
- b. Emergency phone numbers & facility address for emergency response.

- c. During the period from 1 February through to April 30, OSHA Form 300A, *Summary of Work-Related Injuries and Illnesses*, must be posted for work-related injuries and illnesses which have occurred during the previous year.

If appropriate, the following will be posted:

- a. OSHA citations.
- b. Notice of informal hearing conference.
- c. Names and location of assigned first aid providers.
- d. Air or wipe sampling results.
- e. Emergency action plan.

SAFETY MEETINGS

Depending on the work at hand, safety meetings may be held during the work shift. Successful safety meetings demand interactive participation by the presenter as well as those attending. Pay attention, feel free to ask questions, and ensure that, at the completion of a safety meeting, you have no unanswered safety questions.

ENFORCEMENT

It is expected that all employees will abide by our safety rules and guidelines not only to protect themselves, but also to protect their fellow workers from harm. Should a safety violation occur, the following steps will be taken by the employee's immediate supervisor:

- a. **Minor Safety Violations:** Violations which would **not** reasonably be expected to result in serious injury.
 - 1. The hazardous situation will be corrected.
 - 2. The employee will be informed of the correct procedures to follow and the supervisor will ensure that these procedures are understood.
 - 3. The supervisor will make a written report of the occurrence using our Enforcement Documentation Form and inform the employee that this documentation will be forwarded to the Safety Director for a retention period of one year.
 - 4. A repeat occurrence of the same minor safety violation is considered substantially more serious than the first.

- b. **Major Safety Violations:** Violations which would reasonably be expected to result in serious injury or death.
1. The hazardous situation will be corrected.
 2. The employee will be informed of the correct procedures to follow and will impress upon the individual the severity of the violation and the likely consequences should this type of violation be repeated. The supervisor will ensure that the individual understands the correct procedures and will be cautioned that a reoccurrence could result in disciplinary action up to and including discharge.
 3. The supervisor will make a written report of the occurrence using our Enforcement Documentation Form and inform the employee that this documentation will be forwarded to the Safety Director for a retention period of one year.
- c. **Willful Major Safety Violations:** Intentional violation of a safety rule which would reasonably be expected to result in serious injury to the employee or a fellow worker.
1. The hazardous situation will be corrected.
 2. The employee will be removed from the job site, the event will be documented and forwarded to the Safety Director, and the employee will be discharged.

Employees are to understand that the primary purpose of documenting safety violations is to ensure that the important business of employee safety is taken seriously and that the potential for injury is reduced to the lowest possible level.

Schedule of Enforcement Actions for Violations within a 1 Year Period
Minor Violation

Offense	Action	Repeat of Same Offense	Action
1st	Written Notice	1st	1 Day Off
2nd	Written Notice	2nd	3 Days Off
3rd	1 Day Off	3rd	Dismissal
4th	2 Days Off		
5th	3 Days Off		
6th	Dismissal		

Major Violation

Offense	Action	Repeat of Same Offense	Action
1st	Written Notice	1st	4 Days Off
2nd	2 Days Off	2nd	Dismissal
3rd	4 Days Off		
4th	Dismissal		

HAZARDOUS JOB SITE MATERIALS

When working in or around older structures, potential asbestos and lead hazards **may** exist. On many job sites, the potential for crystalline silica exposure **may** exist. The presence of these hazards, and the appropriate PPE and respiratory protection requirements, will be disclosed before any work begins.

Should these materials be "discovered" as work progresses, we will protect our employees from these hazards by:

- a. identification of these items by the competent person.
- b. informing the owner, project designer, or engineer of the hazards.
- c. securing the areas in question until testing proves samples to be negative.

Asbestos can be found in pipe, wall, and boiler insulation; exterior sheeting; and flooring. Friable or crumbling asbestos presents the most hazard as it can float in the air and be inhaled into the respiratory system. Without respiratory protection, the microscopic asbestos fibers can enter the deepest portion of the lung, causing scar tissue to develop and stiffen the lung. The net result is a reduction of gas exchange -- a condition called asbestosis.

Lead can be found in water pipes, soldering, and paint. Lead is a heavy, toxic metal which can be absorbed into your body by ingestion and/or inhalation. It is a cumulative poison which can stay in your body for decades.

While massive doses of lead can kill in a matter of days, the more likely scenario on a job site is moderate exposure to asbestos or lead which probably would not create any health problems for years -- if at all.

Crystalline Silica can be readily found on many job sites in rocks as well as many concrete and masonry products. Crystalline Silica can be released in the air when employees are performing such tasks as:

- a. chipping, hammering, drilling, crushing, or hauling rock.
- b. abrasive blasting.
- c. sawing, hammering, drilling, or sweeping concrete or masonry.

Unprotected respiratory exposure to crystalline silica may cause a lung disease called silicosis.

Because of the chronic (long term) nature of these hazards, detrimental health effects due to exposure would not be immediately noticed.

The competent person on site will prevent exposures to these materials. Areas that contain the above materials will be cordoned off and protected with appropriate warning signs. Do not enter any restricted area unless dictated by job assignment and only after specific training for dealing with these hazards. The training would include PPE, respiratory protection, work procedures, medical surveillance, containment, hygiene, handling, testing, and labeling.

SPECIFIC OSHA COMPLIANCE PROGRAMS

When you are confronted by situations listed below, you must perform your tasks in accordance with our written programs which comply with specific OSHA standards. Below is an overview of each program.

Control of Hazardous Energy - Lockout/Tagout

Applicable: to servicing and maintenance of machines and equipment where the unexpected energization, start up or release of stored energy could occur and cause injury.

Not

Applicable: to routine, repetitive, integral procedures such as minor adjustments & tool changes. Work on cord and plug connected equipment where unplugging negates the hazard and the plug is in the control of the person doing the work.

Hazard: possibility of being crushed, dismembered, mangled, paralyzed, electrocuted, sliced, or punctured by the sudden release of energy such as the following sources: capacitor, chemical, counter weight, electrical, engine, flywheel, hydraulic, pneumatic, spring, thermal, or gravity.

Procedures

- Preparation for Shutdown:** Using the Energy Source Evaluation, all isolating devices must be located.
- Equipment Shutdown:** Inform the affected person and use normal shut down procedures.
- Equipment Isolation:** Physically isolate the equipment from its energy source(s) -- there may be more than one.
- Device application:** Apply color coded locks and/or tags to hold the isolating devices in a "Neutral" or "Off" position.
- Release of Stored Energy:** Dissipate stored energy.
- Verification of Isolation:** Prior to work, operate machine controls and ensure the machine will not operate.
- Release from Lockout/Tagout:** The person who applied the devices is the one who removes them after ensuring the area is clear and affected employees are informed.

Exposure Control Plan

(for bloodborne pathogens or other infectious materials)

An exposure control plan is required when emergency medical response is not available within a reasonable time frame and personnel are assigned as first aid providers as an additional duty.

The primary hazard relates to the possibility of infection resulting from exposure to blood-borne pathogens or other infectious materials while providing first aid to a trauma victim or cleaning up bodily fluids after an incident.

As a statement of policy, should an exposure control plan be required, Universal Precautions will be used. Essentially, this means that each trauma victim's blood, bodily fluids, and other potentially infectious materials will be treated as if they are known to be infectious.

First aid providers must understand:

- a. the hazards of bloodborne pathogens and other infectious materials.
- b. engineering & work practice controls designed to minimize possible exposure such as:
 1. handwashing equipment & procedures.
 2. eating; drinking & smoking prohibitions.
 3. the containment of contaminated sharps.
 4. the containment of other regulated waste.
 5. the disposal of contaminated sharps & regulated waste
 6. controlling splashing/spraying of potentially infectious materials.
 7. the prohibition of mouth pipetting (the mouth suction of blood through a tube).
- c. the need to place an impermeable barrier between potential infectious materials and the provider's work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes using:
 1. disposable gloves
 2. utility gloves
 3. eye & respiratory protection
 4. protective body clothing
- d. hepatitis B epidemiology and how bloodborne pathogens are transmitted.

- e. the importance of hepatitis B vaccination within 24 hours of possible exposure.
- f. the procedure for incident report preparation and the importance of completing them, in writing, before the end of the work shift.

Fall Protection

Fall protection is required for employees working six feet or more above walking/working surface, when there is a potential for objects to fall on them, or when they are working around covers.

The obvious hazard is falling or being hit by a falling object.

A fall protection plan is required when conventional fall protection systems are infeasible.

Through training, employees must know where conventional fall protection systems are required such as when working on or around:

1. unprotected sides and edges
2. leading edges
3. hoist areas
4. holes
5. formwork & reinforcing steel
6. ramps, runways & other walkways.
7. excavations
8. dangerous equipment
9. overhand bricklaying & related work
10. roofing work on low-sloped roofs
11. steep roofs
12. precast concrete erection
13. residential construction
14. wall openings

Additionally, employees must understand:

- a. the selection, use, and maintenance of fall protection system(s).
- b. the types of fall protection systems:
 1. guardrail system
 2. personal fall arrest system
 3. safety net system

4. warning line system
5. safety monitoring system
6. positioning device system
7. controlled access zone (CAZ)
8. covers
9. protection from falling objects.

Forklifts

Forklifts include: fork trucks; tractors; platform lift trucks; motorized hand trucks; and other specialized industrial trucks powered by electric motors or internal combustion engines.

The primary hazards involved in truck operation are:

1. physically hitting a person/object with the truck or load.
2. having a load fall and hit the operator or other person.
3. having the truck tip and crush the operator or other person.
4. fire or explosion during refueling/recharging.

Supervisors should ensure that truck operators are authorized by the Program Administrator. Authority to operate a truck will be revoked if unsafe acts are observed or it is apparent that the operator has not retained the knowledge and job skills necessary to safely perform truck operations.

Supervisors should caution employees not involved with truck operations to stay clear of them due to limited visibility of the operator and the size and weight of the vehicle and load.

Hazard Communication

Practically all chemical products have physical or health hazards if they are inadvertently spilled or improperly used. Our Hazard Communication Plan details the methods used to keep our employees informed of these potential hazards.

The Program Administrator will ensure that all personnel understand:

- a. the importance and use of labels; material safety data sheets (MSDS); and the ready accessibility of MSDS.
- b. the physical & health hazards of chemicals used in the workplace.
- c. the methods used to detect the release of a hazardous chemical.

- d. the methods to protect oneself from chemical hazards including PPE; work practices; & emergency procedures.
- e. the need to share product information with other contractors.

Hearing Conservation

Supervisors are to ensure that employees are not exposed to occupational noises that exceed the levels listed below. Excessive noise may cause permanent hearing loss. Supervisors should be aware that hearing loss is often painless and unnoticeable.

Permissible Noise Exposures

<u>Sound level</u>	
<u>Duration per day, hours</u>	<u>dBA slow response</u>
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

The Program Administrator will ensure that applicable standards are posted, medical surveillance and noise monitoring are instituted, and that all affected personnel understand the process of hearing and the importance of preventing hearing loss.

Permit-Required Confined Space

Permit-required confined spaces may present a very hazardous environment if specific procedures, testing, and training are not implemented prior to entry. As a reminder:

A confined space is a space that:

- is large enough and so configured that an employee can bodily enter and perform assigned work; and
- has limited or restricted means for entry or exit. These spaces may include: ventilation or exhaust ducts, bins and tanks, boilers, sewers, tunnels and open top spaces more than 4 feet in depth such as pits, tubs, and vessels; and
- is not designed for continuous employee occupancy.

A permit-required confined space is:

a confined space that contains any recognized serious safety or health hazards. These hazards may be: engulfment by materials; entrapment by space shape; inhalation of hazardous (possibly fatal) atmospheres.

Supervisors should ensure that employees understand:

1. the need to identify and evaluate permit space hazards before entry.
2. the need to test conditions before entry and monitor conditions during entry.
3. how to prevent unauthorized entry.
4. how to eliminate or control hazards for safe permit-space entry operations.
5. the need to ensure that at least one attendant is stationed outside the permit-required space for the duration of the entry operations.
6. how to coordinate and monitor entry operations when we are working with employees of another contractor or client within a permit-required confined space.
7. our procedures for emergency rescue.
8. the establishment of a written procedure for preparation, issuance, use, and cancellation of entry permits.

Personal Protective Equipment

A hazard assessment will be made on all job sites to determine what types of personal protective equipment (PPE) are appropriate. A major part of this hazard assessment will be determining what PPE needs can be eliminated through feasible engineering controls or work procedures.

Types of hazard categories that are considered are: impact; penetration; compression; chemical; heat; harmful dust; and light radiation.

The focus of PPE is to eliminate eye, hand, foot, limb, and head injury. Visitors exposed to the identified hazards will be loaned appropriate PPE (and given instruction in its use) prior to hazard exposure.

You must understand the limitations of your PPE; the correct procedure for putting on, adjusting, and removing the PPE; and the proper care, maintenance, and useful life of the PPE.

Cleanliness of PPE is of importance particularly when dealing with eye protection where fogging, scratches, or dirt can render the PPE a hazard rather than protection from a hazard.

Unique PPE required for job performance such as hard hats, respirators, ear plugs, safety goggles, etc. will be supplied to the employees. They are responsible for maintenance of the equipment issued to them. Items of PPE that are damaged or non-functioning should be turned in for repair or replacement.

For personal comfort and to eliminate nuisance noises and nuisance respiratory conditions that are not at or above the threshold level for required protection, dust masks and ear plugs may be used at any time.

Respiratory Protection

As a supervisor, it is extremely important that you do not allow employees to be exposed to atmospheres that do not contain clean, breathable air free from contaminants that exceed permissible exposure limits.

Respiratory hazards can range from mildly irritating to fatal.

Because of the serious consequences of improperly using respiratory protection, those for whom it applies, must understand:

1. the importance of medical approval for respiratory use.
2. the respirator selection process.
3. how to determine the service life of particulate filters.
4. fit testing.
5. user seal tests.
6. the importance of work area surveillance.
7. cleaning, inspection & maintenance of respirators.

Of course, job sites often contain nuisance dusts that do not exceed permissible exposure limits. In these cases, employees may wear dust masks for personal comfort. Supervisors should caution those wearing dust masks that they do not offer true respiratory protection.

Of course, job sites often contain nuisance dusts that do not exceed permissible exposure limits. In these cases, employees may wear dust masks for personal comfort.

OSHA standards require that if an employer provides respirators for employee voluntary use or if you provide your own respirator, you must be

provided Appendix D of 29 CFR 1910.134. This appendix is printed below and all employees must read it.

Standard Number: 1910.134 App D

Standard Title: (Mandatory) Information for Employees Using Respirators When not Required Under Standard.

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard. You should do the following: 1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations. 2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you. 3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke. 4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

[63 FR 1152, Jan. 8, 1998; 63 FR 20098, April 23, 1998]

Scaffolds & Ladders

Applicable: when you are required to install, use, or dismantle a scaffold or ladder.

Not

Applicable: to fall protection required on a walking/working surface six feet above a lower level -- this is addressed in a Fall Protection Program.

Hazards: fall, electrical, and falling objects.

The Program Administrator will ensure that employees understand:

1. the procedures for dealing with the above hazards.
2. the proper use of scaffolds & ladders
3. the load and the load-carrying capacities of the scaffold.

During routine job site inspections, supervisors should be constantly vigilant for violations of the below ladder safety rules and take immediate corrective action to ensure the safety of our employees:

- a. a stairway or a ladder will be provided at all personnel points of access where there is a break in elevation of 19 inches or more.
- b. ladders will never be overloaded.
- c. ladder rungs, cleats, and steps must be parallel, level, and uniformly spaced when a ladder is in position for use.
- d. ladders will not be tied or fastened together unless they are so designed.
- e. portable ladders used for gaining access to an upper level will extend at least 3 feet above the upper landing surface or the ladder will be secured at its top.
- f. ladders must be free of oil, grease, or other slipping hazards.
- g. ladders must be used for the purpose for which they were designed.
- h. non-self supporting ladders will be used at an angle that the horizontal distance from the top support to the foot of the ladder is approximately $\frac{1}{4}$ of the working length of the ladder.
- i. ladders will only be used on stable and level surfaces unless secured to prevent displacement.
- j. ladders shall not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental displacement.
- k. ladders placed in any location where they can be displaced by workplace activities or traffic will be secured to prevent accidental displacement, or a barricade will be used to keep the activities or traffic away from the ladder.
- l. the area around the top and bottom of the ladder shall be kept clear.
- m. ladders shall not be moved, shifted, or extended while occupied.
- n. the top step of a stepladder shall not be used as a step.
- o. portable ladders with structural defects will be immediately marked in a manner that readily identifies them as defective and removed from service.
- p. when ascending or descending a ladder, one must face the ladder.

- q. employees must use at least one hand to grasp the ladder when progressing up and/or down the ladder.
- r. employees are not to carry any object or load that could cause loss of balance and a resultant fall.

R.A.R. Engineering Group, Inc.

EMPLOYEE ACKNOWLEDGMENT

PLEASE READ, SIGN, & RETURN THIS FORM TO THE JOB SITE SUPERVISOR OR THE SAFETY PROGRAM ADMINISTRATOR.

I have read and understand the contents of this Employee Handbook.

I will, to the best of my ability, work in a safe manner and follow established work rules and procedures.

I will ask for clarification of safety procedures of which I am not sure **prior** to performing a task.

I will report to the job site supervisor or competent person any unsafe acts or procedures and will ensure they are addressed and resolved before continuing work.

I understand that the complete safety program is located at:

1135 Butler Avenue
New Castle, PA 16101

and is available for my review.

(Employee Name)

(Signature)

(Date)

APPENDIX B: FIELD TESTS - CHARTS, GRAPHS & TABLES

TABLE 1: HYDROCARBON RECOVERY DATA

TABLE 1
MW-2 HYDROCARBON RECOVERY DATA

LEO'S #3 CAR WASH
ERIE, PENNSYLVANIA

Data Collected: June 23, 2003

Data Collection Time(Hrs.)	Applied Vacuum (In. of Hg)	PID (ppm)	%O2	%LEL	SCFM	Recovery data	
						Lbs/Hr*	Gallons per minute
0.00	25	30	20.4	5	6.00	0.06	1.10
0.50	22	52	20.2	5	5.00	0.05	0.90
1.50	22	212	20.9	18	4.00	0.14	1.30
2.00	23	208	20.1	26	5.00	0.25	1.50
2.50	23	254	20.1	26	5.00	0.25	1.50
3.00	22	266	20.4	22	5.00	0.21	1.30
3.50	23	214	20.2	25	5.00	0.24	1.00
4.00	23	247	20.2	22	5.00	0.21	1.60
4.50	23	198	20	28	5.00	0.27	1.00
5.00	23	205	20.2	22	5.00	0.21	1.00

Sample Calculation:

$$*lbs/hr=(\%LEL)140(SCFM)(1.36E-5)$$

Adapted from Subsurface Venting from an Underground Aquifer, API Publication #4410, September 1985.

TABLE 2: GROUNDWATER DRAWDOWN DATA

TABLE 2
GROUNDWATER DRAWDOWN DATA

LEO'S #3 CAR WASH
ERIE, PENNSYLVANIA

Data Collected: June 23, 2003

Monitoring Well	0 Hrs.		5.25 Hrs.		Δ h
	DTP	DTW	DTP	DTW	
MW-1	ND	11.46'	ND	12.32'	0.86'
MW-2	ND	10.55	ND	18.02'	7.47'
MW-3	9.54	10.24'	9.68'	13.15'	2.91'
MW-4	9.04'	10.24'	9.08'	10.28'	0.04'
MW-6	ND	11.39'	ND	11.39'	0.00'
MW-7	ND	8.13'	ND	8.13'	0.00'
MW-8	ND	12.92'	ND	13.62'	0.70'

ND - No LPH detected

Δ h - Groundwater Drawdown

DTP - Depth to product (feet)

DTW - Depth to water (feet)

TABLE 3: VACUUM RESPONSE DATA

TABLE 3
VACUUM RESPONSE DATA

LEO'S #3 CAR WASH
ERIE, PENNSYLVANIA

Data Collected: June 24, 2003

Monitoring Well	Distance from MW-2 (ft)	0.5 Hrs.	1.0 Hrs.	1.5 Hrs.	2.0 Hrs.	2.5 Hrs.	3.0 Hrs.	3.5 Hrs.	4.0 Hrs.	4.5 Hrs.	5.0 Hrs.
MW-1	57	0.0	0.3	0.8	1.5	1.5	1.5	0.8	0.6	0.6	0.6
MW-3	31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MW-4	56	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MW-6	38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MW-7	75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MW-8	37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1

Vacuum response data expressed in inches of water

CHART 1: RECOVERY DATA (MW#2)

CHART 1
 RECOVERY DATA
 Lower Explosive Limit, Hydrocarbon Recovery and Oxygen
 Leo's #3 Car Wash
 Erie, Pennsylvania

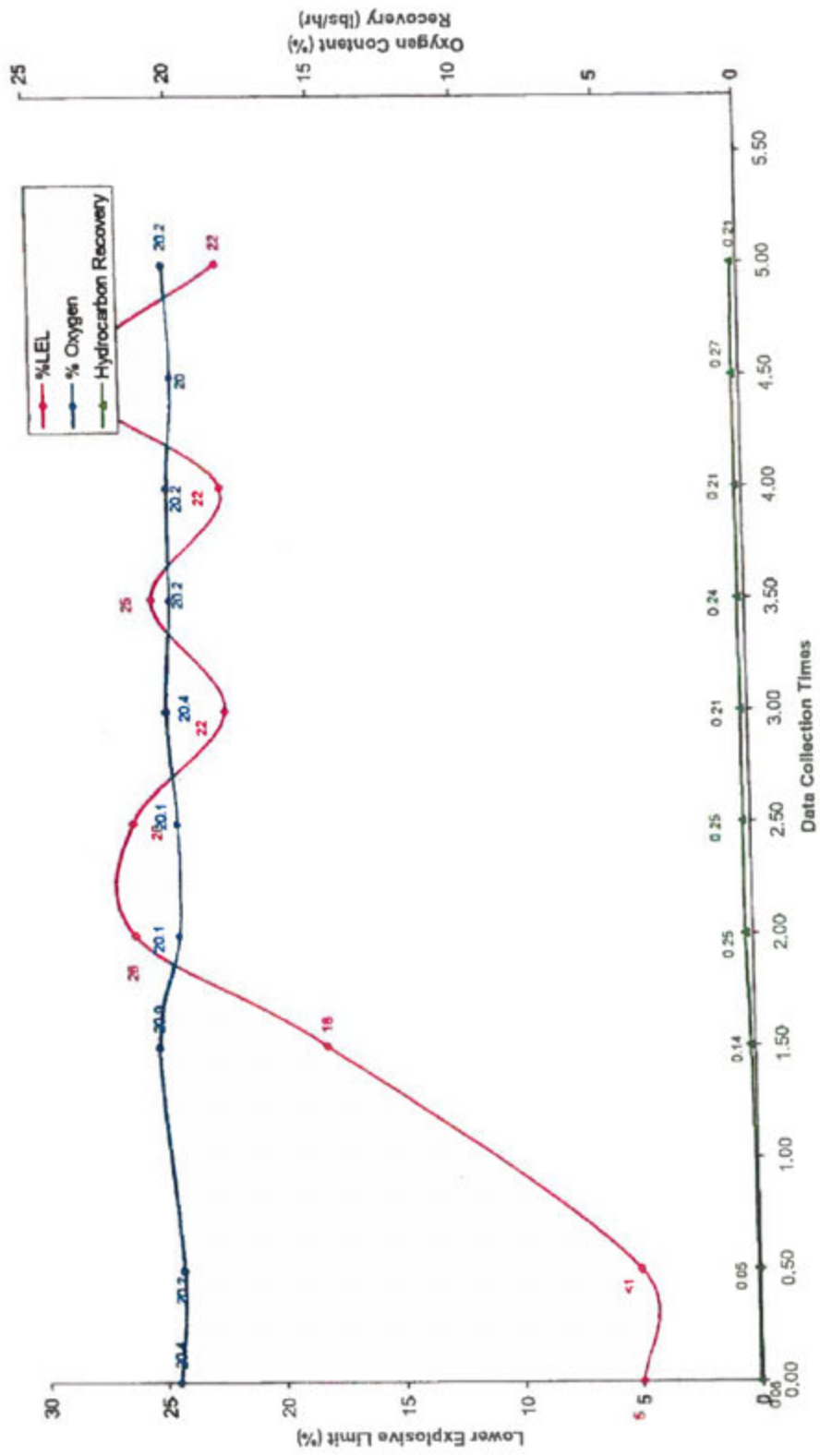
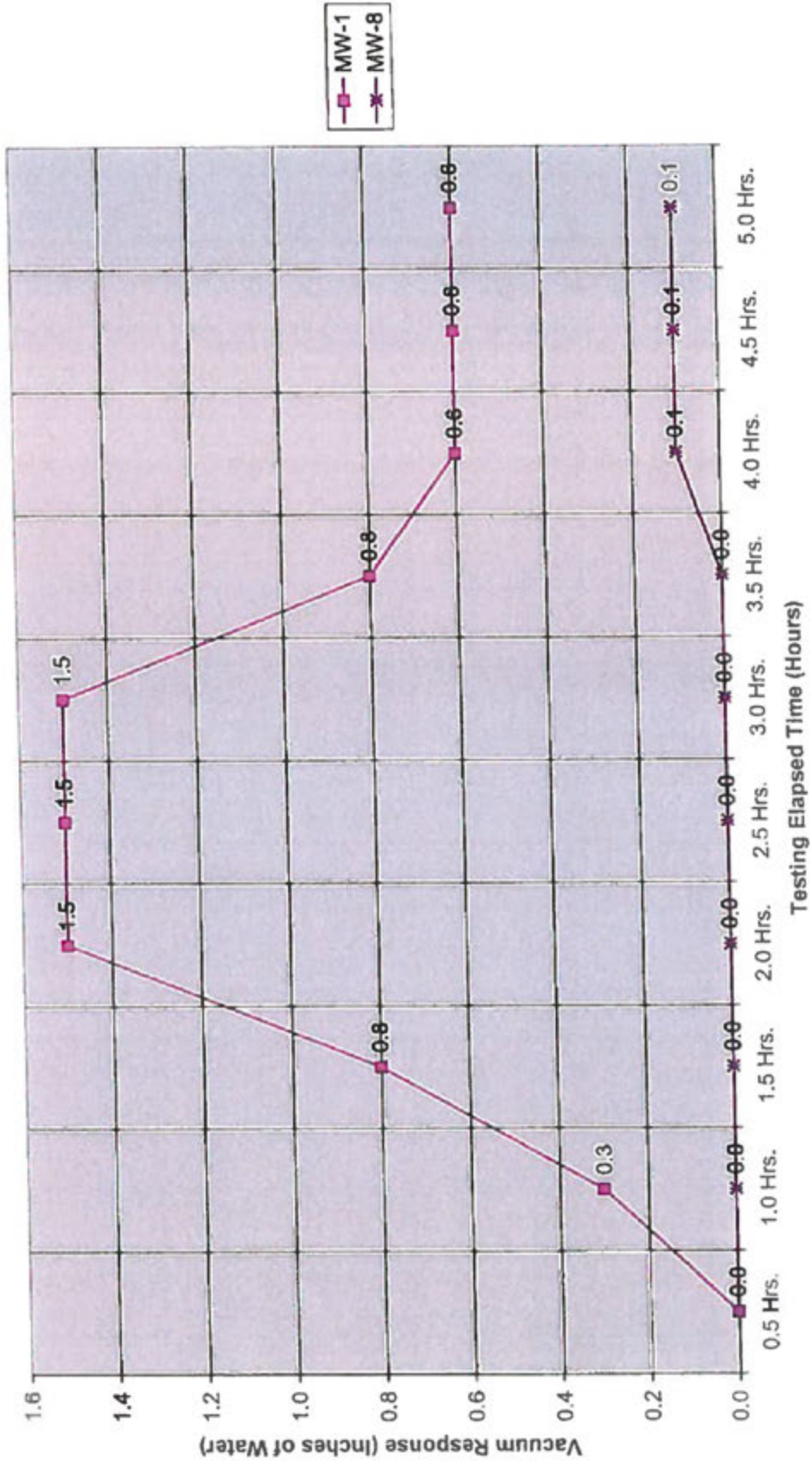


CHART 2: VACUUM RESPONSE DATA (MW#2)

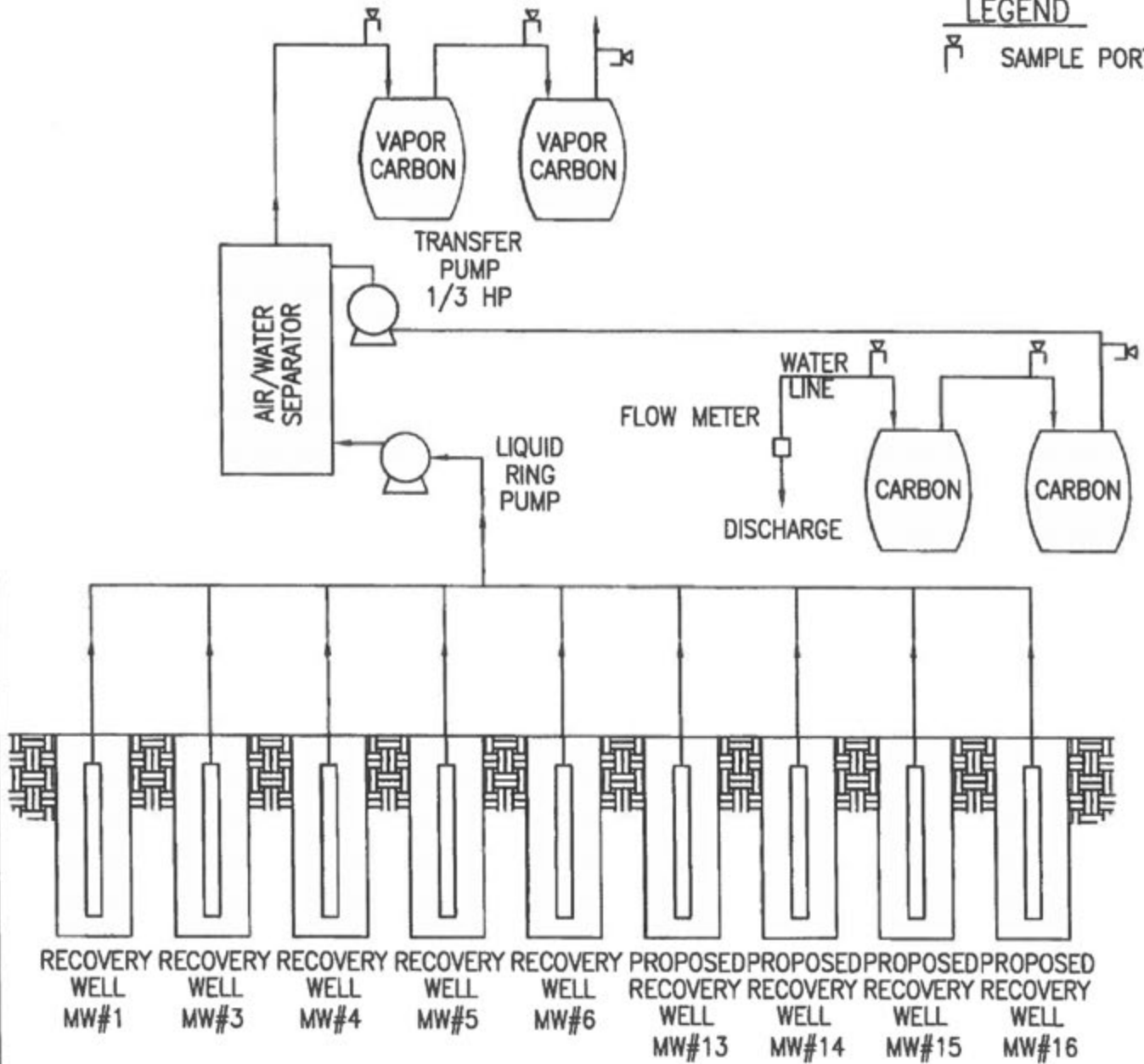
Chart 2
 Vacuum Response Data
 LEO'S #3 CAR WASH ERIE, PA



APPENDIX C: DESIGN & CONSTRUCTION DETAIL

LEGEND

 SAMPLE PORT



RAR engineering group, inc.
 1135 Butler Avenue, New Castle, Pennsylvania 16101
 telephone 724.652.1004 facsimile 724.652.3814
 email rareengineering@rareengineering.com

**LEO'S #3 CAR WASH
 2938 WEST 26TH STREET**

SEAL

**PROCESS AND
 INSTRUMENTATION
 DIAGRAM**

DESIGNED BY		DATE	
DRAWN BY	CMS	DATE	7/2012
CHECKED BY	PEP	DATE	7/2012
SCALE NOT TO SCALE			
FILE NAME			
REVISION		DATE	

ERIE COUNTY PENNSYLVANIA

SIGNATURE _____ DATE _____

SPEC. 1: CARBON ADSORBERS SPECIFICATIONS

TYPICAL VENTSORB APPLICATIONS

Chemical, petrochemical, food, pulp and paper, and many other industrial plants – along with municipal sewage treatment facilities – are frequent users of VentSorb for continuous control of vented emissions. Here are a few examples of user applications:

Storage Tank Vents – VentSorb units are widely used to control evaporative losses vented from storage tanks. Typically, these vapors are emitted during tank filling and emptying. In one application, a glycerin manufacturer is using the canisters to purify ambient air drawn into storage tanks during product transfer. The adsorption process helps prevent contamination of the company's glycerin product. The VentSorb units provide over six months of service for this application.

Reactor Vents – A pesticide manufacturer is using multiple VentSorb units on five reactor vessels to control trace amounts of odorous methylamine and diethylamine (which are by-products of a caustic scrubbing process). Each VentSorb unit handles a 30 cfm air stream containing 15 ppm of amine vapors. The units provide over three months of service for this application.

API Separator Vents – A major refinery is using VentSorb units to control odorous emissions from settling basins where oil is separated from wastewater that is discharged in condensate, blowdown or drain systems. For this application, API separators are covered and vented to comply with local air pollution control regulations. The air stream is pulled through two VentSorb units, operating in parallel configuration, at 100 cfm.

VENTSORB INSTALLATION

VentSorb canisters are shipped ready for installation. Each canister is self-supporting and should be placed on a level, accessible area as near as possible to the emission source. Installation is simple, requiring just a flexible hose or pipe to connect the vent to the 2-inch FNPT bottom inlet of the canister.

If the VentSorb will be vented directly to outside air, a U-shaped outlet pipe or rain hat – such as a pipe tee – is recommended to prevent precipitation from entering the unit.

VentSorb canisters operate from a continuous suction across the vent. The suction can be produced by a blower or by using the positive pressure inside the tank or process vessel. In many cases, the pressure or surge of pressure within the tank or vessel is sufficient to overcome the pressure drop across the canister – thus eliminating the need for a blower. Please consult pressure drop data in this bulletin for more information.

Maximum recommended air flow through a VentSorb is 100 cfm. If higher flows are encountered, plant operators should install two or more canisters in parallel configuration.

When VentSorb canisters are used to control vapors from organic solvent storage tanks, the following precautions are recommended:

- A safety relief valve must be provided. This protects the storage tank should the VentSorb become plugged or blocked in any fashion. Such a vent would open in this emergency situation, thereby relieving pressure.
- Under appropriate conditions, a flame arrestor and/or

backflow preventer must be installed as shown in this bulletin's storage tank installation drawing. This prevents backflow of air through the VentSorb when the storage tank is empty.

- Pre-wetting the carbon helps dissipate excessive heat that may be caused by high organic compound concentration (>0.5 to 1.0 Vol. %).

Also, if VentSorb canisters are used to control organic emissions from airstrippers or other high moisture content air streams, Calgon Carbon Corporation recommends that humidity in the air stream be reduced to under 50 percent. Lower humidity optimizes adsorptive capacity of the carbon. In addition, for similar applications that generate a condensate, Calgon Carbon Corporation recommends installation of a drain on the inlet piping.



Four VentSorb units at a chemical plant are installed to operate in series and in parallel. More than 25 odorous and/or toxic vapors are controlled by 80 VentSorb units at this plant.

RETURN OF VENTSORBS

Arrangements should be made at the time of purchase regarding the future return of canisters containing spent carbon. Calgon Carbon Corporation will provide instructions on how to sample the spent carbon and arrange for carbon acceptance testing. The spent carbon is reactivated by Calgon Carbon Corporation and all of the contaminants are thermally destroyed. Calgon Carbon Corporation will not accept VentSorb units for landfill, incineration or other means of disposal.

No VentSorb units can be returned to the company unless the carbon acceptance procedure has been completed, an acceptance number provided, and the return labels (included with the units at the time of purchase) are attached.

VentSorb units must be drained – and inlet/outlet connections must be plugged – prior to return to Calgon Carbon Corporation.

THEORETICAL VENTSORB CAPACITIES

Theoretical Ventsorb Capacity Lb Adsorbed/VentSorb*

	BOILING POINT/°C	MOLECULAR WEIGHT	10 PPM	100 PPM	1,000 PPM
Acrylonitrile	77.3	53.1	6	12	24
Benzene	80.1	78.1	14	23	36
n-Butane	-0.5	58.1	4	8	13
Carbon Tetrachloride	76.8	153.8	40	56	76
Dichloroethylene	37.0	97.0	12	21	35
Methylene	40.2	84.9	3	7	18
Freon 114	3.8	170.9	11	19	33
n-Hexane	68.7	86.2	18	25	34
Styrene	145.2	104.1	45	57	71
Toluene	110.6	92.1	34	44	58
Trichloroethylene	87.2	131.4	33	50	73

* Theoretical capacity based on 70 degrees F., atmospheric pressure, less than 50 percent humidity and 180 pounds of carbon using Isotherm data for Pellet BG carbon.

VENTSORB CARBON LIFE ESTIMATE

This table lists the theoretical adsorption capacities for several compounds. The adsorption capacity for nonpolar organics increases with the boiling point, molecular weight and concentration of the air contaminant. Estimate the life of a VentSorb canister for other organic compounds by matching them with compounds of similar boiling point and molecular weight in this table. Low molecular weight (less than 50) and/or highly polar compounds such as formaldehyde, methane, ethanol, etc., will not be readily adsorbed at low concentrations.

Note: The standard VentSorb canister contains 180 pounds of Pellet BG carbon. When removing hydrogen sulfide and mercaptans from moist air vented from sewage operations, greater efficiency will be achieved by using a VentSorb canister which contains specially impregnated IVP carbon. A VentSorb containing IVP carbon can remove up to 40 pounds of hydrogen sulfide and 15 pounds of methyl mercaptan.

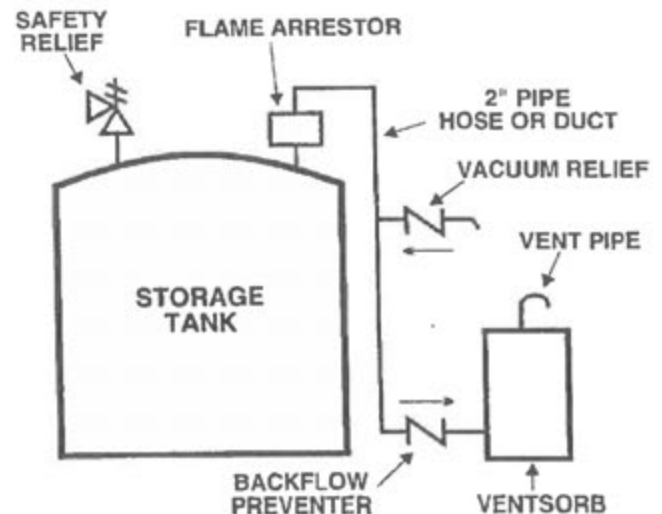
VENTSORB SAFETY CONSIDERATIONS

While complying with recommended installation instructions, plant operators should also be aware of these additional heat-related safety considerations:

1. When contacting with activated carbon, some types of chemical compounds – such as those from the ketone and aldehyde families and some organic acids or organic sulfur compounds – may react on the carbon surface causing severe exotherms or temperature excursions. If you are unaware or unsure of the reaction of an organic compound on activated carbon, appropriate tests should be performed before putting a VentSorb in service.
2. Heat of adsorption can lead to severe temperature excursions at high concentrations of organic compounds. Heating may be controlled by diluting the inlet air, time weighting the inlet concentration to allow heat to dissipate, or pre-wetting the carbon.
3. Do not use VentSorbs with IVP carbon in petrochemical or chemical industry applications.

4. IVP carbon can liberate heat by reacting chemically with oxygen. To prevent heat within a vessel, the carbon must not be confined without adequate air flow to dissipate the heat. In situations where there is insufficient or disrupted air flow through the vessel, the chemical reaction can be prevented by sealing the inlet and outlet connections to the vessel.

NOTE: CONTACT YOUR LOCAL CALGON CARBON CORPORATION TECHNICAL SALES REPRESENTATIVE FOR CLARIFICATION OR TO ANSWER ANY QUESTIONS.



Typical VentSorb Installation
at Storage Tank

CALGON CARBON CORPORATION AIR PURIFICATION SYSTEMS

VentSorb is a unit specifically designed for a variety of small applications. Calgon Carbon Corporation offers a wide range of carbon adsorption systems and services for a greater range of flow rates and carbon usages to meet specific applications.

WARRANTY

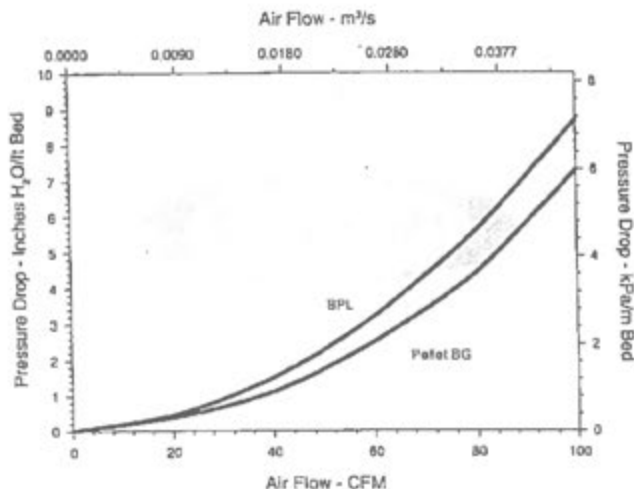
There are no expressed or implied warranties – or any warranty of merchantability or fitness – for a particular purpose associated with the sale of this product.

LIMITATION OF LIABILITY

The Purchaser's exclusive remedy for any cause of action arising out of purchase and use of the VentSorb, including but not limited to breach of warranty, negligence and/or indemnification, is expressly limited to a maximum of the purchase price of the VentSorb unit as sold. All claims of whatsoever nature shall be deemed waived unless made in writing within forty-five (45) days of the occurrence giving rise to the claim. In no event shall Calgon Carbon Corporation for any reason be liable for incidental or consequential damages, damages in excess of the purchase price of the VentSorb unit, loss of profits or fines imposed by governmental agencies.

Application information provided in this bulletin is based upon theoretical data. Calgon Carbon Corporation assumes no responsibility for the use of the information in this product bulletin.

VENTSORB PRESSURE DROP



Pressure drop through a VentSorb unit is a function of the process air flow as shown in the graph. A VentSorb canister can handle up to 100 cfm at a pressure drop of less than 15 inches water column. If higher flows or lower pressure drop is needed, multiple canisters may be installed in parallel operation. The maximum canister pressure should not exceed 4 psig.

If at any time our products or services do not meet your requirements or expectations, or if you would like to suggest any ideas for improvement, please call us at 1-800-548-1999.

For detailed information on the products described in this bulletin, please contact one of our Regional Sales Offices located nearest to you:

1-800-4-CARBON

Domestic Sales Offices

Region I

Bridgewater, NJ
Tel (908) 526-4646
Fax (908) 526-2467

Region II

Pittsburgh, PA
Tel (412) 787-6700
1-800-4-CARBON
Fax (412) 787-6676

Region III

Richmond, CA
Tel (510) 412-1010
Fax (510) 412-5660

Region IV

Houston, TX
Tel (713) 690-2000
Fax (713) 690-7909

International Sales Offices

Australasia/Philippines/ Southeast Asia

Calgon Carbon Asia
Singapore Office
Tel (65) 221-3500
Fax (65) 221-3554

Canada

Calgon Carbon Canada
Bolton, Ontario
Tel (905) 857-9915
Fax (905) 857-9984

China/Korea/Taiwan

Calgon Carbon Asia
Tokyo Office
Tel 81 3 3560 7505
Fax 81 3 3584 7202

Europe

Chemviron Carbon
B-1200 Brussels, Belgium
Tel 32 2 773 02 11
Fax 32 2 770 93 94

Japan

Calgon Far East
Tokyo Office
Tel 81 3 3582 1861
Fax 81 3 3586 9266

Latin America

Pittsburgh, PA
Tel (412) 787-4519
Fax (412) 787-4523

Calgon Carbon Corporation's activated carbon products are continuously being improved and changes may have taken place since this publication went to press.



THEORETICAL FLOWSORB TREATMENT CAPACITY FOR TYPICAL CASES

	Case 1		Case 2		Case 3	
	<u>Conc.</u>	<u>Gallons</u>	<u>Conc.</u>	<u>Gallons</u>	<u>Conc.</u>	<u>Gallons</u>
Benzene	20 ppb	} 1,600,000	200 ppb	} 400,000	2 ppm	} 85,000
Toluene	40 ppb		400 ppb		4 ppm	
Xylene	40 ppb		400 ppb		4 ppm	
	Case 4		Case 5		Case 6	
	<u>Conc.</u>	<u>Gallons</u>	<u>Conc.</u>	<u>Gallons</u>	<u>Conc.</u>	<u>Gallons</u>
TCE	50 ppb	} 1,900,000	500 ppb	} 550,000	5 ppm	} 125,000
PCE	50 ppb		500 ppb		4 ppm	
	Case 7		Case 8		Case 9	
	<u>Conc.</u>	<u>Gallons</u>	<u>Conc.</u>	<u>Gallons</u>	<u>Conc.</u>	<u>Gallons</u>
Phenol	1 ppm	} 230,000	10 ppm	} 50,000	100 ppm	} 10,000
Total SOC	10 ppm		100 ppm		1,000 ppm	

Each case represents a groundwater or wastewater stream that contains the combination of contaminants listed. The treatment capacity indicates the total gallons of that particular water that may be treated before any of the specific contaminants are present in the treated water as noted. Theoretical capacity based on 5 gpm, water at 70°F or less and 165 pounds of Filtrasorb 300. Background TOC is less than 1 ppm except phenol cases as noted. Contaminants reduced to < 5 ppb, except phenol case which is for 95% phenol reduction.

HOW TO ESTIMATE FLOWSORB LIFE

The treatment table on this page lists the volume of water that can be purified by the Flowsorb for typical contamination situations. However, most applications involve a unique mixture of organic chemical contaminants including some chemicals that adsorb at different capacities or strengths. Please consult with your Calgon Carbon Technical Sales Representative for more information about carbon usage rates.

RETURN OF FLOWSORBS

Arrangements should be made at the time of purchase regarding the future return of canisters containing spent carbon. Calgon Carbon will provide instructions on how to sample the spent carbon and arrange for carbon acceptance testing. The spent carbon is reactivated by Calgon Carbon and all of the contaminants are thermally destroyed. The company will not accept Flowsorbs for landfill, incineration or other means of disposal.

Flowsorbs cannot be returned to Calgon Carbon unless the carbon acceptance procedure has been completed, an acceptance number provided, and the return labels (included with the units at the time of purchase) are attached.

Flowsorbs must be drained — and inlet/outlet connections must be plugged — prior to return to Calgon Carbon.

SAFETY CONSIDERATIONS

It is unlikely that a worker would be able to physically enter a Flowsorb canister. However, the following information and precautions apply to a partially closed canister or situations where carbon is to be removed from the canister and stored elsewhere.

Wet or dry activated carbon preferentially removes oxygen from air. In closed or partially closed containers, oxygen depletion may reach hazardous levels. If workers must enter a vessel containing carbon, appropriate sampling and work procedures should be followed for potentially low-oxygen spaces — including all applicable federal and state requirements.

CALGON CARBON CORPORATION LIQUID PURIFICATION SYSTEMS

Flowsorb is a unit specifically designed for a variety of small flow applications. Calgon Carbon Corporation offers a wide range of carbon adsorption systems and services for a greater range of flow rates and carbon usages to meet specific applications.

WARRANTY

There are no expressed or implied warranties – or any warranty of merchantability or fitness – for a particular purpose associated with the sale of this product.

LIMITATION OF LIABILITY

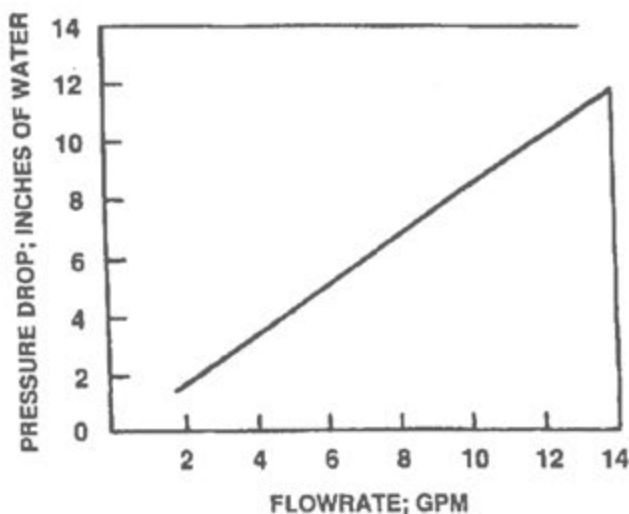
The Purchaser's exclusive remedy for any cause of action arising out of purchase and use of the Flowsorb, including but not limited to breach of warranty, negligence and/or indemnifications, is expressly limited to a maximum of the purchase price of the Flowsorb unit as sold. All claims of whatsoever nature shall be deemed waived unless made in writing within forty-five (45) days of the occurrence giving rise to the claim. In no event shall Calgon Carbon Corporation for any reason be liable for incidental or consequential damages, in excess of the purchase price of the Flowsorb unit, loss of profits or fines imposed by governmental agencies.

For information regarding incidents involving human and environmental exposure, please call (412) 787-6700 and ask for the Regulatory and Trade Affairs Department.

Application information provided in this bulletin is based upon theoretical data. Calgon Carbon Corporation assumes no responsibility for the use of the information in this product bulletin.

If at any time our products or services do not meet your requirements or expectations, or if you would like to suggest any ideas for improvement, please call us at 1-800-548-1999. From outside the U.S. please call +1-412-787-6700.

FLOWSORB PRESSURE DROP



1-800-4-CARBON

www.calgoncarbon.com

Domestic Sales Offices

East Coast Region

Bridgewater, NJ
Tel (908) 526-4646
Fax (908) 526-2467

Midwest Region

Pittsburgh, PA
Tel (412) 787-6700
1-800-4-CARBON
Fax (412) 787-6676

West Coast and Rockies Region

Richmond, CA
Tel (510) 412-1010
Fax (510) 412-5660

Gulf Coast Region

Houston, TX
Tel (713) 690-2000
Fax (713) 690-7909

International Sales Offices

Australasia/Philippines/ Southeast Asia

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Singapore Office
Tel (65) 221-3500
Fax (65) 221-3554

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Tokyo Office
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Fax 81 3 3584 7202

Europe

Chemviron Carbon
B-1200 Brussels, Belgium
Tel 32 2 773 02 11
Fax 32 2 770 93 94

Japan

Calgon Far East
Tokyo Office
Tel 81 3 3582 1861
Fax 81 3 3586 9266

Latin America

Pittsburgh, PA
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CALGON CARBON CORPORATION

TYPICAL FLOWSORB OPERATING PARAMETERS

Flow Rate: 10 gpm (37.8 l/m)
 Contact Time: 4.5 minutes
 Pressure Drop: < 1 psi (clean water and carbon)
 Operating Pressures: Recommend operation at
 less than 5 psig, but higher pressures,
 up to 12 psig, possible with tight cover closure

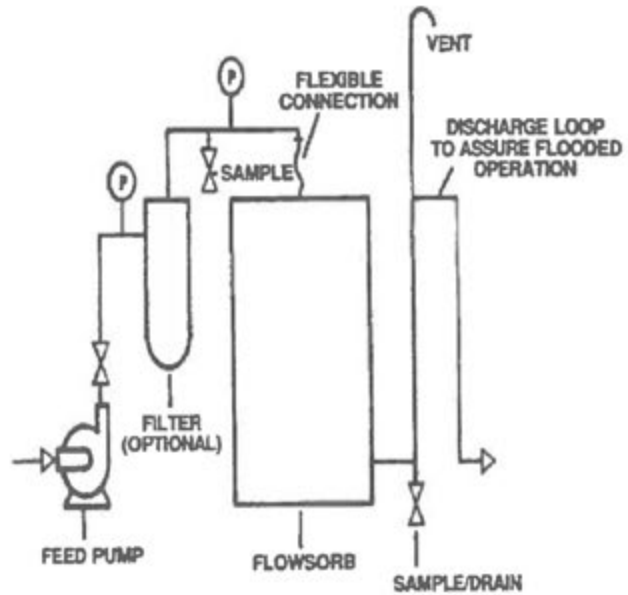
FLOWSORB INSTALLATION

Flowsorb canisters are shipped with dry activated carbon; the carbon must be wetted and deaerated prior to use. This procedure displaces air from the internal structure of the carbon granule, thus assuring that the liquid to be treated is in contact with the carbon surface.

Prior to operation, each canister must be filled with clean water; the water should be introduced into the bottom outlet connection. The unit should set for approximately 48 hours—this allows most of the carbon's internal surface to become wetted, as shown on the wetting curve below.

After wetting, the carbon bed can be deaerated by draining the canister and again filling the canister upflow with clean water. This procedure will eliminate any air pockets which may have formed between the carbon granules. The Flowsorb is now ready for operation.

Canisters should be set on a flat, level surface and piped as recommended in the installation illustration. The influent pipe connection should be attached to the unit by using a flexible connection, as some minor deflection of the lid may occur if pressure builds due to filtration or other flow blockage downstream.



TYPICAL FLOWSORB INSTALLATION

Flowsorb discharge piping should include an elevated piping loop to assure that the canister remains flooded with water at all times. In addition to the piping loop, a drain connection is recommended on the discharge piping; this allows drainage of the unit prior to disconnection or temporary shutdown.

A filter should be installed if the liquid to be treated contains substantial amounts of suspended solids. A simple cartridge or screen filter helps prevent pressure buildup in the carbon bed.

FLOWSORB OPERATION

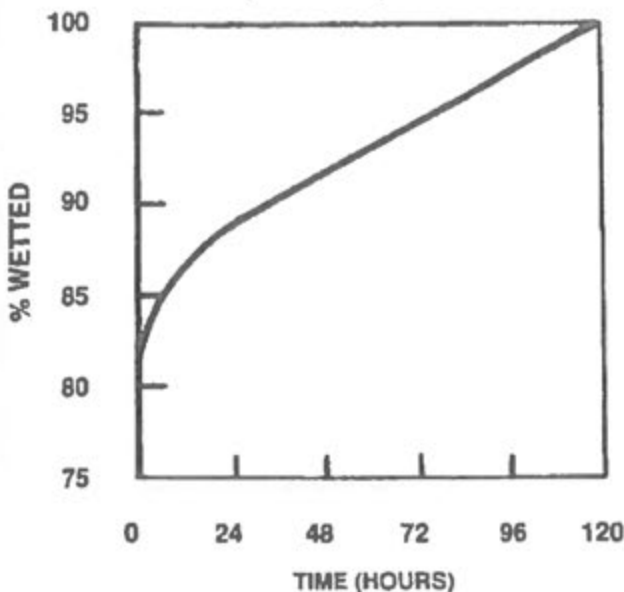
Flowsorb canisters should be full of clean water before treatment begins. Flow rate to the canister should be determined based on required contact time between the liquid and the carbon media. In groundwater treatment applications, the recommended contact time is typically 8-10 minutes with a resultant flow of approximately 5 gpm. Consult your Calgon Carbon Corporation Technical Sales Representative for advice about proper contact time for your application.

Flowsorbs can be manifolded in parallel operation for higher flow rates. For series operation, two Flowsorbs can be piped together sequentially, as normal pressure drop will not exceed the recommended operating pressure.

These canisters have space for bed expansion and can be backflushed by introducing clean water or liquid at approximately 20-25 gpm to the outlet and taking backflush water from the inlet.

If the operating pressure is expected to exceed 5 psig, an application of adhesive caulk at the lid gasket is recommended to prevent leakage. With all surfaces dry, apply the adhesive caulk to the lid recess and lip of the drum per the manufacturer's procedure and set the Flowsorb gasket into the lid recess. After allowing the caulk to set, install the drum lid and tighten the bolt ring.

WETTING CURVE FOR GAC
 (77°F/25°C)



APPENDIX D: SITE MAP DEPICTING BUILDINGS, ROADS
PROPERTY BOUNDARIES & OTHER PERTINENT INFORMATION

