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Shaw The Shaw Group Inc.™

SOIL VAPOR EXTRACTION OPERATION & MAINTENANCE MANUAL

NATIONAL HEATSET PRINTING
FARMINGDALE, NY

SITE NUMBER 1-52-140

PREPARED FOR:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
BUREAU OF EASTERN REMEDIAL ACTION
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EXECUTIVE SUMMARY

The following is a description of the soil vapor extraction (SVE) pilot test system that has been installed at the former National Heatset Printing site on Adams Boulevard in Farmingdale, New York.

Shaw Environmental, Inc. (Shaw) has been retained to design, install and operate an SVE system to remove adsorbed-phase volatile organic compounds (VOCs) from the subsurface at the site. The adsorbed phase VOCs are assumed to be from residual contamination from the improper disposal of solvents used by National Heatset Printing.

SVE is a process for removing VOCs from the unsaturated soils by induced air flow. Removal is accomplished by direct volatilization. Additionally, induced air flow to the subsurface provides oxygen to microorganisms, which may promote biodegradation of VOCs. Generally, air flow is induced in the subsurface by applying vacuum to vertical wells or horizontal trenches.

One vertical well has been utilized on the subject property. A maximum flow rate of approximately 400 cfm of VOC vapors will be removed from the subsurface and will be treated using vapor phase activated carbon (VGAC) prior to discharge into the atmosphere.

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1.0 INTRODUCTION / CERTIFICATION

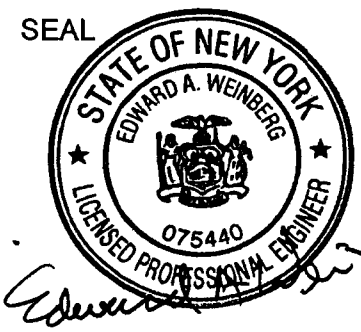
1.1 Introduction

This manual discusses the installation, operation and maintenance of the soil vapor extraction (SVE) system at the National Heatset Printing Site in Farmingdale, New York. Shaw installed this system at the request and under the oversite of the New York State Department of Environmental Conservation (NYSDEC). The objective of this Operations and Maintenance Manual is to provide the operations personnel technical information on the equipment comprising the soil vapor extraction system with guidelines on how to operate and maintain it in safe, reliable conditions.

1.2 Professional Engineer Certification

I certify under the penalty of law that this Operation and Maintenance Manual was prepared in accordance with a system designed to assure that the information in this document was properly gathered and evaluated. The information and figures submitted in this manual are, to the best of my knowledge and belief, true, accurate, and complete.

SEAL



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Signature Date: October 2, 2003

1.3 Site Background

The National Heatset Printing site is located at One Adams Boulevard in the Hamlet of East Farmingdale, Town of Babylon, Suffolk County (**Figure 1**). The site contains one multi-tenant

industrial building and is approximately 4.5 acres in size. The National Heatset Printing Company occupied a portion of the on-site building from July 1983 to April 1989. Their operations consisted of lithographic tri-color printing of newspaper and periodical advertisements and the manufacture of lithographic printing plates. National Heatset had been using organic solvents at the site since 1983. Inspections by the Suffolk County Department of Health Services (SCDHS) in 1983 and 1986 revealed the improper storage and discharge of waste materials.

The National Heatset Printing Company filed for bankruptcy in 1987. The SCDHS discovered that after filing for bankruptcy, National Heatset disposed of its chemical inventory by dumping the materials onto the soils and into a leaching pool located at the rear of the building on the northeast side of the property.

Investigations conducted by the SCDHS and the property owner's consultant revealed the presence of soil and groundwater quality impacts at and downgradient from the site. The contaminants identified consisted of volatile organic compounds, principally Tetrachloroethylene (PCE). The property was listed in the Registry as a Class 2 site in 1993.

1.4 Plant Design and Overall Operation

A Soil Vapor Extraction (SVE) system has been designed to remediate soil contamination existing at the site. The system was designed using the following criteria:

- Extraction of soil vapors using an SVE blower
- Operation of one vapor extraction well (2" riser/screen and 2" extraction line)
- Off-gas Treatment for vapors consisting of two 1,000-lbs granular activated carbon (GAC) units and an engineered 30-feet discharge stack
- All equipment, interconnecting piping and equipment controls mounted or installed within a vented explosion-proof container

Based on the well design flow rates and process losses (such as piping and valve restriction), the total capacity of the SVE blower is 200 Standard Cubic Feet per Minute (SCFM) @ 80 inches of Water Column (W.C.).

1.4.1 Soil Vapor Extraction

The soil vapor extraction system includes one vapor extraction well, monitoring Well F, which was an existing monitoring well, constructed of 2-inch schedule-40 PVC with 0.02 slotted screens and screened from approximately 10 to 30 feet below ground surface (bgs). The well was modified on April 20, 2002 to facilitate vapor extraction and groundwater monitoring. A 2-foot by 2-foot DOT rated roadbox was installed at grade to protect the well. Well modifications included being teed into 2-inch diameter PVC schedule 80 piping that conveys extracted vapor into the treatment equipment enclosure.

Inside the pilot test equipment enclosure, the 2-inch diameter SVE piping contains a ball valve to control the air flow and vacuum, as well as a sampling port for drawing air samples and conducting flow measurements. The 2-inch piping is connected to a vacuum blower designed to extract a maximum of 400 cfm of air flow from the soil vapor well. Vapors from the source area are extracted by applying vacuum via a blower system. A 10 Horsepower (Hp) regenerative blower develops a maximum vacuum of approximately 98" W.C. The system includes blower inlet and discharge silencers to reduce the noise level generated by system operation. The SVE equipment includes vacuum, temperature and pressure gauges. The blower, motor and other ancillary equipment and appurtenances are mounted inside the enclosure and all controls are integrated into a single control panel by the SVE equipment manufacturer. The control panel is mounted on the exterior of the enclosure. Please refer to **Figure 2** for the piping and instrumentation details and **Figure 3** for a plan view of the treatment enclosure.

Soil gas vapors from the vapor well are drawn through a moisture separator prior to the vacuum blower. Upon high level in the moisture separator, a float is activated, and the SVE system will automatically shut down. The moisture collected from the separator will be containerized and stored on-site prior to sampling and appropriate disposal as necessary.

1.4.2 Off-Discharge Air Treatment

Off-gas treatment system is comprised of two 1,000-lbs vapor-phase granular activated carbon (VGAC) units. The two filters are arranged in this series (lead/lag arrangement) to provide assurance that the discharge air will comply with the air permit discharge criteria.

The discharge stack, constructed of 4-inch Schedule-40 PVC pipe, is mounted along the exterior of the site building and is elevated to a height of approximately 30-feet above the ground surface.

As-built drawings showing the electrical details and well construction details are included as **Figures 4 and 5**.

2.0 SYSTEM DESCRIPTION

Please refer to the as-built drawings as a guide for the following SVE equipment component descriptions. Each major equipment is described by system specification, startup procedures, normal operation, shutdown procedures, preventative maintenance, repair procedures, spare parts and warrantees / guarantees.

2.1 General Process Equipment Overview

- One SVE well,
- Soil Vapor Extraction (SVE) Blower with instrumentation for extracting vapor from the extraction well,
- Two Vapor-Phase Carbon Vessels arranged in series (lead/lag) to treat the VOCs in the off-gas from the SVE blower,
- 30-foot high discharge stack,
- Instrumentation and controls,
- 20' x 8' x 8' enclosure to house the equipment.

2.2 Standard Operating Procedures (SOPs) By Major Equipment

2.2.1 SVE Equipment

The SVE system consists of one SVE well, one moisture separator and a blower with inlet and discharge silencers.

SVE system specifications are as follows:

Blower

Manufacturer/Model.....AMETEK Rotron Model EN858
Design flow.....200 SCFM @ 80" W.C. – Vacuum
Maximum flow.....400 cfm
Maximum vacuum.....98" W.C.
Maximum pressure.....120" W.C.

Motor ..... AMETEK Rotron, 10.0 HP, Explosion Proof
Electrical Service ..... 230 VAC/3 phase/60 Hz
Temperature rating ..... 120 °C or 248 °F
Materials of construction.....Cast aluminum blower housing, cover, impeller and manifold; cast iron threaded flanges; Teflon lip seal

Moisture Separator
Manufacturer/Model.....EnviroSupply & Service
Moisture separator size/holding capacity.....240 gallons/approximately 120 gallons
Dimensions.....38" dia. x 72" high
Materials of Construction .....Carbon Steel

Startup

Prior to operating the blower for the first time, or after long-term shutdown, check the unit and the installation for the following prerequisites that should include:

- Verify that the inlet piping is free of debris.
- Recheck blower leveling, drive alignment and tightness of all mounting bolts.
- Verify that the power to the motor is available and that electrical overload devices are installed and workable and that the safety disconnect switch in the container is "ON".
- Open the dilution bleed valve in the in the inlet piping. "Bump" blower a few revolutions with driver to check that direction of rotation is correct, by turning the HOA switch to MANUAL at the control panel outside.

After verifying that the blower is ready for operation, follow the steps below to conduct trial run of the blower:

- Start the blower in MANUAL, let it accelerate to full speed, then shut off. Listen for knocking sounds, both with power on and as speed slows down.
- Operate blower for about 10 minutes unloaded (utilizing 100% dilution air, 50% extraction well air). Feel cylinder and head plate surfaces for development of spots too hot to touch that may be indicative of impeller "rubs". Be aware of any noticeable increase in vibration or noise.
- If all the conditions are met, the blower should be run under normal operating conditions for at least one hour as a final check.
- Gradually adjust the dilution air and extraction well valves to apply working pressure (vacuum).

- Check the vacuum on the inlet line with a good vacuum gauge or manometer to verify that vacuum ratings (98" W.C. (water column)) of the blower are not exceeded.
- Check temperature in inlet and discharge lines of the blower to verify that temperature ratings (120° C) of the blower are not exceeded.

Note: Use the Manual Switch for testing and maintenance checks on the blower. There are no process alarms or blower safeguards when the switch is in manual mode. See "normal operations". When operating in Manual mode the blower will operate until the Manual switch is turned to OFF.

Normal Operation and Controls Description

The SVE blower is designed to extract 200 scfm of air @ 80" W.C. The blower can be started either manually by turning the HOA switch to "Manual" position or automatically. When in "AUTO" position, operation of the blower is controlled by the high level switch installed in the moisture separator.

Shutdown

When in "AUTO" position, the SVE Blower system can be shut down by the following condition:

- Moisture separator liquid is at high-high level – high-high level switch is activated and automatically shuts down the SVE system.

The blower can be shut down manually by turning the HOA switch to "OFF" position.

Preventive Maintenance

- Periodically check operating conditions and verify that there are no drastic changes.
- If the blower capacity is too great for the vapor extraction air requirements, a small amount of ambient air may be sucked in as make-up air by using the dilution bleed air valve.
- Occasionally stop the blower and clean the temporary inlet protective screen.
- In accordance with the AMETEK Rotron service and parts manual, the SVE blower bearings will require replacement after 15,000 to 20,000 hours of run time (approximately two years of continuous use).

Repair Procedures and Spare Parts

Repair procedures and spare parts list for AMETEK Rotron Regenerative Blower are located in the AMETEK Instructions in **Appendix A-Section 1**.

Warranties/Guaranties

All AMETEK Rotron blowers are covered by a manufacturers' warranty for 18 months from date of shipment.

Contact Phone Number: (845) 246-3401

2.2.2 Off-Gas Equipment

SVE blower discharge is treated through two carbon filters prior to being discharged into the atmosphere. The two filters are arranged in lead-lag series to provide assurance that the off-gas will comply with the air permit discharge criteria. A completed NYSDEC Air Permit Application is attached in **Appendix E**.

Carbon Filter specifications are as follows:

Manufacturer/Model	EnviroSupply & Service, Model ESV1000
Air flow rate	400 scfm
Amount of carbon	1,000 lbs per vessel, 40 x 10 mesh GAC, virgin
Materials of Construction	Carbon steel with Polyamide Epoxy Resin internal coating and Epoxy Mastic external coating
Pressure Rating	15 psi (max)
Dimensions	48" dia. x 71" high

Startup

- Start introducing process air into carbon vessels.
- Check the following parameters during the startup to achieve the optimum performance:

- Air flow rate
- Air leaks
- Air temperature

Normal Operation – Controls Description

During normal operation the off-gas laden with organic compounds is treated in the vapor phase carbon vessels prior to discharge into the atmosphere. Monitoring of the carbon influent, mid and effluent air is performed during each monthly site visit. VOC concentrations observed at these locations assist in determining the carbon loading rate and in the scheduling of carbon change outs.

Shutdown

The carbon filters have no moving parts. The carbon system is shut down when the SVE system or blower shuts down. During shutdown periods, it may be necessary to drain condensate that may accumulate in the carbon vessels. Draining of the carbon vessels is performed by using the drain port located on each of the vessels. Accumulation of significant quantities of condensate in the carbon vessels is not anticipated because of the moisture separator that is located on the vacuum side of the SVE blower and the heat of compression of the blower operating at 80" W.C. Any condensate collected from the carbon vessels must be containerized on-site pending sampling and appropriate disposal as necessary.

Normal Operation – Carbon Change Out

Periodically the vapor-phase carbon needs to be changed. The frequency of the carbon changeout is determined by the influent VOC concentrations. The two carbon vessels are arranged in series (lead/lag arrangement). When the VOC concentrations in the off-gas from the lag carbon vessel indicate VOC breakthrough, (PID / drager tube field air monitoring concentrations greater than 10 ppm) the carbon in each vessel is to be replaced with fresh carbon.

Procedure and Safety Precautions for Carbon Change Out

The following steps may serve as a guideline for removing and replacing spent carbon from the VGAC units.

- Shut down SVE system. Lockout/Tagout the SVE system to prevent accidental restart.
- Don appropriate Personal Protective Equipment (PPE), including but not limited to Level C with air purifying respirator and organic vapor cartridges.
- Open drain ports on the bottom of each VGAC unit to remove any accumulated liquid. Place any collected liquid into a 55-gallon drum for storage pending disposal in accordance with State, Local and Federal regulations. Close drain ports before proceeding with carbon removal.
- Utilize a drum vacuum or other vacuum equipment to remove the spent carbon from each of the two 1,000-pound VGAC units and place into DOT approved containers for transport to a predetermined reactivation/disposal facility.
- Seal the shipping containers and label each container with appropriate hazardous waste and DOT shipping labels.
- Place 1,000 pounds of fresh granular activated carbon in each VGAC unit, close and seal each unit.
- Load shipping containers onto transport vehicle with appropriate licenses and permits for shipment to the regeneration/disposal facility.
- Remove lockout/tagout device from SVE system. Restart SVE system utilizing procedures listed in **Section 2.2.1** and **Section 3.2**
- Remove PPE and store in a labeled accumulation drum on-site pending disposal in accordance with State, Local and Federal Regulations.

Preventive Maintenance

- Periodically inspect the inside of the vessel before filling with carbon to verify the integrity of the internal components.
- Depending on the inlet gas stream moisture content, periodical drainage of the condensate from the bottom of the carbon vessel is recommended. During this procedure, shut down the SVE blower before opening the drain valve to prevent any water splattering. After all the condensate is drained, close the drain valve and follow a normal restart of the SVE blower.

Troubleshooting

No troubleshooting other than the preventive maintenance items listed above is required for the carbon vessels.

Repair Information and Spare Parts

Refer to the EnviroSupply & Service O&M Manual for repair information and spare parts list.

Warranties/Guarantees

Standard one-year manufacturer's warranty from the date of certification or installation (9/18/02) applies.

Contact: John Slesinski (508) 553-2855.

2.2.3 Treatment Enclosure

The equipment associated with soil vapor extraction is housed in an enclosure (approx. dimensions: 20' long x 8' wide x 8' high) located adjacent to the north wall of the site building in accordance with local building and planning codes. The enclosure is equipped with explosion proof features such as lights, heater with thermostat, ventilation fan, blower and motors

The enclosure has one set of double doors and one personnel door. Appropriate safety signs, *Health and Safety Plan* (HASP), first aid kit, and fire extinguisher are maintained in prominent locations within the enclosure. Treated air is discharged from the carbon filter through a stack, which extends approximately 30' above grade elevation.

The control panel, panel board, the main disconnect switch, and a revenue meter have been installed outside the enclosure. The panel board, the main disconnect switch, and the Revenue Meter are located inside the former treatment room in the site building, while the control panel has been installed on the exterior of the enclosure.

Ventilation Fan specifications are as follows:

Manufacturer/Model.....Cook model 201A17DB
Design Air Flow.....160 cfm
Electrical Service .....1/2 HP, 230 V/3 phase/60 Hz, explosion proof

The ventilation fan is rated for 1 cubic feet per minute for each square foot of solid floor area (160 cfm for 160 square feet).

Heater Fan

A thermostat controlled, explosion proof heater is located within the treatment enclosure.

Repair Procedures and Spare Parts

The manufacturer's cost sheet is located in **Appendix A- Section 6.0**.

Warranties/Guaranties

Standard one-year manufacturer's warranty from the date of certification or installation applies.

2.2.4 Electrical System

All instrumentation, motor controls, and lighting inside the treatment container are explosion proof. The control panel has been installed outside of the container inside a NEMA 4 enclosure. The main disconnect switch and revenue meter have been installed in the former treatment room. The revenue meter installation and instruction manual is presented as **Appendix B**. The power feed to the SVE enclosure is from a new 200A, 3 phase, 230 volt disconnect switch connected from the existing control panel for the former treatment system. See **Figure 4**.

3.0 SYSTEM STARTUP AND MONITORING PROCEDURE

3.1 Prerequisites to Startup

The following steps must be followed prior to startup:

- All the equipment must be tested prior to startup according to the manufacturer's instructions.
- The SVE well, if not preset, must be partially opened.
- All control panels and motors must be connected to power.
- All HOA switches in AUTO position.

3.2 Normal Startup

- Initially, the air filter dilution valve for the extraction blower will be opened.
- The vacuum blower will be started. The only air entering the system will be through the dilution valve. Differential vacuum across the SVE blower, moisture separator, and temperature after the blower will be monitored and recorded on a Process Monitoring Form.
- With the dilution valve open, the extraction well flow control valve will be slowly opened until the extraction wellhead vacuum reads a maximum of 15 in. H_2O. The vacuum at the wellhead will be monitored and recorded on a Process Monitoring Form by a technician in the field. The flowrate, VOC concentration at the corresponding sample port, and the VOC concentration at the system extraction manifold and outlet will be recorded by the start-up engineer.
- The system dilution valve will be adjusted as necessary as vacuum is established. Typically, the dilution bleed valve may be cracked open for normal operation.
- Monitoring will continue during the initial vacuum operations. The following data will be recorded on a Process Monitoring Form until wellhead vacuum readings stabilize. Stabilized conditions will be considered achieved when extraction wellhead vacuum varies less than 10% between subsequent readings. An example process monitoring form is included in **Appendix C**.

- SVE wellhead vacuum inches H2O
- SVE system flowrate in scfm
- Total VOC's at discharge stack using PID
- Differential vacuum across SVE blower and separator
- Temperature after SVE blower

- Once the operating parameters of the entire SVE system have stabilized, the vacuum and flowrate will be incrementally increased to the design rates. Three incremental steps (e.g., 8 in., 14 in. and 20 in.) are typically required to achieve full system capability. If groundwater is entrained in the extraction flow stream, the vacuum and flowrate will be decreased to the point at which significant water is not entrained.

3.3 System Shutdown

The system will shutdown automatically upon activation of the moisture separator high-high level switch when all of the HOA switches are in the AUTO position.

3.4 Emergency Shutdown

In the event of an emergency, shut down the system by utilizing the main disconnect switch located on the control panel. Meet at the designated safety area in the event of shutdown due to power failure, flood, tornado, or other emergency, contingency episodes.

3.5 Routine Operations / Monitoring

Follow the guidelines in **Sections 4 and 5** for routine system operations and monitoring. The system can run unattended for extended periods of time.

4.0 EQUIPMENT MAINTENANCE AND TESTING

4.1 Preventative Maintenance (PM) Program

The SVE equipment, piping and all instrumentation and controls should be monitored on a monthly basis to prevent the system from shutting down due to leakage, worn out parts or malfunctioning equipment. The program will follow manufacturer's recommended procedures, which are addressed in more detail in **Section 2.0**, System Startup and Shutdown (**Section 3.0**), and individual Manufacturer's O&M Manuals included in **Appendix A**. **Sections 4.3.1** and **4.3.2** address scheduled maintenance for SVE components. **Section 4.3.3** addresses routine maintenance for the Vapor Phase Carbon system including carbon changeouts, the frequency of which will be determined by influent and effluent concentrations.

4.2 Device Testing / Preventive Monitoring (PM)

4.2.1 Well Tests

If it becomes apparent during the scheduled operation and maintenance visits that the correct vacuum or pressures cannot be achieved at the SVE well, the system will be inspected and taken off-line if necessary.

If the vacuum gauge reading demonstrates low values, the SVE piping, well, and manifold should be checked for leaks or signs of short circuiting, correct valving positions, and proper operation of the blower. Once the cause of the problem is identified, it will be repaired and the system returned to normal operation. If the vacuum gauge demonstrates high readings it may indicate that the well screen needs to be cleaned by injecting air, or that something is lodged in the line, or a valve is in the wrong position.

4.2.2 Fans / Blowers / Filters

Prior to system startup, the SVE blower must be tested for rotation and capacity. Detailed instructions for testing are included in Ametek Rotron O&M Instructions included in **Appendix A**.

4.2.3 Carbon Changeout Procedures

Carbon changeout procedures and frequency are addressed in **Section 2.2.2, Off-Gas Equipment**.

4.3 Maintenance Summary Schedule

The following maintenance is recommended for the major SVE equipment by the equipment manufacturer. See **Appendix A** for more details.

4.3.1 SVE Blowers

- Check all gauges (monthly)
- Check for unusual noise or vibration (monthly)
- Check for any air leaks (monthly)

4.3.2 Other SVE Components

Rotometers

The flow of air in the SVE system is being measured with portable anemometers (TSI Velocicalc Plus Model 8360). The flowmeters are calibrated in the factory and normally do not require any extensive maintenance. The only maintenance required to assure proper operation is occasional cleaning. An Operation and Service Manual is presented as **Appendix D**.

SVE Moisture Separator

SVE moisture separator is a 240-gallon vertical pressure vessel manufactured by EnviroSupply & Service. The vessel is equipped with a high-high level switch to monitor liquid level in the tank. Monitoring of the vessel includes occasional visual checks of the level switch to assure proper operation of the moisture separator.

4.3.3 Vapor Phase Activated Carbon

- Replace carbon in the vessels when the VOC concentrations approach the discharge levels (see **Discharge Requirements listed in Appendix E**)
- Monitor inlet temperature on regular basis.
- Inspect discharge Piping/Fittings for cracks/leaks

4.3.4 Ventilation Fan

- Periodically clean guards, dampers, motors, and propeller to prevent decrease in airflow or motor overheating.
- Periodically check for loose bolts and tighten them to prevent excessive vibration.

5.0 SYSTEM MONITORING

The SVE system was designed to operate continuously. Performance monitoring data showing mass removal rates versus time will be used to evaluate trends for the subject area. The duration of SVE operation will be based on acquired operational data.

5.1 Baseline Startup Monitoring

On September 18, 2002 a baseline startup system monitoring event was conducted at the National Heatset Site. During that event the SVE system was activated, routine maintenance tasks were completed, the controls system was checked for proper settings and operation, and startup system readings were taken and recorded.

This data serves as a baseline for which future system operation and remedial effectiveness can be compared. **Appendix C** includes a blank site visit form that can be copied and utilized for future monitoring events.

5.2 Compliance Monitoring and Samples

The SVE system will be monitored on a monthly basis to evaluate system performance, to assure that all components are in working order, and to maintain compliance with the substantive requirements of a New York State Department of Environmental Conservation Air Discharge Permit (See **Appendix E**). The general tasks to be performed during each visit are listed in the following paragraph. Notes from the monthly visits should be recorded and kept in the contractor's operating files.

SVE equipment will be inspected and operating parameters (temperature, vacuum readings, air concentration readings, and air flow rates) of the equipment and at individual points will be monitored and adjusted as required. The SVE point will be monitored and adjusted at the manifold in the equipment shed. Routine maintenance of the equipment will include the following tasks:

- Draining the moisture knock-out tank by utilizing the one-inch drain located approximately 6 inches from the base of the knock-out tank,
- Draining any moisture that may have accumulated in the carbon vessels.

The hour meter readings will be recorded to verify duration of the system operation between site visits.

Air effluent volatile organic compound concentrations will be monitored with a PID and drager tube during each site visit. Air flow rates will be measured and documented. A confirmatory effluent air sample will be collected each month and analyzed by Method TO-14 modified (site specific compounds) to verify field measurements.

5.3 System Operating Parameters and Process Monitoring

During continuous operation, the expected operating parameters for the SVE system are based on the design calculations, pilot test results, and baseline startup as previously summarized.

5.4 Air Monitoring For Working Safety

Air monitoring must be conducted to determine the potential for personnel exposures and fugitive emissions from site contaminants. Results of air monitoring will be used to ensure the proper selection of protective clothing and equipment, including respiratory protection for protection of on-site personnel and off-site receptors from exposure to unacceptable levels of site contaminants. Air monitoring results will also be used to adjust the SVE system such that fugitive emissions are not released into the environment beyond the vacuum influence of the SVE well. Descriptions of air monitoring strategies, procedures and equipment are provided below.

5.4.1. Direct Reading Air Monitoring

During the operation and maintenance of the SVE system, direct reading air monitoring will be performed. Results of the air monitoring will determine exposure to workers. A Photovac PID, equipped with an 11.7 eV lamp will be used to monitor for total VOCs during these activities. The Photovac is equipped with a pre-programmed library selection which provides response

factors for 70 compounds, enabling direct reading of a targeted contaminant in parts per million (ppm). A manufacturer's information sheet is included in **Appendix F**. If a sustained PID reading above background levels are observed, contaminant-specific monitoring methods, such as Draeger colorimetric detector tubes, should be used. The following air monitoring plan and contaminant concentration action levels will apply for all air monitoring points located beyond the range of vacuum influence.

5.4.2 Instrumentation

The following is a description of the air monitoring equipment and procedures to be used at this site.

5.4.3 Photoionization Detector (PID)

Monitoring Procedure

- Breathing Zone: To monitor the breathing zone, the inlet of the PID must be held in the breathing zone for a minimum of 15 seconds. The highest sustained reading observed will be recorded for that air monitoring location.
- SVE Air Sample Ports: Tygon tubing will be attached to the sample ports on the SVE lines and the ports between and after the VGAC units. The sampling pump will be used to fill a vapor sampling bag. A PID will then be used to measure the VOC concentration in the vapor from the sampling bag.
- Vapor Probes and Monitoring Wells: An air tight well cap will be placed on the monitoring well with a tygon tubing attached. A personal air sampling pump will be used to purge the well/probe for three minutes, so that representative soil vapors enter the well from the soil formation. The sampling pump will be used to fill a vapor sampling bag. A PID will then be used to measure the VOC concentration in the vapor from the sampling bag.

Type and Operational Aspects

Described below are the features and operational aspects of the PID.

- Photovac PID – **Appendix F** contains an information sheet for the Photovac 2020.
- Ionization potential (IP) - The energy required to remove the outermost electron from a molecule; measured in electron volts (eV); characteristic property of a specific chemical.

- Photoionization - Using ultraviolet (UV) light to remove the outermost electron from a molecule.
- Energy of UV light (10.2, 9.5, 11.7 eV) must be equal to or greater than the IP to photoionize the molecule. The 11.7 eV bulb equipped in the Photovac 2020 is adequate for the compounds of concern at the site.
- Fan or pump is used to draw air into the detector where the contaminants are exposed to a UV light source (lamp).
- Ions are collected on a charged plate and produce a current directly proportional to the number of ionized molecules; current is amplified and displayed on the meter.

Calibration Method/Frequencies

The PID Photovac is designed for trace gas analysis in ambient air and is calibrated at the manufacturer with certified standards of BTEX as benzene.

The approximate span settings for the probe that would give different readings of the amounts of trace gas of a particular species in a sample are based upon the relative photoionization sensitivities of various gases twice daily (beginning and end of shift).

It is recommended that calibration be checked once each day. The field personnel will record and log such calibration information into an air monitoring notebook.

Preventive Maintenance

Maintenance of the PID Model 2020 consists of cleaning the lamp and ion chamber, and replacement of the lamp or other component parts or sub-assemblies.

5.4.4 Colorimetric Detector Tubes

Type and Operational Aspects

The operator will select a specific colorimetric detector tube for tetrachloroethene. For general air monitoring the tubes should be held in the breathing zone. For monitoring of the SVE influent, mid or effluent air, the colorimetric tube should be placed into the appropriate air sample port.

Draeger Multi Glass Detector Model 21/31

Principle of Operation:

- Colorimetric indicator tubes (detector tubes) consist of a glass tube impregnated with an indicating chemical.
- Tube is connected to a piston or bellow pump to draw a known volume of air through the tube. (Do not overdraw the pump; follow manufacturers instructions)
- Contaminant reacts with the indicator chemical in the tube, producing a change in color whose length is proportional to the contaminant concentration; glass tube has gradations in ppm to match the length of stain.
- Preconditioning filter may precede the detector tube to remove interfering contaminants (vinyl chloride).

Calibration Methods/Frequencies

There is no method or procedure for calibrating any colorimetric detector tube. However, it is important to read the instructions provided with a specific detector tube to determine number of pump strokes, interfering chemicals, proper color change, and shelf life. It is important that the number of strokes is not exceeded on the first measurement, as this may overload the tube and overshoot the standard range of measurement.

The sampling pump can be checked but not calibrated using a bubble tube and bellows pump. All bellows pumps draw in a specific amount of air during each stroke. This amount should correspond to a specific amount on the bubble tube (i.e., if one stroke equals 100 cc, then the bubble should move 100 cc in the bubble tube). Also, a leak check can be conducted by activating the pump stroke, then inserting an unopened colorimetric tube in the pump inlet. The pump should not move, if it does, this indicates a leak. If the pump fails either the leak test or the volume test, return it to the manufacturer for repair.

Preventative Maintenance

Generally speaking, the reagent of the colorimetric tubes cannot be stored for unlimited periods. The shelf life of the Drager tubes are, therefore, limited to two years (for storage at room temperature).

5.4.5 Air Monitoring Results

Air monitoring results will be reported as described in **Section 6.0**.

6.0 REPORTING

System performance and discharge compliance results will be documented in monthly reports to the NYSDEC Bureau of Eastern Remedial Action.

7.0 HEALTH AND SAFETY

A site specific Health and Safety Plan has been developed for the National Heatset Site by Shaw. A copy of this plan will kept inside the treatment enclosure for reference at all times.

8.0 DISPOSAL/RESIDUALS MANAGEMENT

Waters collected from the SVE systems 240-gallon moisture separator will be contained in 55-gallon drums. Once a drum is full, the fluid will be sampled and analyzed to determine proper off-site disposal options. The collected fluid will be disposed of in accordance with all State, Local, and Federal regulations.

Spent carbon from the VGAC units will be shipped for off-site regeneration or disposed of at a permitted off-site facility. The spent carbon will be regenerated or disposed of in accordance with State, Local, and Federal regulations.

9.0 PROJECT CLOSURE

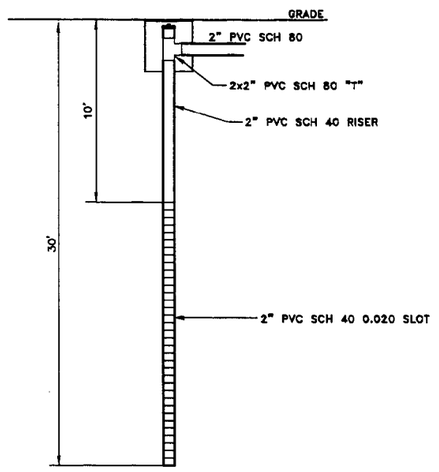
Shaw was retained by the NYSDEC to operate the system for 12 months following the startup date (September 18, 2002). The final Shaw inspection will be completed in conjunction with personnel from the NYSDEC so that continued O&M may be completed by the department. The SVE system will operate continuously until the VOC removal reaches asymptotic conditions. When asymptotic conditions are reached, the SVE system will be pulsed (manually shut down every other month) until the VOC removal again reaches asymptotic conditions. The SVE system will be shut down at that time and soil samples will be collected from unsaturated soils within the footprint of the site building. To ensure that appropriate locations are chosen, the selection of the soil sample locations will be made once asymptotic conditions are reached after pulsed operation of the SVE system. The soil analytical data will be compared to maximum concentration levels specified in the New York State Soil Standards. If the soil analytical data does not meet the New York State guidelines, operation of the SVE system will be resumed after consultation with the NYSDEC.

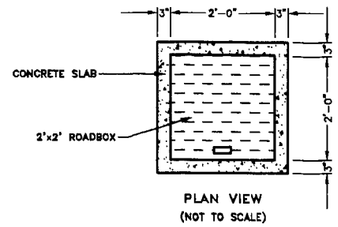
If the soil analytical data meets the guidelines, operation of the SVE system will not resume. Demobilization and restoration activities will be performed and a project closure report will be submitted to the NYSDEC.

FIGURES

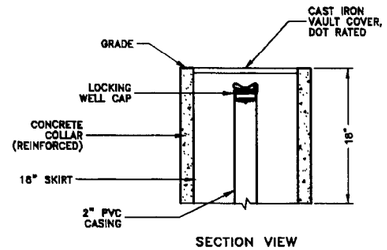
IMAGE	X-REF	OFFICE	DRAWING NUMBER
---	---	ALB	802901D52

SOIL VAPOR EXTRACTION WELLS
(NOT TO SCALE)





PLAN VIEW
(NOT TO SCALE)



SECTION VIEW
(NOT TO SCALE)

STATE OF NEW YORK
EDWARD A. WEINBERG
075440
LICENSED PROFESSIONAL ENGINEER

Edward A. Weinberg
PE 075440 10/7/03

FIGURE 5

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
2	8/27/03	SSH			UPDATE DRAWING
1	4/17/03	SSH			UPDATE DRAWING

Shaw
Shaw E&I Engineering of New York, P.C.

NATIONAL HEATSET PRINTING
BABYLON, NEW YORK

WELLHEAD CONSTRUCTION DETAILS
1 ADAMS BOULEVARD
BABYLON, NEW YORK

DESIGNED BY	J. SKAARUP	05/13/02	CHECKED BY	Ed	10/7/03
DRAWN BY	S. SHKOLNIK	05/13/02	APPROVED BY		
SCALE: NTS	DRAWING NO. 802901D52		SHEET NO.		REVISION NO. 2

Images:
Xref:

L:\project\802901\802901D52.dwg
Plot Date/Time: 08/27/03 11:10am
Format Revised: 7/18/00

OFFICE ALBANY, NY

DRAWING NUMBER 802901D54

208V/3Ø/200A
MAIN CIRCUIT BREAKER

PROPERTY OWNER
NYSDEC

MAIN DISCONNECT

ANALOG RUN TIMER

208V/3Ø/60
L1 L2 L3

SHORT CIRCUIT PROTECTION OF FEEDER CIRCUITS REQUIRED (BY OTHERS)

MAIN DISCONNECT

F1 F2 F3
TR50R

F4 F5 F6
TR4R

M1

OL1
T1 T2 T3

10 HP
32.2 FLA
BLOWER

M2

OL2
T1 T2 T3

1/2 HP
2.3 FLA
FAN

F7 ATQR12
F8 ATQR12

208V
2KVA CONTROL TRANSFORMER
120V

BR1

POWER
OFF ON

F9
OTM2

F10
OTM7

BROWN

BR2

BR3

WHITE

POWER
ON
W

BLOWER
OFF
HAND AUTO

R1-1

15

21

BLOWER
ON
G

M1

22

O/L-1

HIGH HIGH FLOAT

4

R

HIGH HIGH LEVEL RESET

3

HIGH HIGH LEVEL SW.

3

4

R1

R1-2

FAN
ON
G

FAN
OFF ON

5

FAN
T-STAT CONTACT

5

11

11

M2

15

O/L-2

R2-1

12

500W. HEATER

12

2

HEATER
T-STAT CONTACT

1

13

R2

LIGHTS
OFF ON

14

LIGHT
1A. MAX

14

2

STATE OF NEW YORK
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075440
LICENSED PROFESSIONAL ENGINEER

Edward A. Weinberg
PE075440 10/7/03

FIGURE 4

REFERENCE:

BASE MAP SOURCE: ENVIRO SUPPLY CO. AND Calhoun & Paxon Co., Inc.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
2	8/27/03	SSH			UPDATE DRAWING
1	4/17/03	SSH			UPDATE DRAWING

Shaw
Shaw E&I Engineering of New York, P.C.

NATIONAL HEATSET PRINTING
FARMINGDALE, NEW YORK

ELECTRICAL ONE-LINE DIAGRAM AND CONTROL SCHEMATIC

DESIGNED BY	J. SKAARUP	04/07/03	CHECKED BY		10/7/03
DRAWN BY	S. SHKOLNIK	04/07/03	APPROVED BY		

SCALE:	DRAWING NO.	SHEET NO.	REVISION NO.
NTS	802901D54		2

VERIFY SCALE 0 1"

Image: Xref:

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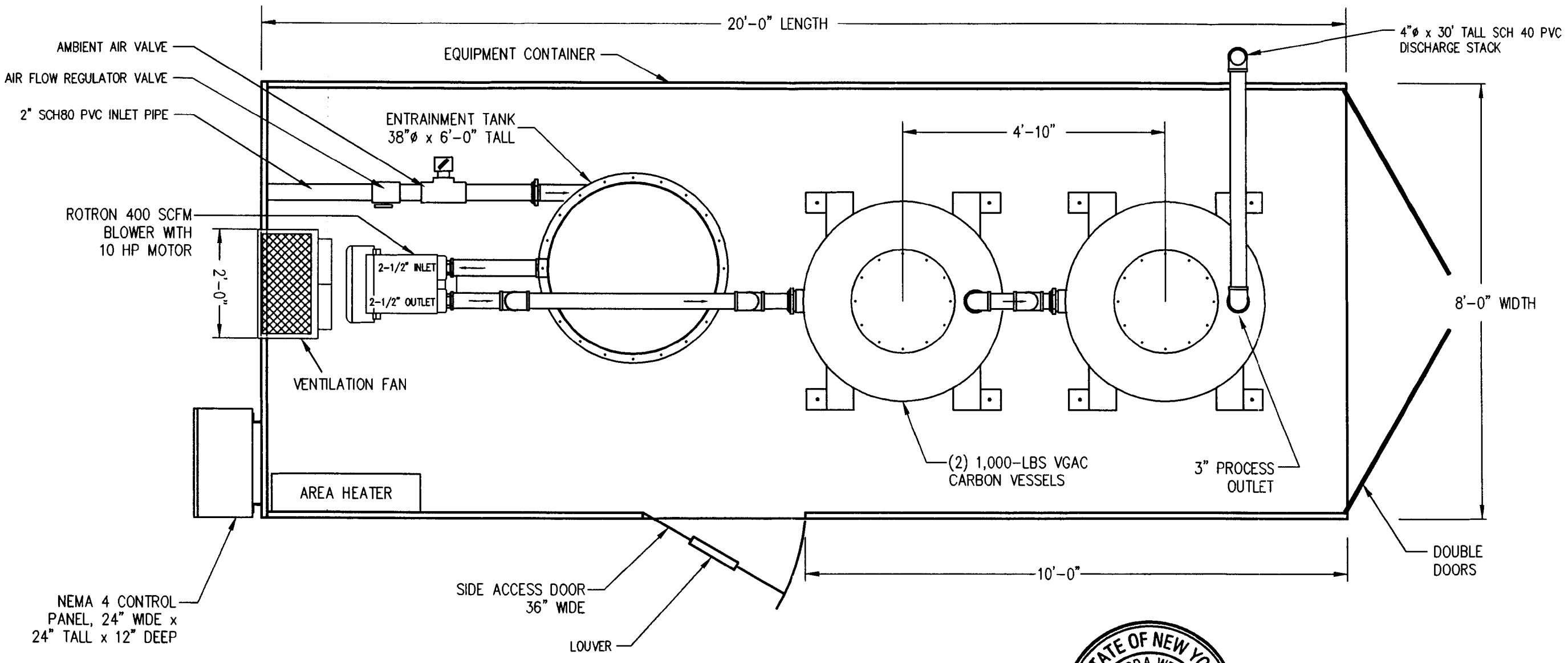
Format Revised: 7/15/00

OFFICE ALBANY, NY
DRAWING NUMBER 802901B41

SITE BUILDING



PLAN VIEW

SCALE
0 2 4 FEET

REFERENCE:

BASE MAP SOURCE: ENVIROSUPPLY & SERVICE.

STATE OF NEW YORK
EDWARD A. WEINBERG
075440
LICENSED PROFESSIONAL ENGINEER

Edward A. Weinberg
PE 075440 10/7/03

FIGURE 3

Shaw
Shaw E&I Engineering of New York, P.C.

NATIONAL HEATSET PRINTING
FARMINGDALE, NEW YORK

AS-BUILT SOIL VAPOR EXTRACTION SYSTEM
GENERAL ARRANGEMENT

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
2	8/27/03	SSH			UPDATE DRAWING
1	4/17/03	SSH			UPDATE DRAWING

DESIGNED BY	J. SKAARUP	04/01/03	CHECKED BY		10/7/03
DRAWN BY	S. SHKOLNIK	04/01/03	APPROVED BY		
SCALE: 1" = 2'	DRAWING NO. 802901B41		SHEET NO.		REVISION NO. 2

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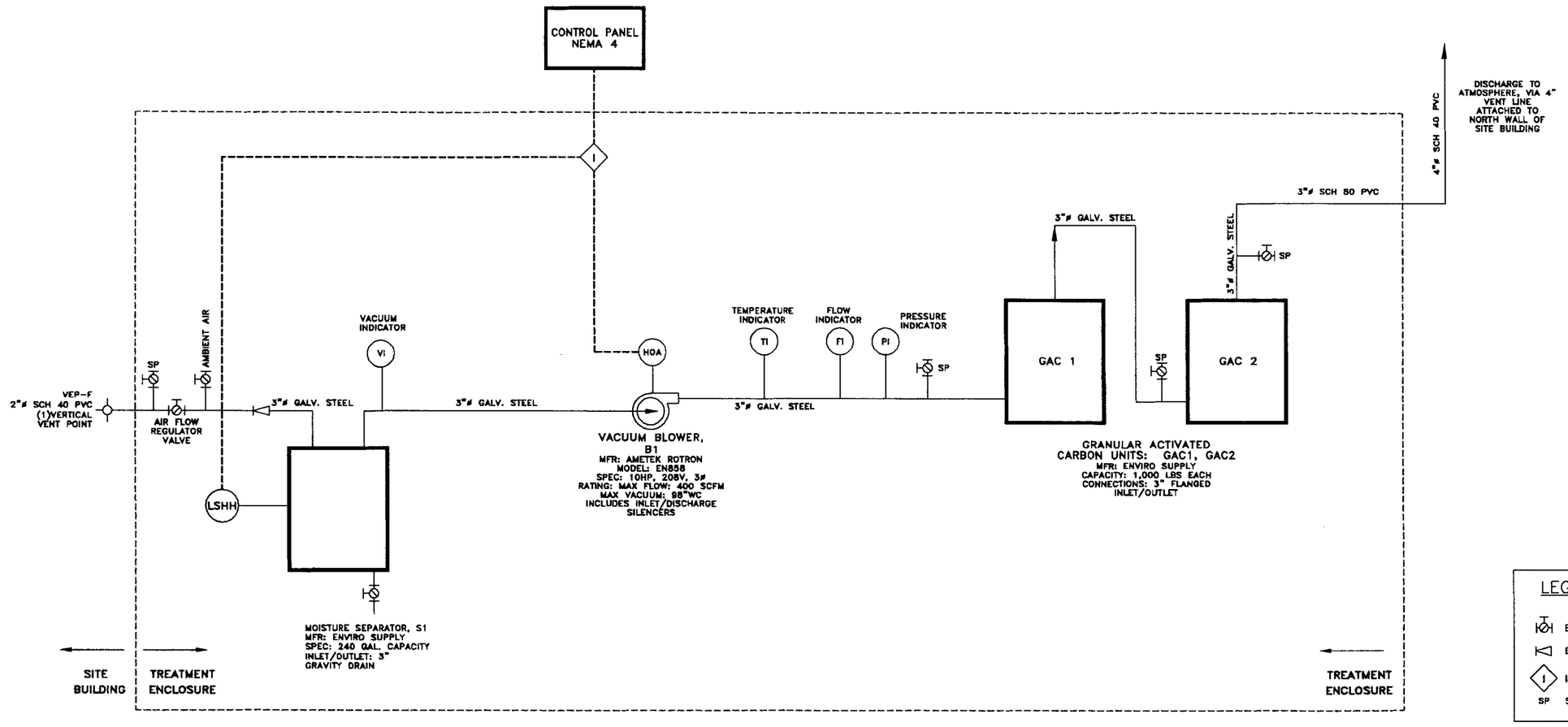
Format Revised: 12/15/99
Image: .
Xref: .

OFFICE ALBANY, NY

DRAWING NUMBER 802901D16



LEGEND:

- BALL VALVE
- EXPANSION FITTING
- I — INPUT TO INTERLOCK
- SP — SAMPLE PORT

VERIFY SCALE 0 1"

STATE OF NEW YORK
EDWARD A WEINBERG
075440
LICENSED PROFESSIONAL ENGINEER

Edward A Weinberg 10/7/03
PE 075440

NOT TO SCALE

FIGURE 2

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
3	8/25/03	SSH			UPDATE DRAWING
2	6/9/03	SSH			UPDATE DRAWING
1	4/17/03	SSH			UPDATE DRAWING

Shaw E&I Engineering of New York, P.C.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PIPING & INSTRUMENT DIAGRAM

NATIONAL HEATSET PRINTING SITE
FARMINGDALE, NEW YORK

DESIGNED BY	J. SKAARUP	01/22/03	CHECKED BY		10/7/03
DRAWN BY	S. SHKOLNIK	01/22/03	APPROVED BY		
SCALE: NTS	DRAWING NO. 802901D16		SHEET NO.		REVISION NO. 3

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Plot Date/Time: 09/08/03 10:58am
Format Revised: 7/18/00

Image: .
Xref: .

IMAGE | X-REF | OFFICE | DRAWING NUMBER
--- | --- | ALBANY, NY | 802901B35

MW-8
MW-7
MW-6
A
B
ELECTRICAL
MW-1
PILOT TEST ENCLOSURE
NO ACCESS
VP-2
C
E
VAPOR EXTRACTION POINT
F
G
VP-1
DIRECTION OF GROUNDWATER FLOW
FORMER VP-3
VP-3
VENT
RAMP
RAMP
VP-4
VP-5
VP-6
MW-9
MW-4A
VENT
MW-5
VENT
FLAMMABLE STORAGE AREA
VENT
VENT
RAMP
RAMP
MW-3A
MW-10
MW-2A
ADAMS BLVD.
H
FILL PIPES (3)

SCALE
0 50 100 FEET

LEGEND:

- TRAIN TRACK
- VAPOR MONITORING POINT
- DEEP MONITORING WELL (>30')
- SHALLOW MONITORING WELL (<30')
- MANHOLE OR ACCESS POINT
- FENCE LINE
- ES — ELECTRIC LINE
- G — GAS LINE
- S — SANITARY SEWER
- PROPERTY LINE
- INTERIOR BUILDING WALL (DIVIDES WAREHOUSE)

STATE OF NEW YORK
EDWARD A. WEINBERG
075440
LICENSED PROFESSIONAL ENGINEER

Edward A. Weinberg
PE 075440 10/7/03

FIGURE 1

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
4	6/9/03	SSH			UPDATE DRAWING
3	4/17/03	SSH			UPDATE DRAWING
2	1/16/03	SSH			ADD FORMER VP-3 TO DRAWING
1	12/3/02	SSH			UPDATE DRAWING

Shaw™
Shaw E&I Engineering of New York, P.C.

NATIONAL HEATSET PRINTING
FARMINGDALE, NEW YORK

SOIL VAPOR EXTRACTION
PILOT TEST LOCATION MAP

DESIGNED BY	J. SKAARUP	10/23/02	CHECKED BY	10/7/03
DRAWN BY	CA/HMD/SSH	10/23/02	APPROVED BY	
SCALE: AS SHOWN	DRAWING NO. 802901B35		SHEET NO.	REVISION NO. 4

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Plot Date/Time: 06/09/03 09:31am
Format Revised: 12/15/99
Image: .
Xref: .

APPENDIX A

MANUFACTURER'S O&M MANUALS

PRODUCT MANUAL

FOR

THE SHAW GROUP
SOIL VAPOR EXTRACTION CONTAINER

S/N 204

MANUFACTURED BY

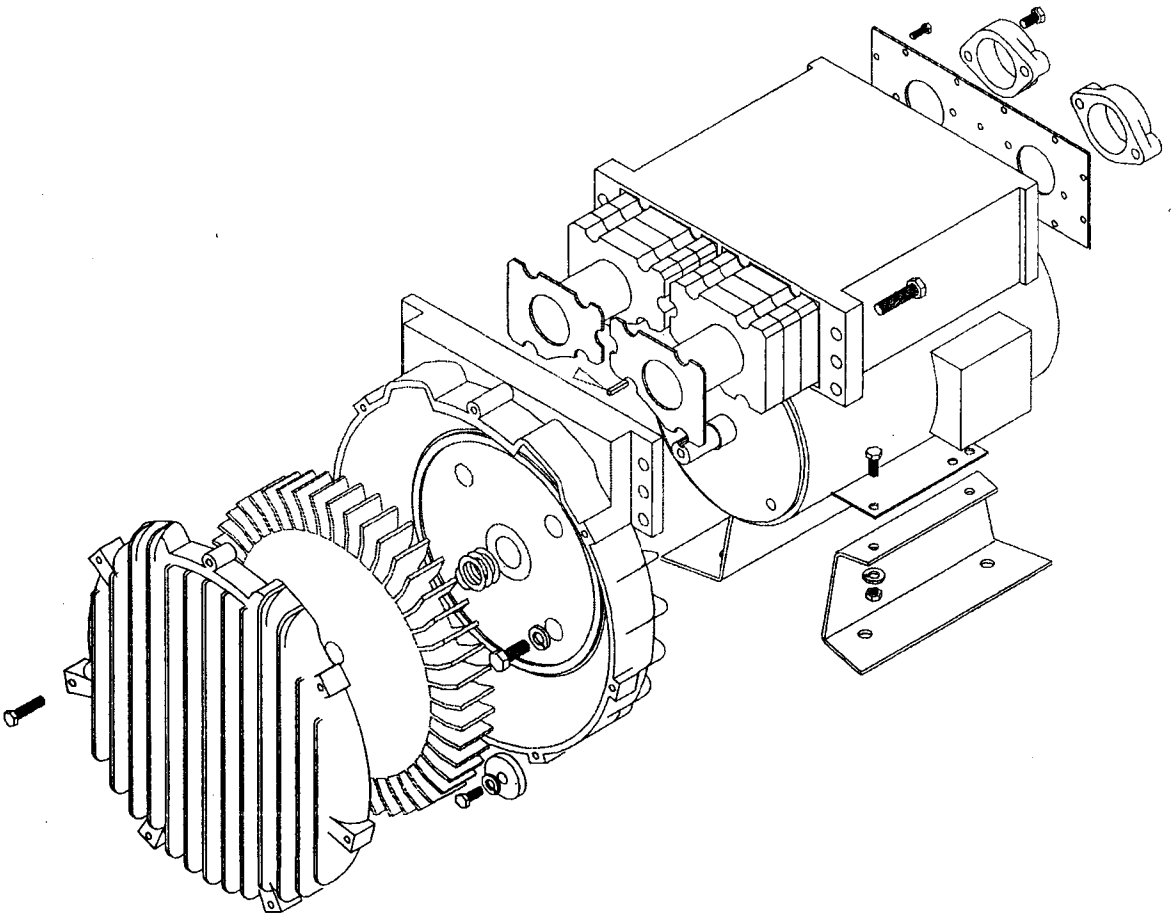
ENVIROSUPPLY & SERVICE INC.
1751 KAISER AVE.
IRVINE, CA 92614

800-201-8150

SERVICE AND PARTS MANUAL FOR BLOWER MODEL

EN8, EN12, EN14

DIRECT DRIVE REGENERATIVE BLOWER



ROTRON® Industrial Products
75 North Street, Saugerties, NY 12477 U.S.A.
Telephone: 845-246-3401 Fax: 845-246-3802
e-mail: rotronindustrial@ametek.com
Internet: www.rotronindustrial.com

AMETEK

Your Choice. Our Commitment.™

WARRANTY, INSTALLATION, MAINTENANCE AND TROUBLESHOOTING INSTRUCTIONS

AMETEK

ROTRON INDUSTRIAL PRODUCTS
75 North Street, Saugerties, NY 12477 U.S.A.
Telephone: 845 -246-3401 Fax: 845-246-3802
e-mail: rotronindustrial@ametek.com web site: www.rotronindustrial.com

1. **No Fault Policy** - AMETEK Rotron DR, EN and HiE regenerative direct drive blowers are guaranteed for one full year from the date of installation (limited to 18 months from the date of shipment.) to the original purchaser only. Should the blower fail, **regardless of the cause of failure**, we will at our option repair or replace the blower.

2. **Standard Policy** - AMETEK Rotron Minispiral, Revaflow, Multiflow, Nautilair, remote drive blowers, moisture separators, packaged units, CP blowers, Nasty Gas™ models and special built (EO) products are guaranteed for one full year from date of shipment for workmanship and material defect to the original purchaser only. Should the blower fail, we will evaluate the failure. If failure is determined to be workmanship or material defect related, we will at our option repair or replace the blower.

3. **Parts Policy** - AMETEK Rotron spare parts and accessories are guaranteed for three months from date of shipment for workmanship and material defect to the original purchaser only. If failure is determined to be workmanship or material defect related we will at our option repair or replace the part.

Corrective Action - A written report will be provided indicating reason(s) for failure, with suggestions for corrective action. Subsequent customer failures due to abuse, misuse, misapplication or repeat offense will not be covered. AMETEK Rotron will then notify you of your options. Any failed unit that is tampered with by attempting repair or diagnosis will void the warranty, unless authorized by the factory.

Terms and Conditions - Our warranty covers repairs or replacement of regenerative blowers only, and will not cover labor for installation, outbound and inbound shipping costs, accessories or other items not considered integral blower parts. Charges may be incurred on products returned for reasons other than failures covered by their appropriate warranty. Out-of -warranty product and in warranty product returned for failures determined to be caused by abuse, misuse, or repeat offense will be subject to an evaluation charge. Maximum liability will in no case exceed the value of the product purchased. Damage resulting from mishandling during shipment is not covered by this warranty. It is the responsibility of the purchaser to file claims with the carrier. Other terms and conditions of sale are stated on the back of the order acknowledgement.

Installation Instructions for SL, DR, EN, CP, and HiE Series Blowers

1. **Bolt It Down** - Any blower must be secured against movement prior to starting or testing to prevent injury or damage. The blower does not vibrate much more than a standard electric motor.

2. **Filtration** - All blowers should be filtered prior to starting. Care must be taken so that no foreign material enters the blower. If foreign material does enter the blower, it could cause internal damage or may exit at extremely high velocity.

   Should excessive amounts of material pass through the blower, it is suggested that the cover(s) and impeller(s) be removed periodically and cleaned to avoid impeller imbalance. Impeller

imbalance greatly speeds bearing wear, thus reducing blower life. Disassembling the blower will void warranty, so contact the factory for cleaning authorization.

3. **Support the Piping** - The blower flanges and nozzles are designed as connection points only and are not designed to be support members.

   Caution: Plastic piping should not be used on blowers larger than 1 HP that are operating near their maximum pressure or suction point. Blower housing and nearby piping temperatures can exceed 200°F. Access by personnel to the blower or nearby piping should be limited, guarded, or marked, to prevent danger of burns.

4. **Wiring** - Blowers must be wired and protected/fused in accordance with local and national electrical codes. All blowers must be grounded to prevent electrical shock. Slo-Blo or time delay fuses should be used to bypass the first second of start-up amperage.

5. **Pressure/Suction Maximums** - The maximum pressure and/or suction listed on the model label should not be exceeded. This can be monitored by means of a pressure or suction gage (available from Rotron), installed in the piping at the blower outlet or inlet. Also, if problems do arise, the Rotron Field representative will need to know the operating pressure/suction to properly diagnose the problem.

6. **Excess Air** - Bleed excess air off. DO NOT throttle to reduce flow. When bleeding off excess air, the blower draws less power and runs cooler.

   Note: Remote Drive (Motorless) Blowers - Properly designed and installed guards should be used on all belts, pulleys, couplings, etc. Observe maximum remote drive speed allowable. Due to the range of uses, drive guards are the responsibility of the customer or user. Belts should be tensioned using belt gauge.

Maintenance Procedure

When properly piped, filtered, and applied, little or no routine maintenance is required. Keep the filter clean. Also, all standard models in the DR, EN, CP, and HiE series have sealed bearings that require no maintenance. Bearing should be changed after 15,000 to 20,000 hours, on average. Replacement bearing information is specified on the chart below.

Bearing Part Number	Size	Seal Material	Grease	Heat Stabilized
510217 510218 510219	205 206 207	Polyacrylic	Nye Rheotemp 500 30% +/- 5% Fill	Yes – 325 F
510449 516440 516648	203 202 307	Buna N	Exxon Polyrex Grease	NO
516840 516841 516842 516843 516844 516845 516846 516847	206 207 208 210 309 310 311 313	Buna N	Exxon Polyrex Grease	NO

Troubleshooting

		POSSIBLE CAUSE	OUT OF WARRANTY REMEDY ***
IMPELLER DOES NOT TURN	Humming Sound	1. * One phase of power line not connected 2. * One phase of stator winding open 3. Bearings defective 4. Impeller jammed by foreign material 5. Impeller jammed against housing or cover 6. ** Capacitor open	1. Connect 2. Rewind or buy new motor 3. Change bearings 4. Clean and add filter 5. Adjust 6. Change capacitor
	No Sound	1. * Two phases of power line not connected 2. * Two phases of stator winding open	1. Connect 2. Rewind or buy new motor
IMPELLER TURNS	Blown Fuse	1. Insufficient fuse capacity 2. Short circuit	1. Use time delay fuse of proper rating 2. Repair
	Motor Overheated Or Protector Trips	1. High or low voltage 2. * Operating in single phase condition 3. Bearings defective 4. Impeller rubbing against housing or cover 5. Impeller or air passage clogged by foreign material 6. Unit operating beyond performance range 7. Capacitor shorted 8. * One phase of stator winding short circuited	1. Check input voltage 2. Check connections 3. Check bearings 4. Adjust 5. Clean and add filter 6. Reduce system pressure/vacuum 7. Change capacitor 8. Rewind or buy new motor
	Abnormal Sound	1. Impeller rubbing against housing or cover 2. Impeller or air passages clogged by foreign material 3. Bearings defective	1. Adjust 2. Clean and add filter 3. Change bearings
	Performance Below Standard	1. Leak in piping 2. Piping and air passages clogged 3. Impeller rotation reversed 4. Leak in blower 5. Low voltage	1. Tighten 2. Clean 3. Check wiring 4. Tighten cover, flange 5. Check input voltage

* 3 phase units

** 1 phase units

*** Disassembly and repair of new blowers or motors will void the Rotron warranty. Factory should be contacted prior to any attempt to field repair an in-warranty unit.

Blower Disassembly:

WARNING: Attempting to repair or diagnose a blower may void Rotron's warranty. It may also be difficult to successfully disassemble and reassemble the unit.

1) Disconnect the power leads. **CAUTION:** Be sure the power is disconnected before doing any work whatsoever on the unit.

2) Remove or separate piping and/or mufflers and filters from the unit.

3) Remove the cover bolts and then the cover. **NOTE:** Some units are equipped with seals. It is mandatory that these seals be replaced once the unit has been opened.

4) Remove the impeller bolt and washers and then remove the impeller. **NOTE:** Never pry on the edges of the impeller. Use a puller as necessary.

5) Carefully note the number and location of the shims. Remove and set them aside. NOTE: If the disassembly was for inspection and cleaning the unit may now be reassembled by reversing the above steps. If motor servicing or replacement and/or impeller replacement is required the same shims may not be used. It will be necessary to re-shim the impeller according to the procedure explained under assembly.

6) Remove the housing bolts and remove the motor assembly (arbor/.housing on remote drive models).

7) Arbor disassembly (Applicable on remote drive models only):
   a) Slide the bearing retraining sleeve off the shaft at the blower end.
   b) Remove the four (4) screws and the bearing retaining plate from the blower end.
   c) Lift the shaft assembly far enough out of the arbor to allow removal of the blower end snap ring.
   d) Remove the shaft assembly from the arbor.
   e) If necessary, remove the shaft dust seal from the pulley end of the arbor.

Muffler Material Replacement:

1) Remove the manifold cover bolts and them manifold cover.

2) The muffler material can now be removed and replaced if necessary. On blowers with fiberglass acoustical wrap the tubular retaining screens with the fiberglass matting before sliding the muffler pads over the screens.

3) Reassemble by reversing the procedure.

NOTE: On DR068 models with tubular mufflers it is necessary to remove the cover and impeller accessing the muffler material from the housing cavity.

Blower Reassembly:

1) Place the assembled motor (assembled arbor assembly for remote drive models) against the rear of the housing and fasten with the bolts and washer.

2) To ensure the impeller is centered within the housing cavity re-shim the impeller according to the procedure outlined below.

3) If blower had a seal replace the seal with a new one.

4) Place the impeller onto the shaft making sure the shaft key is in place and fasten with the bolt, washer and spacer as applicable. Torque the impeller bolt per the table below. Once fastened carefully rotate the impeller to be sure it turns freely.

5) Replace the cover and fasten with bolts.

6) Reconnect the power leads to the motor per the motor nameplate.

Bolt Size	Torque
1/4-20	6.25 +/- 0.25
5/16-18	11.5 +/- 0.25
3/8-16	20.0 +/- 0.5
½-13	49.0 +/- 1
5/8 –11	90.0 +/- 2

Impeller Shimming Procedure:

WARNING: This unit may be difficult to shim. Extreme care may be exercised.

Tools Needed:Machinist's Parallel Bar
Vernier Caliper with depth measuring capability
Feeler gauges or depth gauge

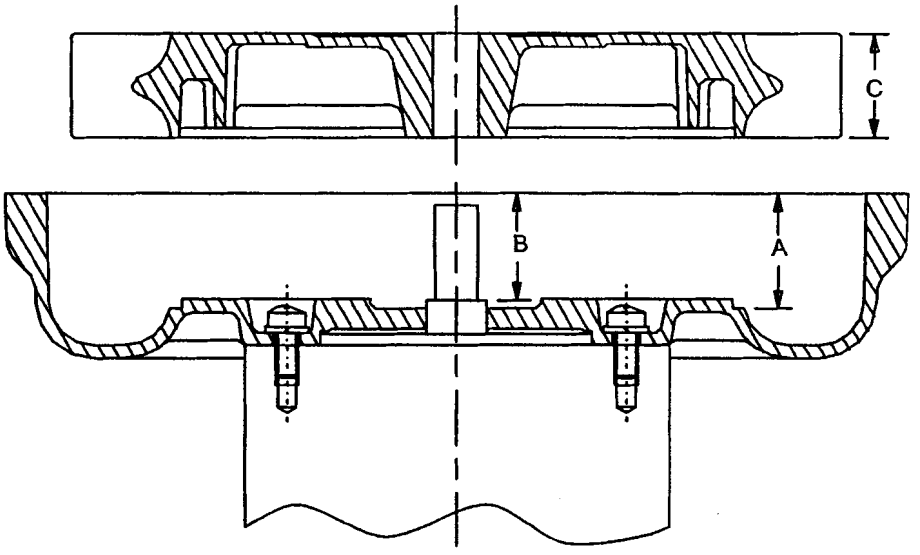
Measure the Following:

Distance from the flange face to the housing (A)
Distance from the flange face to the motor shaft shoulder (B)
Impeller Thickness (C)

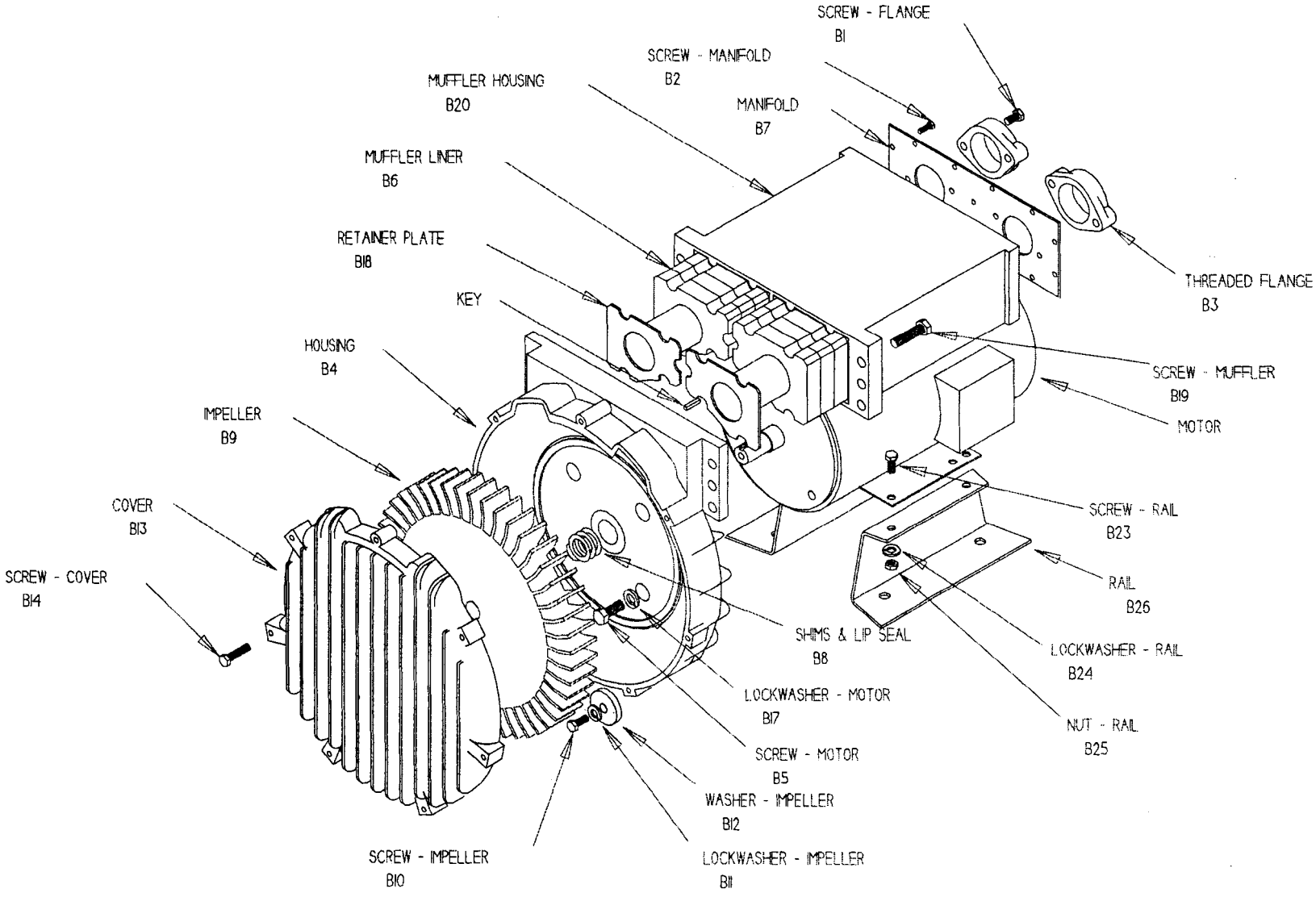
Measurements (A) and (B) are made by laying the parallel bar across the housing flange face and measuring to the proper points. Each measurement should be made at three points, and the average of the readings should be used.

Shim Thickness = B – (A+C)/2

After the impeller installation (step #4 above) the impeller/cover clearance can be checked with feeler gauges, laying the parallel bar across the housing flange face. This clearance should nominally be (A+C)/2.



ASSEMBLY DIAGRAM
EN8 EN12 EN14



Parts Breakdown

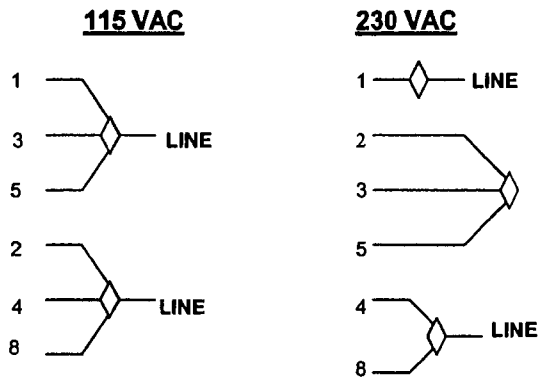
Item No.	Qty. Req'd	Description	Model: EN8	EN12	EN14	EN14	EN14	EN14
		Part No.:	038185	038186	038188	038187	038760	038761
			038441	038442	038444			038762
			OBSOLETE	OBSOLETE	OBSOLETE	OBSOLETE		
M3	1	Key Motor Shaft	511532	511532	155066	511532	511532	155066
B1	4	Screw, Flange	155025	155025	155025	155025	(6 pcs) 140016	(6 pcs) 140016
B2	17	Screw, Manifold	120214	120214	(18 pcs) 120214	(18 pcs) 120214	Not Used	Not Used
B3	2	Flange	511614	511516	515985	515985	529912	529912
		Screen, Flange Guard/O-ring	Not Used	Not Used	Not Used	Not Used	(2 pcs) 155377	(2 pcs) 155377
		Elbow 90°	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B4	1	Housing	516764	515356	516799	516797	516797	516799
B5	4	Screw, Hsg /Motor	155034	140014	120205	120205	120205	120205
B6	38	Muffler Material	515405	(52 pcs) 515348	516108	516108	(54 pcs) 550073	(54 pcs) 550073
	2	Matting, Fiberglass	516662	516663	516664	516664	550116	550116
B7	1	Manifold Plate	523432	523435	523438	523438	Not Used	Not Used
B8	*	Shim .002"	511547	511547	515991	511547	511547	515991
	*	Shim .005"	511548	511548	515992	511548	511448	515992
	*	Shim .010"	511549	511549	515993	511549	511549	515993
	*	Shim .020"	511550	511550	515994	511550	511550	515994
	*	Shim .030"	Not Used	Not Used	Not Use	Not Used	Not Used	Not Used
B9	1	Impeller	515249	515270	515509	515683	516683	515509
B10	1	Bolt, Impeller	120210	140015	155068	120251	120251	155068
B11	1	Lockwasher, Impeller	251788	251788	251788	251788	251788	251788
B12		Washer, Impeller	511529	Not Used	Not Used	Not Used	Not Used	Not Used
B13	1	Cover	515247	515359	515910	515910	515910	515910
B14	8	Screw, Cover	140016	140016	155069	155069	155069	155069
B15	1	Eye Bolt	140019	140019	140019	140019	140019	140019
B16	1	Spacer, Impeller Bolt	515555	511529	515990	515990	515990	515990
		Shaft Sleeve	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B17		Lockwasher, Housing	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B18	1	Screen, Muffler Retaining, Right (**)	515603	515351	516010	516010	550042	550042
	1	Screen, Muffler Retaining, Left (**)	515604	515350	516011	516011	550040	550040
B19	8	Bolt, Muffler Hsg/Hsg	(6 pcs) 155025	155025	155067	155067	(6 pcs) 155067	(6 pcs) 155067
B19A		Bolt, Muffler/Housing	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B20	1	Muffler Housing	515606	516982	516037	516037	550039	550039

		Muffler Discrete	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
		Bolt, Motor/Muffler	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
		Lockwasher, Motor/Muffler	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
		Washer, Motor/Muffler	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
		Spacer, Motor/Muffler	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B21		Heat Slinger	Not Used	Not Used	515997	511527	Not Used	Not Used
B22		Guard Heat slinger	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B23	4	Bolt, Rail	120007	155095	120256	155025	155025	1200256
B24	4	Lockwasher Rail	251787	251787	251788	251788	251788	251788
B24A	4	Washer/Rail/Motor	Not Used	155091	Not Used	Not Used	Not Used	Not Used
B25	4	Nut, Rail	251789	251789	155070	155070	155070	155070
B26	2	Rail Mounting	595301	515286	516242	516242	516242	516242
	1	Lip Seal	516693	516693	516694	516693	516693	516694

Model	Part No.	Motor	Wiring Diagram	Specific Parts	Bearing, Rear (M1)	Bearing, Impeller End (M2)
EN8BD72WL	038185	515556	K + L		516840	516844
EN8BD86WL	038441	529627	N + L			
EN12BG72WL	038186	511512	K + L		516842	516844
EN12BG86WL	038442	529631	N + L			
EN14DX86WL	038444	529632	N + L		516844	516846
EN14DX72WL	038188	516095	K + L			
EN14BK72WL	038187	511513	K + L			
EN14BK72MWL	038760	511513	K + L			
EN14DX72MWL	038761	516095	K + L			
EN14DX86MWL	038762	529632	K + L			

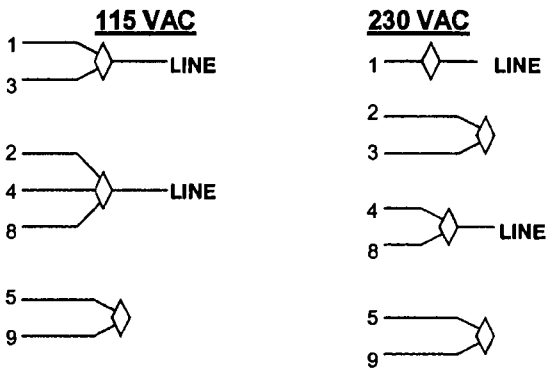
WIRING DIAGRAMS, XP MOTORS

H. 1Ø, 6 WIRE



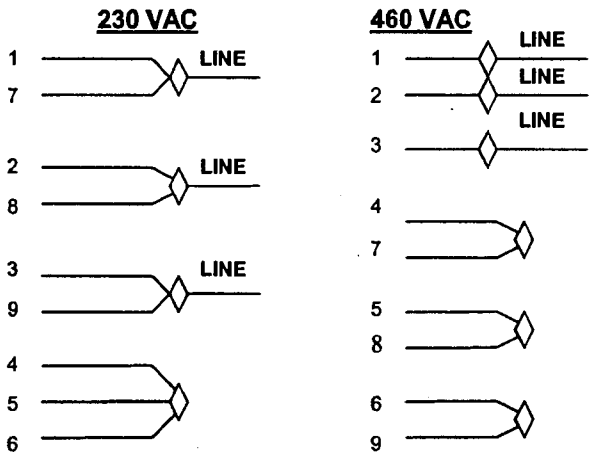
INTERCHANGE LEADWIRES 5 & 8 to REVERSE ROTATION

I. 1Ø, 7 WIRE



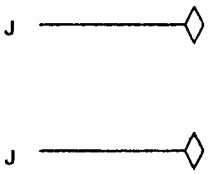
INTERCHANGE LEADWIRES 5 & 8 to REVERSE ROTATION

K. 3Ø, 9 WIRE



INTERCHANGE ANY TWO LEAD LINES TO REVERSE ROTATION

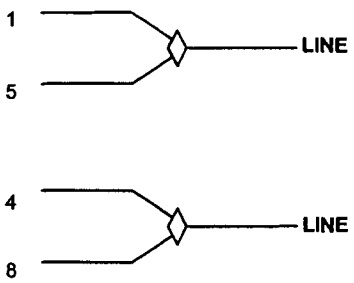
L. PILOT DUTY THERMAL OVERLOADS



HOOK J LEADS TO CONTROL CIRCUITRY

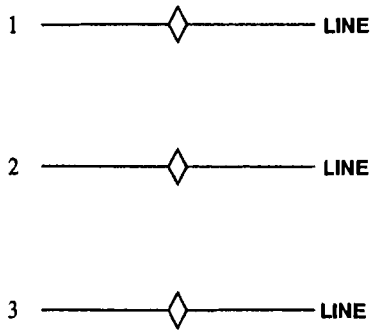
M. 1Ø 230 VAC

SINGLE VOLTAGE



INTERCHANGE LEADWIRES 5 & 8 TO REVERSE ROTATION

N. 3Ø 575 VAC



INTERCHAGE ANY TWO LEAD LINES TO REVERSE ROTATION

GENERAL INSTALLATION INSTRUCTIONS

AMETEK

ROTRON INDUSTRIAL PRODUCTS
75 North Street, Saugerties, NY 12477 U.S.A.
Telephone: 845 -246-3401 Fax: 845-246-3802
e-mail: rotronindustrial@ametek.com website: www.rotronindustrial.com

Rotron Regenerative Blowers

Installation Instructions for SL, DR, EN, CP, and HIE Series Blowers

1. **Bolt It Down** - Any blower must be secured against movement prior to starting or testing to prevent injury or damage. The blower does not vibrate much more than a standard electric motor.

2. **Filtration** - All blowers should be filtered prior to starting. Care must be taken so that no foreign material enters the blower. If foreign material does enter the blower, it could cause internal damage or may exit at extremely high velocity.

   Should excessive amounts of material pass through the blower, it is suggested that the cover(s) and impeller(s) be removed periodically and cleaned to avoid impeller imbalance. Impeller imbalance greatly speeds bearing wear, thus reducing blower life. Disassembling the blower will void warranty, so contact the factory for cleaning authorization.

3. **Support the Piping** - The blower flanges and nozzles are designed as connection points only and are not designed to be support members.

   Caution: Plastic piping should not be used on blowers larger than 1 HP that are operating near their maximum pressure or suction point. Blower housing and nearby piping temperatures can exceed 200°F. Access by personnel to the blower or nearby piping should be limited, guarded, or marked, to prevent danger of burns.

4. **Wiring** - Blowers must be wired and protected/fused in accordance with local and national electrical codes. All blowers must be grounded to prevent electrical shock. Slo-Blo or time delay fuses should be used to bypass the first second of start-up amperage.

5. **Pressure/Suction Maximums** - The maximum pressure and/or suction listed on the model label should not be exceeded. This can be monitored by means of a pressure or suction gage (available from Rotron), installed in the piping at the blower outlet or inlet. Also, if problems do arise, the Rotron Field representative will need to know the operating pressure/suction to properly diagnose the problem.

6. **Excess Air** - Bleed excess air off. DO NOT throttle to reduce flow. When bleeding off excess air, the blower draws less power and runs cooler.

   Note: Remote Drive (Motorless) Blowers - Properly designed and installed guards should be used on all belts, pulleys, couplings, etc. Observe maximum remote drive speed allowable. Due to the range of uses, drive guards are the responsibility of the customer or user. Belts should be tensioned using belt gauge.

For further information regarding Rotron regenerative blowers (including service & parts manuals), please contact your local field sales engineer.

Revised 12/10/98

Maintenance Procedure

When properly piped, filtered, and applied, little or no routine maintenance is required. Keep the filter clean. Also, all standard models in the DR, EN, CP, and HIE series have sealed bearings that require no maintenance. Bearing should be changed after 15,000 to 20,000 hours, on average. Replacement bearing information is specified on the chart below.

Bearing Part Number	Size	Seal Material	Grease	Heat Stabilized
510217 510218 510219	205 206 207	Polyacrylic	Nye Rheotemp 500 30% +/- 5% Fill	Yes – 325 F
510449 516440 516648	203 202 307	Buna N	Shell Dolium "R" 25-40% Fill	NO
516840 516841 516842 516843 516844 516845 516846 516847	206 207 208 210 309 310 311 313	Buna N	Shell Dolium "R" 30%+/- 5% Fill	NO

Troubleshooting

		POSSIBLE CAUSE	OUT OF WARRANTY REMEDY ***
IMPELLER DOE NOT TURN	Humming Sound	1. * One phase of power line not connected	1. Connect
		2. * One phase of stator winding open	2. Rewind or buy new motor
		3. Bearings defective	3. Change bearings
		4. Impeller jammed by foreign material	4. Clean and add filter
		5. Impeller jammed against housing or cover	5. Adjust
		6. ** Capacitor open	6. Change capacitor
	No Sound	1. * Two phases of power line not connected	1. Connect
		2. * Two phases of stator winding open	2. Rewind or buy new motor
IMPELLER TURNS	Blown Fuse	1. Insufficient fuse capacity	1. Use time delay fuse of proper rating
		2. Short circuit	2. Repair
	Motor Overheated Or Protector Trips	1. High or low voltage	1. Check input voltage
		2. * Operating in single phase condition	2. Check connections
		3. Bearings defective	3. Check bearings
		4. Impeller rubbing against housing or cover	4. Adjust
		5. Impeller or air passage clogged by foreign material	5. Clean and add filter
		6. Unit operating beyond performance range	6. Reduce system pressure/vacuum
		7. Capacitor shorted	7. Change capacitor
		8. * One phase of stator winding short circuited	8. Rewind or buy new motor
	Abnormal Sound	1. Impeller rubbing against housing or cover	1. Adjust
		2. Impeller or air passages clogged by foreign material	2. Clean and add filter
		3. Bearings defective	3. Change bearings
	Performance Below Standard	1. Leak in piping	1. Tighten
		2. Piping and air passages clogged	2. Clean
		3. Impeller rotation reversed	3. Check wiring
		4. Leak in blower	4. Tighten cover, flange
		5. Low voltage	5. Check input voltage

* 3 phase units
** 1 phase units
*** Disassembly and repair of new blowers or motors will void the Rotron warranty. Factory should be contacted prior to any attempt to field repair an in-warranty unit.

Revised 12/10/98

AMETEK®
ROTRON TECHNICAL MOTOR DIVISION
REGENERATIVE BLOWER GROUP

75 North Street
Saugerties, New York 12477
Phone: (845) 246-3401
Fax: (845) 246-3802

EXPLOSION-PROOF BLOWERS

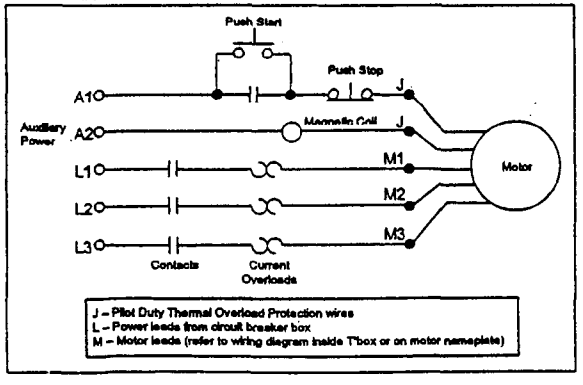
IMPORTANT: Read before wiring this Explosion-proof Blower

This AMETEK Rotron Explosion-proof Regenerative Blower may be equipped with Pilot Duty Thermal Overload (PDTO) or Automatic Thermal Overload (ATO) protection. When properly wired to a motor starter, this protection limits the motor winding temperature rise per the National Electric Code (NEC) article 500. Failure to properly wire this blower is an NEC violation and could cause an explosion. AMETEK Rotron assumes no responsibilities for damages incurred by negligent use of this product, and will not warranty a blower on which the PDTO is not properly connected. Some blowers 1 HP and under do not require PDTO and have built in ATO. Consult the factory if verification of wiring connections is required.

In all cases, follow the motor controller manufacturer's instructions. The following schematic is for conceptual understanding only, and may not apply to all motor/controller combinations.

The manufacturer's wiring diagram found on the motor takes precedent over reference diagrams supplied by AMETEK Rotron Technical Motor Division.

Schematic



The schematic is shown for a three phase motor. For a single phase motor disregard L3 and M3. Pushing the START button completes the auxiliary control circuit, allowing current to flow through the magnetic coil. The contacts are magnetically closed, starting the motor and latching the auxiliary circuit. The motor will continue to run until the STOP push button is depressed, the motor reaches the overload temperature, or the current sensing overloads trip out.

If you have any questions, contact AMETEK Rotron at 914-246-3401 for the location of your area representative.

POLICY REGARDING INSTALLATION OF AMETEK ROTRON REGENERATIVE BLOWERS IN HAZARDOUS LOCATIONS

AMETEK Rotron will not knowingly specify, design or build any regenerative blower for installation in a hazardous, explosive location without the proper NEMA motor enclosure. AMETEK Rotron does not recognize sealed blowers as a substitute for explosion-proof motors. Sealed units with standard TEFC motors should never be utilized where local, state, and/or federal codes specify the use of explosion-proof equipment.

AMETEK Rotron has a complete line of regenerative blowers with explosion-proof motors. Division 1 & 2, Class I, Group D; Class II, Groups F & G requirements are met with these standard explosion-proof blowers.

AMETEK Rotron will not knowingly specify, design or build any regenerative blower for installation in a hazardous, corrosive environment without the proper surface treatment and sealing options.

AMETEK Rotron has a complete line of Chemical Processing and Nasty Gas™ regenerative blowers with Chem-Tough™, stainless steel parts, and seals.

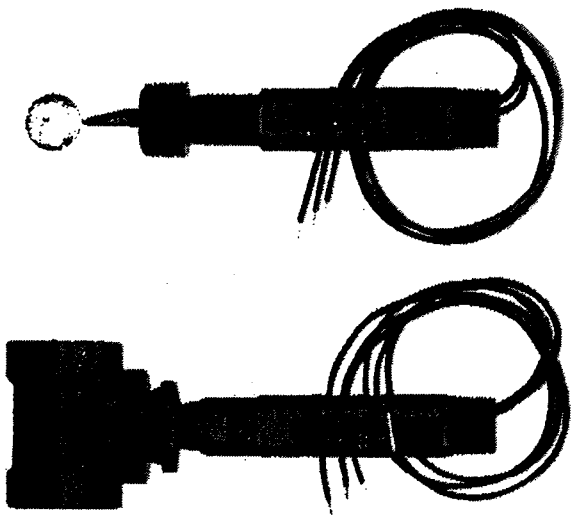
AMETEK Rotron offers general application guidance; however, suitability of the particular blower selection is ultimately the responsibility of the purchaser, not the manufacturer of the blower.

FS2 Rev B 3/10/98

02/20/02 Rev. E

FLOTECT. MODEL L-6 FLOAT SWITCH

Installation and Operating Instructions



Explosion-Proof; U.L. and C.S.A. Listed -
Class I, Groups *A, B, C & D
Class II, Groups E, F & G
CENELEC: EExd IIC T6 (T amb=75°C)
*(Group A, stainless steel body only)

PHYSICAL DATA

Temperature Limit: 220°F (105°C) maximum
Maximum Pressure: See chart below
Switches: One or two SPDT snap switches
Electrical Rating: U.L.: 5A @ 125/250 VAC.
C.S.A. and CENELEC: 6A @ 125/250 VAC, 5A resistive, 3A inductive @ 30 VDC.
Optional ratings: MV option—Gold contacts for dry circuits. Rated 0.1A @ 125 VAC MT option: 400°F (205°C) 5A @ 125/250 VAC (not listed).
Wiring Connections: 3-18" (460mm) wire leads, 18 ga.
CENELEC models only: push-in type terminal blocks
Black = common, blue = N.O., red = N.C.
Minimum Specific Gravity:
Polypropylene float - 0.9
Round SS float - 0.7
Cylindrical SS float - 0.5
Switch Body: Brass 3/4" NPT conduit connection.
For SS switch body, change model no. to L6EPS.
Piping/Mounting Connection: 1" NPT
Installation: Horizontal, index arrow pointing down.
Weight: 1 lb. (.5 KG); w/external chamber 1-3/4 lb. (.8 KG)

WETTED MATERIALS CHART

Model	Brass	Bronze	Ceramic	Polypropylene	301SS	303SS	304SS
B-S-S-A	X		X		X		X
B-S-S-B	X	X	X	X	X		
B-S-S-C	X		X		X		X
B-S-S-H	X	X	X		X		X
B-S-S-O	X		X	X	X		
S-S-S-A			X	X	X		X
S-S-S-C			X		X	X	X
S-S-S-L			X		X	X	X
S-S-S-O			X	X	X	X	
S-S-S-S			X	X	X	X	

MAXIMUM PRESSURE CHART

Model Number	Float	Pressure Rating PSIG (KG/CM²)
L6EPB-B-S-S-A	Cylindrical SS	200 (14)
L6EPB-B-S-S-B	Polypropylene	250 (18)
L6EPB-B-S-S-C	Round SS	350 (25)
L6EPB-B-S-S-H	Round SS	250 (18)
L6EPB-B-S-S-O	Polypropylene	1000 (70)
L6EPB-S-S-S-A	Cylindrical SS	200 (14)
L6EPB-S-S-S-C	Round SS	350 (25)
L6EPB-S-S-S-L	Round SS	350 (25)
L6EPB-S-S-S-O	Polypropylene	2000 (140)
L6EPB-S-S-S-S	Polypropylene	2000 (140)

INSTALLATION:

Unpack switch and remove any packing material found inside lower housing or float chamber.

Switch must be installed with body in a horizontal plane and arrow on side pointing down.

If switch has an external float chamber (tee), connect it to vertical sections of 1" NPT pipe installed outside vessel walls at appropriate levels. If unit has no external float chamber, it must be mounted in a 1" NPT half coupling welded to the vessel wall. The coupling must extend through the wall.

Inspect and clean wetted parts at regular intervals.

ELECTRICAL CONNECTIONS:

Connect wire leads in accordance with local electrical codes and switch action required. N.O. contacts will close and N.C. contacts will open when liquid level causes float to rise. They will return to "normal" condition on decreasing liquid level. Black = common, Blue = N.O. and Red = N.C.

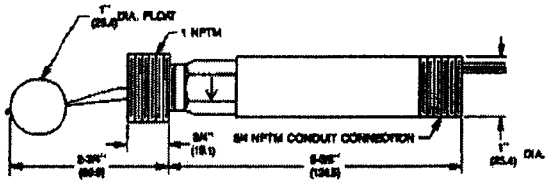
For units supplied with both internal and external grounds, the ground screw inside the housing must be used to ground the control. The external ground screw is for supplementary bonding when allowed or required by local code. Some CSA listed models are furnished with a separate green ground wire. Such units must be equipped with a junction box, not supplied but available on special order.

CENELEC certified models include a junction box. Cable should enter enclosure through an approved EX cable gland, not supplied. Push stripped and tinned leads into appropriate openings in terminal block(s). To connect fine stranded leads or to remove any wire, depress spring release with small screwdriver first.

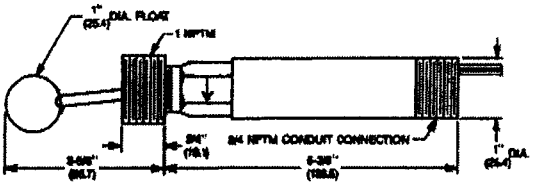
All wiring, conduit and enclosures must meet applicable codes for hazardous areas. Conduits and enclosures must be properly sealed. For outdoor or other locations where temperatures vary widely, precautions should be taken to prevent condensation inside switch or enclosure. Electrical components must be kept dry at all times. **CAUTION:** To prevent ignition of hazardous atmospheres, disconnect the device from the supply circuit before opening. Keep assembly tightly closed when in use.

Dimensions on reverse

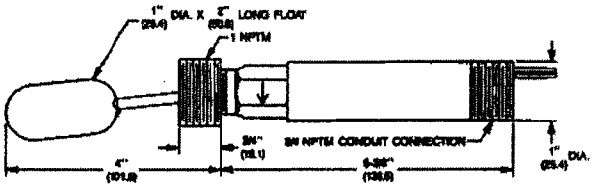
FLOTECT. MODEL L-6 FLOAT SWITCH — DIMENSION DRAWINGS



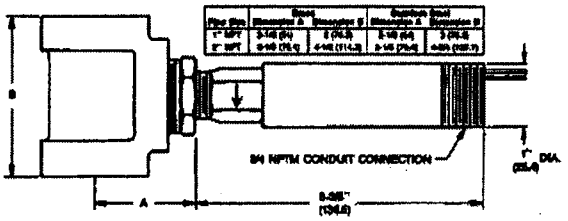
Polypropylene Float



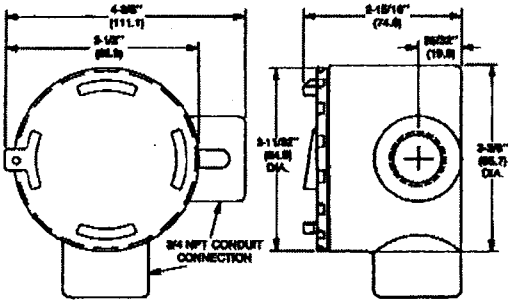
Round Stainless Steel Float



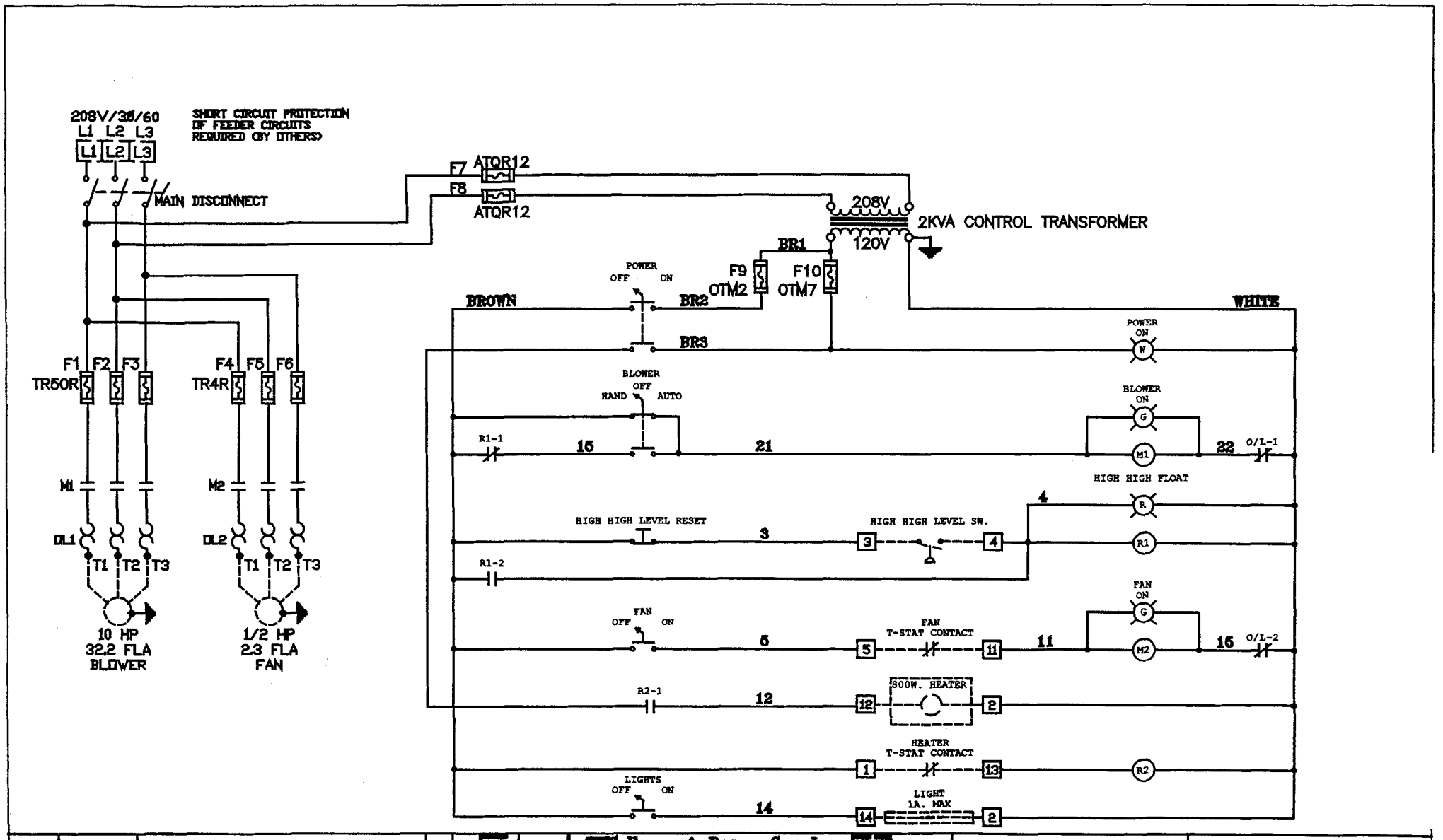
Cylindrical Stainless Steel Float



With External Float Chamber (Tee)



CSA, CENELEC Conduit Enclosure



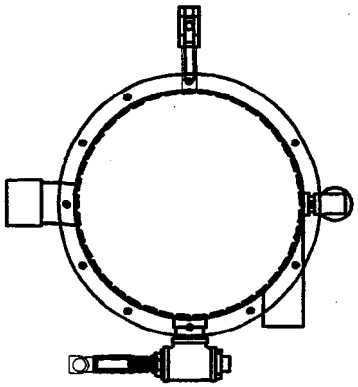
NO	DATE	REVISION	BY	APP
				AH 8/28/02
				HERNANDEZ

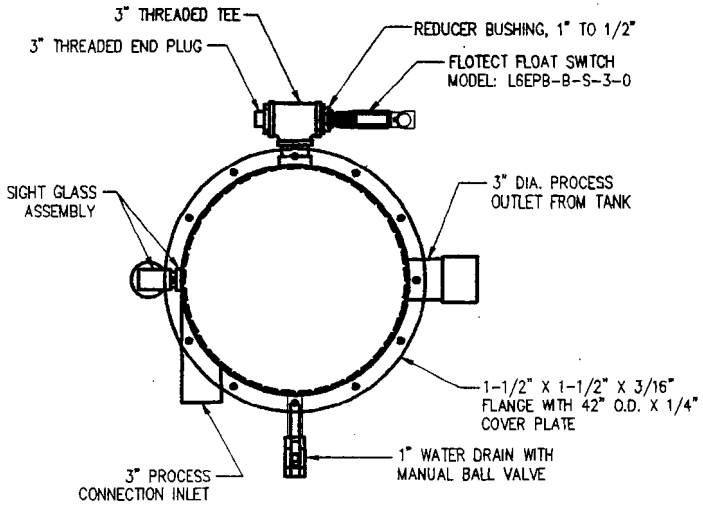
Calhoun & Poxon Co., Inc.
Electrical Equipment
[redacted]
Ph. [redacted]
Fx. [redacted]

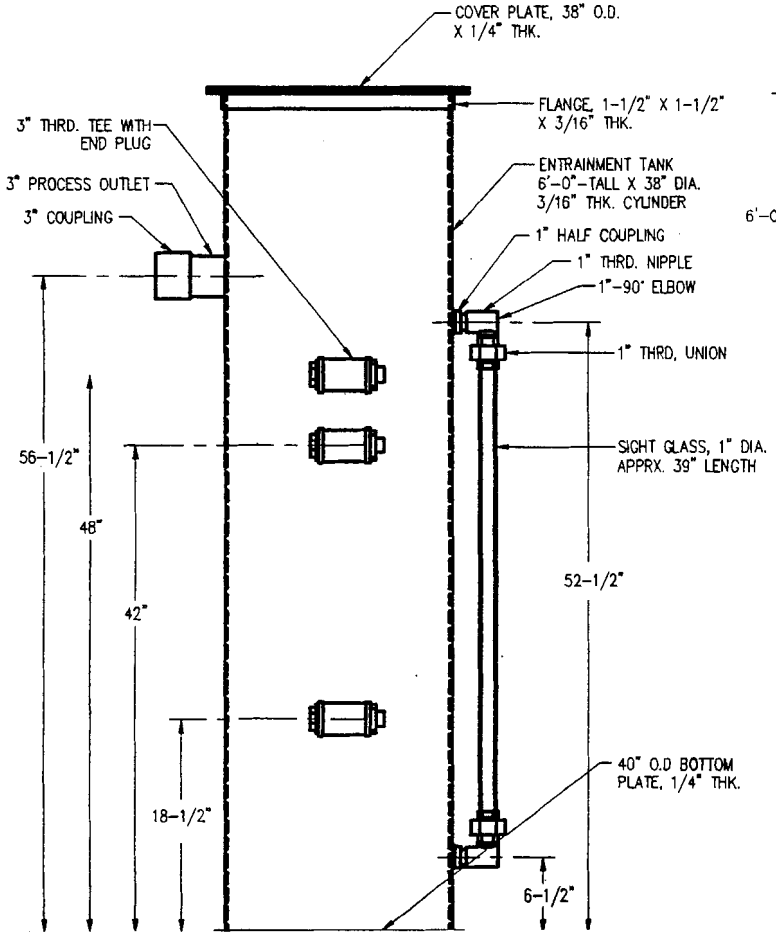
8/8/02 NTS

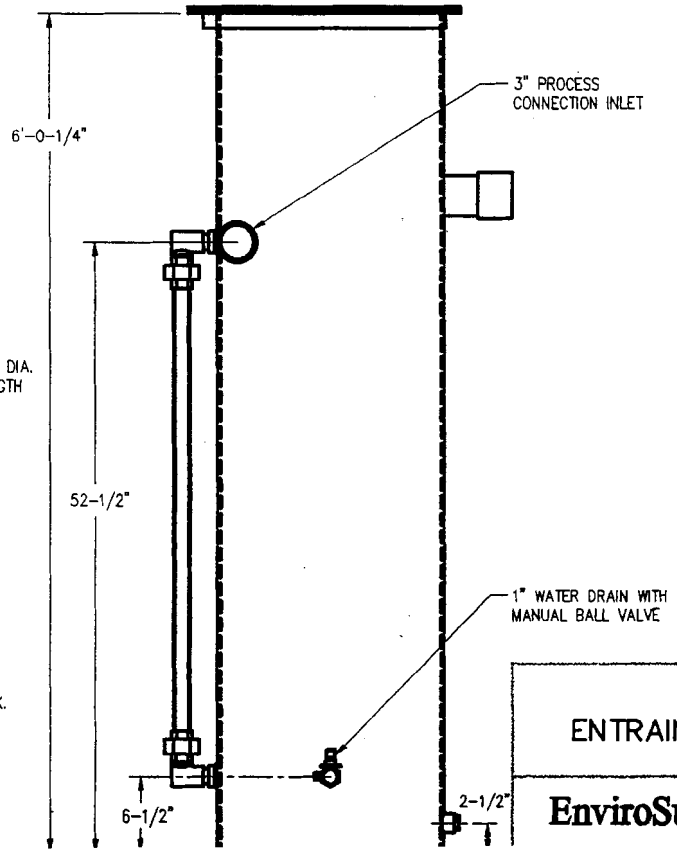
ENVIRO SUPPLY CO.
JOB # CS3-204
PROJECT

CONTROL PANEL WIRING
39579
REV. 0









NOT TO SCALE

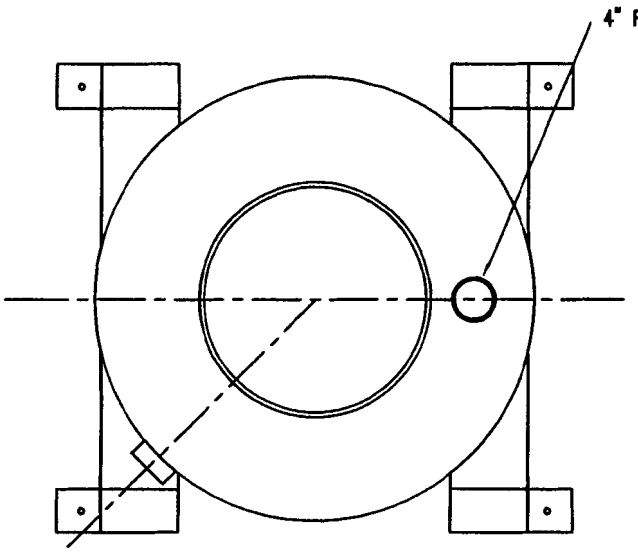
ENTRAINMNET TANK

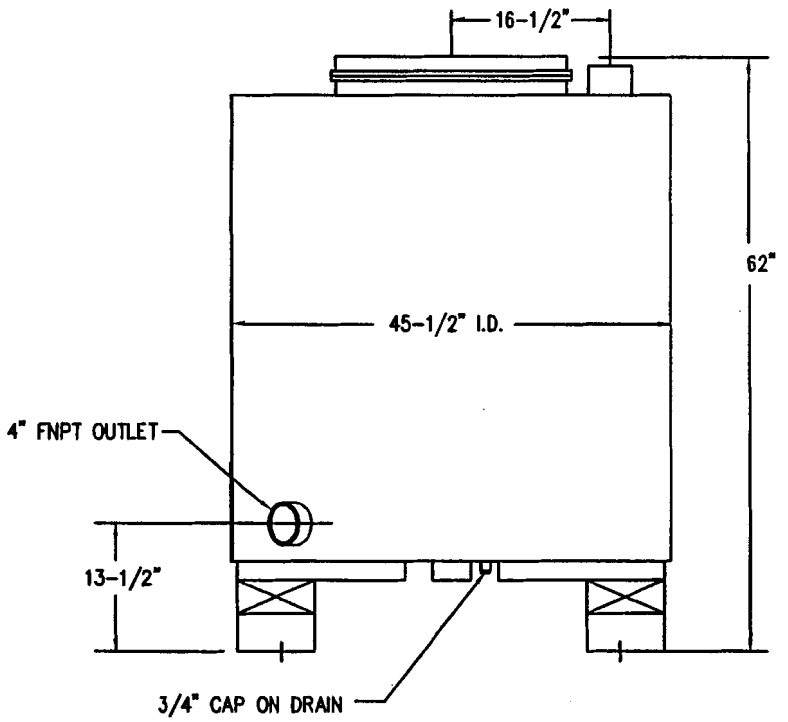
EnviroSupply & Service

DATE:

FILE: 250-GEN

PROJECT NO.:

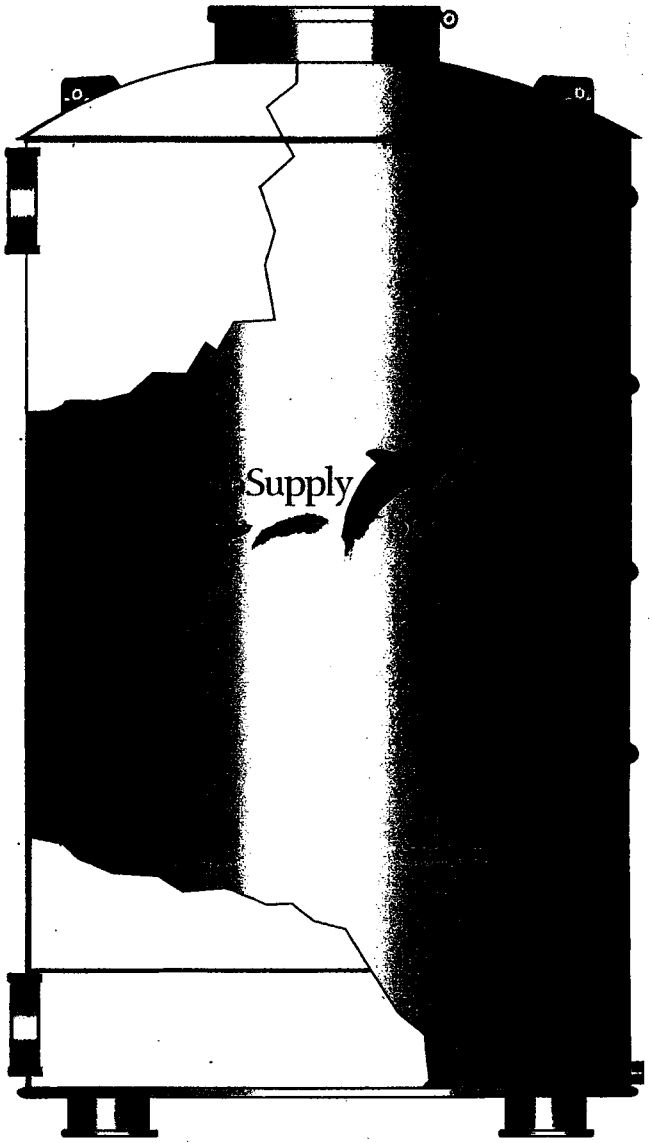




DESIGN NOTES:

1. DESIGN DATA
   45 1/2" PRESSURE VESSEL (15 PSI MAX)
   NOT ASME STAMPED
   FOR VAPOR USE ONLY
   63 CUBIC FEET ACTIVATED CARBON
   VACUUM = 6.0" HG
2. MATERIAL
   HEADS - 7 GA. CARBON STEEL
   SHELL-7 GA. CARBON STEEL
   SUPPORTS 1/4" HOT ROLLED STEEL
3. SURFACE PREPARATION
   INTERIOR COATING: BONDED EPOXY
   EXTERIOR COATING: EPOXY PRIMER
   POLYEURETHANE FINISH
4. APPROX. WEIGHT:
   EMPTY VESSEL 750 POUNDS

V-1000 VAPOR PHASE ACTIVATED CARBON FILTER GENERAL ARRANGEMENT	
EnviroSupply & Service	DATE: 3/11/03 FILE: ENVIRO-GA
	PROJECT NO.: 000



ES Series Adsorbers

EnviroSupply & Service's liquid and vapor phase activated carbon adsorbers are designed to provide an efficient and economical solution to your filtration needs. The ES V & L series are designed as a low cost, vapor adsorber that can easily be put into service. The ES series adsorbers are designed for a maximum pressure of 15 psi, a vacuum of up to 15" mercury, and are designed to hold from 500 to 2000 lbs of activated carbon.

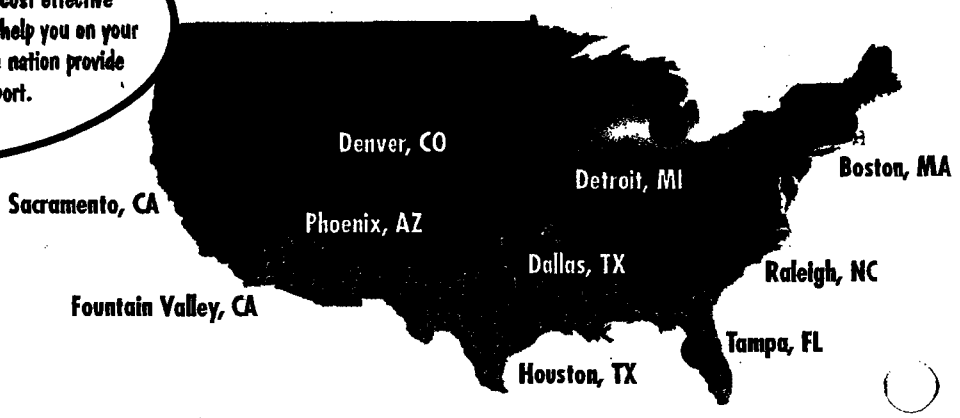
Model #	Diameter	Can Length	Inlet/ Outlet	Forklift Guides	Overall Height	Overall Width
ES V [illegible]	45	56	[illegible]	[illegible]	[illegible]	[illegible]
ES V [illegible]	45	72	6" fpt	34	87"	48"

Changeout services available!

Important Features:

- Designed for either up-flow or down-flow.
- Durable carbon steel construction.
- 3-6" threaded influent/effluent connections.
- Condensate drain plug.
- 18" man way for easy access.
- Epoxy primer and industrial topcoat exterior.
- Can be filled with any of EnviroSupply & Service's virgin or reactivated carbons.
- Shipped with carbon and ready for immediate service.
- Available for sale or rent.

With a wide variety of standard designs and the ability to "build to your specs", EnviroSupply & Service can provide you with simple and cost effective solutions to your treatment needs. Let us help you on your next project. Our 10 stores spanning the nation provide you with local service and support. Call us today!

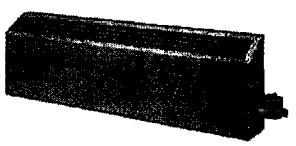


Call 1-800-201-8150 or contact your local office.

Visit us at www.envirostore.com !

For information about choosing a heater, see page 522.

Hazardous-Location Convection Heaters

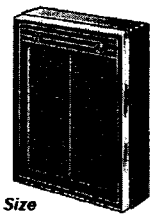


Approved for Divisions 1 and 2, Class 1, Groups B, C, and D. Heating element has a copper sheath and aluminum fins for safe and efficient operation. Cabinet is 16-ga. steel. Furnished with wall mounting bracket. Have 6" wire leads and operate on 60 Hz, 1 phase. UL listed and CSA certified.

DPST hazardous location thermostat is adjustable for local control within the hazardous location. Mounts to the wall.

Watts	BTU/Hr.	Amps	Ht.	Wd.	Dp.		Each
120 VAC Heaters							
800	2,729	6.7	18"	34"	8"	1752K43	$701.75
1,800	6,141	15	18"	34"	8"	1752K21	719.30
208 VAC Heaters							
800	2,729	3.8	18"	34"	8"	1752K45	719.30
1,800	6,141	8.7	18"	34"	8"	1752K46	719.30
3,600	12,283	17.3	18"	34"	8"	1752K47	956.14
7,600	25,932	36.5	18"	58"	8"	1752K48	1456.14
240 VAC Heaters							
800	2,729	3.3	18"	34"	8"	1752K49	719.30
1,800	6,141	7.5	18"	34"	8"	1752K22	719.30
3,600	12,283	15	18"	34"	8"	1752K24	956.14
7,600	25,932	31.7	18"	58"	8"	1752K26	1493.88
480 VAC Heaters							
3,600	12,283	7.5	18"	34"	8"	1752K25	956.14
7,600	25,932	15.8	18"	58"	8"	1752K27	1493.88
DPST Hazardous Location Thermostat						1752K34	202.38

Wall-Mount Fan-Forced Heaters



Mid Size

We offer these heaters in two different sizes to fit almost any wall opening. They can also be surface mounted using mounting frames (sold separately below). They feature built-in thermostats and overheat safety shutoff. They have 8" wire leads and are UL listed.

When operating on 208 VAC, the heat output (BTUs) and the wattage will decrease by 25%.

Watts★	BTU/Hr.	cfm	Ht.	Wd.	Dp.		Each
120 VAC							
Mid Size							
1,500	5,120	N/A	16"	13"	3¾"	1726K711	$120.77
208/240 VAC							
Mid Size							
2,000	6,826	N/A	16"	13"	3¾"	1726K721	119.61
Full Size							
3,000	10,239	N/A	19 3/16"	16"	3¾"	1726K832•	186.27
4,000	13,652	N/A	19 3/16"	16"	3¾"	1726K853	198.08
Surface Mounting Frames							
For Mid-Size Heaters						1726K611	22.84
For Full-Size Heaters						1726K619	39.22

★ Divide by voltage to convert to amps. • 4,000 watts @ 277 volts.

Ceiling-Mount Fan-Forced Heaters

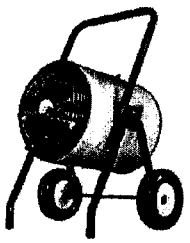
These heaters slip onto standard 2 ft. × 2 ft. grids of suspended ceilings to send heat directly below. Use the recess mounting kit (sold separately below) to mount heaters in plaster/drywall ceilings. Heaters require a mounting depth of 9⅛". Adjustable louvers direct air flow. Heaters have overheat safety shutoff and 6" wire leads. Run on 60 Hz, 1 phase. UL listed and CSA certified.

			208 VAC		*240 VAC*
Watts★	BTU/Hr.	cfm		Each	Each
3,000	10,236	425	1998K13	$647.93	1998K14 $647.93
5,000	17,060	425	1998K15	732.63	1998K16 732.63

		Each
Recess Mounting Kit	1998K22	$80.00
Wall-Mount Thermostat	1998K19	34.83

★ Divide by voltage to convert to amps.

High-Output Mobile Fan-Forced Heaters



A high-output heating element combined with a powerful fan results in superior heat coverage. Heaters pivot to direct heat where it's needed. A steel stand with 10" dia. wheels provides mobility. Include adjustable thermostat and overheat safety shutoff. Operate on 60 Hz, 3 phase. UL listed and CSA certified, except where noted.

15,000-watt heaters are 39" Ht. × 27¼" Wd. × 20¼" Dp. ***30,000-watt*** heater is 39" Ht. × 27¼" Wd. × 22" Dp.

Power cords are 25-ft. long and are furnished with ring terminals (plugs sold separately on pages 678-683).

				Heaters		*Power Cords (Without Plug)*
VAC	Watts★	BTU/Hr.	cfm		Each	Each
208	15,000	51,182	800	1714K42	$826.30	1714K93♦ $149.12
240	15,000	51,182	800	1714K12	785.08	1714K93♦ 149.12
480	15,000	51,182	800	1714K22	785.08	1714K92 66.67
480	30,000	102,364	800	1714K32	1241.18	1714K93♦ 149.12

★ Divide by voltage to convert to amps.
♦ Power cord not CSA certified.

Portable/Multi-Mount Fan-Forced Heater

NEMA 6-30 Plug

Multi-mount bracket acts as a floor stand, or use for mounting heater to the wall or ceiling. Heater features a built-in adjustable thermostat and overheat safety shutoff. Includes a 6-ft. long, 30-amp, 3-wire cord with NEMA 6-30 plug. Operates on 240 VAC, 60 Hz, 1 phase; also operates on 208 VAC (heat output is reduced 25%). UL and C-UL listed.

Watts★	BTU/Hr.	cfm	Ht.	Wd.	Dp.		Each
5,600	19,107	262	15½"	10½"	13"	3688K72	$196.26

★ Divide by voltage to convert to amps.

240V Rugged-Duty Fan-Forced Heater

NEMA 6-20 Plug

This 240 volt (60 Hz, 1 phase) heater safely generates over 2½ times the heat of a 120 volt, 1500-watt heater. It also runs on 208 volts, but heat output is reduced by 25%. Heater is heavy-gauge steel with a red baked-enamel finish. A 6-ft. long, 20-amp, 3-wire cord with NEMA 6-20 plug is included. UL listed.

Watts	BTU/Hr.	cfm	Ht.	Wd.	Dp.		Each
4,000	13,648	353	12¾"	10 5/8"	10"	1704K32	$117.65
Wall/Ceiling Mounting Bracket						1704K89	42.33

Low-Profile Fan-Forced Heaters

These slim-line heaters are designed for horizontal use and fit under counters, in soffits, and in other recessed locations. Size is 3½" Ht. × 14¼" Wd. × 8" Dp. (required opening size is 3⅝" Ht. × 14½" Wd. × 9" Dp.). They come wired for 1500 watts (can be wired for 750 watts). Run on 60 Hz, 1 phase. Come with a thermostat (SPST for 120 VAC; DPST for 240 VAC). UL listed. Offered in 120 and 208/240 VAC. When running on 208 VAC, heat output is reduced by 25%.

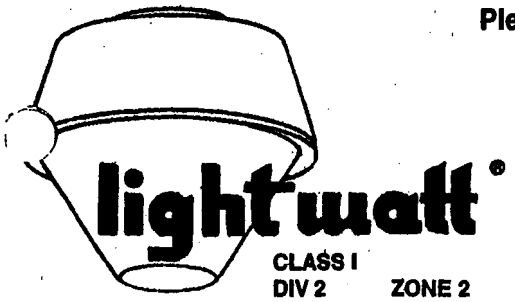
			120 VAC	*208/240 VAC*
Watts★	BTU/Hr.	cfm	Each	Each
1500/750	5118/2559	85	17045K72 $136.82	17045K82 $143.85

★ Divide by voltage to convert to amps.

Low-Voltage DC Mini Fan-Forced Heaters

Perfect for vehicles that are slow to warm or for extra heat on the coldest days. Have connections for hardwiring to the vehicle's battery and come with a multi-mount bracket for easy installation. They have a built-in adjustable thermostat, remote on/off switch, overheat safety shutoff, 30-amp wiring harness, and fuse.

VDC	Watts	BTU/Hr.	cfm	Ht.	Wd.	Dp.		Each
12	300	1100	102	8¼"	5¼"	7¾"	17075K71	$99.15
24	600	2200	102	8¼"	5¼"	7¾"	17075K81	149.85



Please Read Thoroughly Before Installing

INSTRUCTIONS FOR CLASS I DIV 2 HAZARDOUS LOCATION LIGHTWATT® LUMINAIRE LW2 SERIES

Catalog Number Series: LW2C, LW2B, LW2S
Pendant, Ceiling thru wire, Wall bracket and Stanchion mountings

Installed Location(s) and Type: _____

Lamp Code(s): _____ **Installed by:** _____ **Date:** _____

WARNINGS

- Improperly installed luminaires can cause shock, electrocution and fire hazards.
- Install, operate, and maintain to meet all applicable Codes and Ordinances.
- Disconnect power before installation or servicing.
- Selected ballast voltage must match supply voltage.
- Protect all unused lead ends with approved insulators.
- Handle and secure so luminaire cannot fall.
- All servicing should be done by qualified personnel.
- Check the operating temperature limits marked on luminaire prior to installation to be sure it conforms to environmental restrictions identified by local inspection authorities and NEC classifications.
- Ground luminaire to supply ground.
- Read and follow the lamp manufacturer's warning and use this information before installing or relamping this luminaire.
- All installations and wiring should be per National Electrical Code (NEC) and local rules and regulations.

Installing electricians are responsible for evaluating local conditions and ensuring safe operation.

RIGID PENDANT MOUNTING - LW2C FIXTURE SERIES

1. Open splice compartment on top of fixture (remove two screws).
2. Attach fixture to 3/4" threaded conduit (supplied by customer) with supply wire hanging out. Use a suitable thread lubricant to seal all threaded joints against water leakage (for wet locations).
3. Tighten setscrew located inside splice compartment to secure fixture.
4. Connect supply wires to correctly marked fixture wires corresponding to the supply voltage. Connect fixture ground wire to supply ground. Tuck all connected wires and extra wires back into splice compartment.
5. Close splice compartment (with two screws).

SURFACE THRU-WIRE MOUNTING - LW2C FIXTURE SERIES

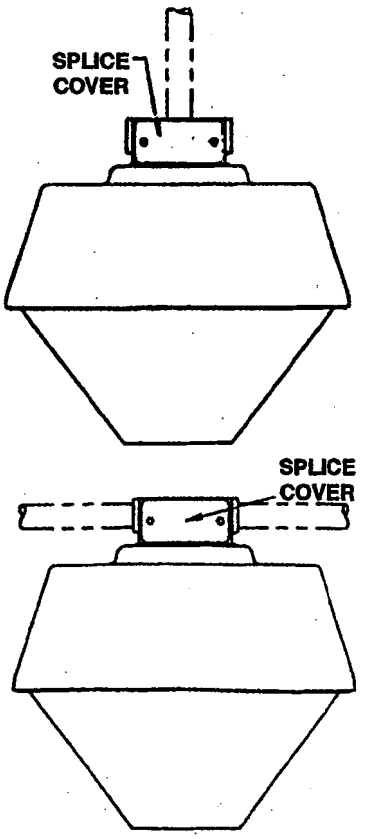
1. Remove closure plug(s) from side conduit opening(s) in top casting.
2. Close top conduit opening with a removed closure plug.
3. Open splice compartment (remove two screws).
4. Attach fixture to 3/4" threaded conduit. Use a suitable thread sealant to seal all threaded joints against water leakage (for wet locations), including top conduit opening.
5. Pull supply wires and attach them to the correctly marked fixture wires corresponding to the supply voltage. Connect fixture ground wire to supply ground. Tuck all connected wires and extra wires back into splice compartment.
6. Close splice compartment (with two screws).
7. Support fixture by conduit clamps placed within 18" of top splice casting, (NECPAR370-13).

GENERAL INFORMATION

- It is not necessary to remove the refractor bottom to install and wire the luminaire. Lamp is usually supplied installed in the luminaire.
- This luminaire is suitable for wet location applications in ambients of 40°C.
- Read the hazardous location label on the luminaire housing to find the temperature code information. Make sure this temperature code is less than the NEC classification rating for the particular installation location.
- Luminaires are not intended for use in orientations beyond that normally provided by the mounting type assembly. Operation beyond these orientations will void the temperature codes listed on the label.

GENERAL INSTALLATION INFORMATION

- Use a waterproof pipe joint compound, not included, for all wire entries and plugged entries into any mounting type assembly.
- Luminaire shipped assembled with ceiling and pendant mounting types and shipped partially assembled with wall and stanchion mountings. Assemble these before installation.
- Allow a minimum of 6" supply wire to extend outside splice cover for proper hookup.

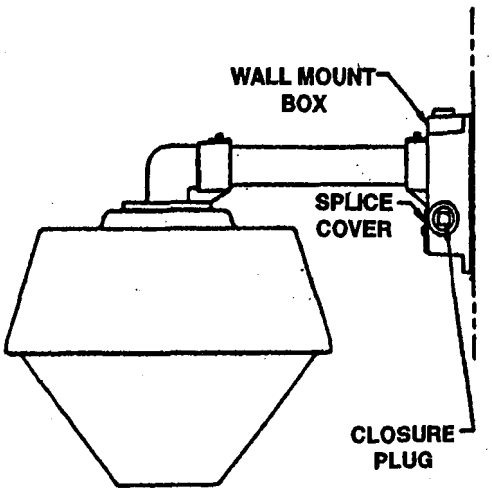


SAVE THIS INSTRUCTION SHEET FOR FUTURE USE AND REFERENCE.

HUBBELL®
Hubbell Lighting, Inc.
A Subsidiary of Hubbell Incorporated
2000 Electric Way
Christiansburg, VA 24073-2500
(540) 382-6111
FAX (540) 382-1526

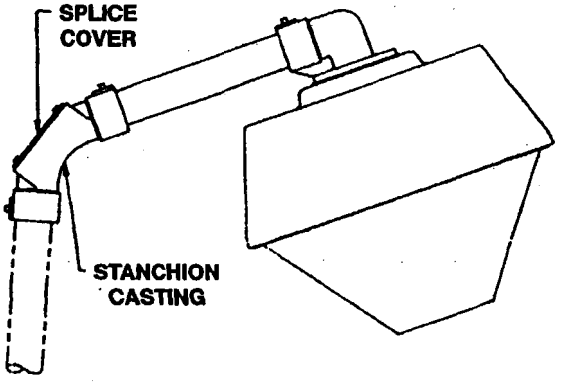
WALL BRACKET MOUNTING - LW2B FIXTURE SERIES

1. Fasten wall mounting box to mounting surface with four 1/4" diameter fasteners (supplied by customer). Wall mount box can be oriented as shown or any other orientation as convenient.
2. Remove closure plug(s) from conduit opening(s) as required, to install 3/4" threaded conduit (supplied by customer).
3. Open splice compartment cover (remove two screws).
4. Thread fixture and its 1-1/4" pipe extension to wall mount box as shown. Use a suitable thread sealant to seal all threaded joints against water leakage (for wet locations). Make sure the fixture wires extend into the wall mount box.
5. Tighten the setscrews to secure the fixture in vertical position (two screws).
6. Pull supply wires and attach them to the fixture wires. Make sure the voltage for the fixture wires agrees with the supply voltage. Connect fixture ground wire to supply ground. Tuck connected wires back into splice compartment.
7. Close splice compartment (with two screws).



STANCHION MOUNTING - LW2S FIXTURE SERIES

1. Thread stanchion mount casting and 1-1/4" pipe extension to fixture as shown. Use a suitable thread sealant to seal all threaded joints against water leakage (for wet locations). Make sure the fixture wires extend into the stanchion mount casting.
2. Open splice compartment (remove two screws).
3. Thread fixture and mounting assembly to an upright 1-1/4" threaded pipe (supplied by customer).
4. Orient fixture assembly and tighten all setscrews (three screws).
5. Pull supply wires and attach them to the fixture wires. Make sure the voltage for the fixture wires agrees with the supply voltage. Connect fixture ground wire to supply ground. Tuck all connected wires back into splice compartment.
6. Close splice compartment (with two screws).



RELAMPING FIXTURE

1. Check to make sure the HID lamp to be installed is the correct type and wattage for the fixture. Important information regarding lamp type and wattage is given on the fixture label.
2. Insert lamp into socket and hold socket while threading lamp until tight.
3. Wipe fingerprints and grime off the lamp.

MAINTENANCE AND CLEANING

1. Periodically brush the dust off of the horizontal surfaces of the ballast housing and clean the refractor and reflector with a mild, non-abrasive soap, water or glass cleaner using a clean soft cloth.
2. Maintain a group or section cleaning and relamping program to maximize the lumen output of the fixtures and optimize the cost per lumen generated.
3. CAUTION: Do not perform routine maintenance or cleaning while the fixture is energized.

TROUBLESHOOTING A NON-OPERATING FIXTURE

1. Make sure that a proper lamp is installed and that it is not old and worn out.
2. Check the line voltage at the fixture to see if it is correct and within line voltage tolerance.
3. Check to see if fixture is wired properly to the incoming power leads.
4. Check to see if the fixture is grounded properly.
5. If all the above have been checked, and the fixture does not operate properly, contact your local Hubbell representative, distributor or agent for further troubleshooting.

TOP LUMINAIRE RETAINER

1. Angled bracket on top of fixture housing can be used to attach a top luminaire retaining chain.
2. Attach chain with S-hook to bracket. Loop chain around suitable structural member for support.
3. Reduce slack in chain by looping chain several times around structural member or by positioning the retaining S-hook in a proper place on the supporting chain.
4. Close off both S-hooks with large pliers to secure safety chain attachment in place.

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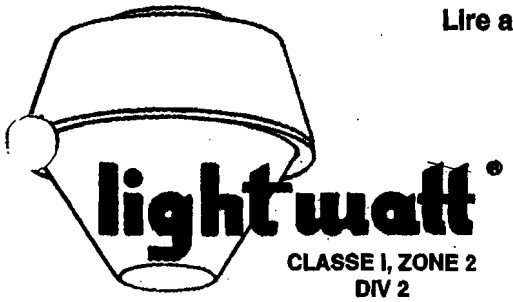


CLASSE I, ZONE 2
DIV 2

Lire attentivement avant d'effectuer le montage

NOTICE DE MONTAGE POUR LE LUMINAIRE LIGHTWATT[MD], SÉRIE LW2 DANS LES ENDROITS DANGEREUX DE LA CLASSE I, DIV. 2

Numéros de référence, série LW2C, LW2B, LW2S
Montage en pendentif, au plafond, au mur et sur potence

Emplacement et Type _____

Code d'ampoule _____ **Installé par :** _____ **Date :** _____

AVERTISSEMENT

- Les luminaires montés de façon incorrecte peuvent causer des risques de choc, d'électrocution et d'incendie.
- Installer, utiliser et entretenir en conformité avec les prescriptions des codes en vigueur.
- Mettre hors tension avant de faire le montage ou la maintenance.
- La tension de ballast choisie doit être la même que la tension d'alimentation.
- Recouvrir les extrémités de tous les conducteurs non utilisés avec des isolateurs homologués.
- Manipuler et assujettir le luminaire de façon à ce qu'il ne puisse pas tomber.
- La maintenance doit être effectuée par du personnel qualifié.
- Vérifier les limites de température indiquées sur le luminaire avant le montage pour s'assurer qu'elles sont conformes aux restrictions environnementales imposées par les autorités locales et les classifications du Code canadien de l'électricité.
- Établir la mise à la terre du luminaire à la mise à la terre du système.
- Lire et respecter les avertissements du fabricant de l'ampoule avant d'installer ce luminaire ou avant d'en changer l'ampoule.
- Le montage et le câblage doivent être conformes aux prescriptions du Code canadien de l'électricité et aux codes locaux en vigueur.
- L'électricien installateur est responsable de l'évaluation des conditions locales et d'assurer un fonctionnement sûr.

MONTAGE EN PENDENTIF RIGIDE - LUMINAIRES DE LA SÉRIE LW2C

1. Ouvrir le compartiment de connexion sur le dessus du luminaire (enlever 2 vis).
2. Fixer le luminaire sur le conduit fileté de 19 mm (fourni par le client) en laissant les câbles d'alimentation pendant. Utiliser un lubrifiant approprié pour sceller tous les joints filetés contre les infiltrations d'eau (dans les endroits mouillés).
3. Serrer les vis de blocage à l'intérieur du compartiment de connexion pour assujettir le luminaire.
4. Raccorder les câbles d'alimentation aux fils marqués du luminaire correspondant à la tension d'alimentation. Raccorder le fil de MALT du luminaire à la mise à la terre du système. Insérer tous les fils connectés et non utilisés dans le compartiment de connexion.
5. Refermer le compartiment de connexion (avec deux vis).

MONTAGE EN SURFACE, CÂBLAGE EN TRAVERSÉE - LUMINAIRES DE LA SÉRIE LW2C

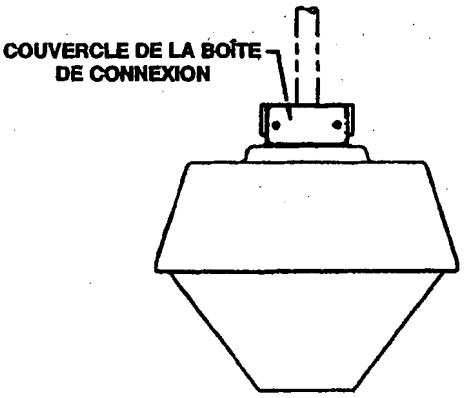
1. Enlever l'obturateur de l'ouverture de conduit sur le côté de la pièce supérieure.
2. Fermer l'ouverture de conduit du dessus avec l'obturateur enlevé précédemment.
3. Ouvrir le compartiment de connexion (enlever deux vis).
4. Fixer le luminaire sur le conduit fileté de 19 mm. Utiliser un scellant approprié pour sceller tous les joints filetés, y compris l'ouverture de conduit sur le dessus, contre les infiltrations d'eau (dans les endroits mouillés).
5. Tirer les câbles d'alimentation et les raccorder aux fils du luminaire qui correspondent à la tension d'alimentation. Connecter le fil de MALT du luminaire à la mise à la terre de l'alimentation. Insérer tous les fils connectés et non utilisés dans le compartiment de connexion.
6. Fermer le compartiment de connexion (avec deux vis).
7. Supporter le luminaire au moyen de brides de conduit placées à moins de 45 cm de la boîte de connexion.

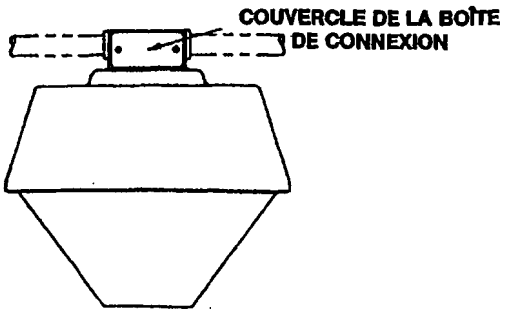
RENSEIGNEMENTS GÉNÉRAUX

- Il n'est pas nécessaire d'enlever le fond du réfracteur pour installer et câbler le luminaire. Le luminaire est normalement fourni avec l'ampoule installée.
- Ce luminaire convient aux endroits mouillés avec une température ambiante de 40ºC.
- Lire l'étiquette placée sur le boîtier du luminaire concernant les endroits dangereux pour trouver le code de température. S'assurer que ce code de température est inférieur à la classification du Code canadien de l'électricité pour l'endroit du montage.
- L'orientation du luminaire n'est pas prévue au-delà des limites normalement permises par le dispositif de fixation. Une orientation au-delà de ces limites annulera le code de température indiqué sur l'étiquette.

DIRECTIVES GÉNÉRALES DE MONTAGE

- Utiliser une pâte de scellement imperméable pour tuyau, non fournie, pour toutes les entrées de câble et les prises d'entrée dans tout type de système de fixation.
- Le luminaire est livré avec les accessoires de suspension au plafond et en pendentif tout assemblés. Il est livré avec les accessoires de fixation au mur et sur poteau partiellement assemblés. Compléter l'assemblage avant le montage.
- Allouer un minimum de 15 cm de câble d'alimentation à l'extérieur de la boîte de connexion pour permettre le raccordement approprié.





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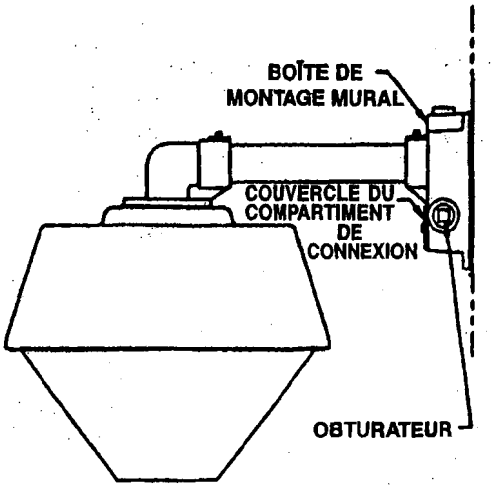
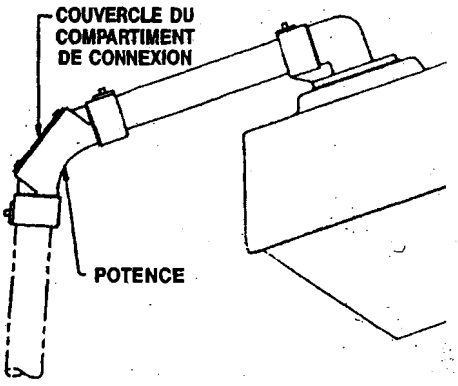
MONTAGE SUR BOÎTE MURALE - LUMINAIRE SÉRIE LW2B

1. Fixer la boîte murale sur la surface avec quatre attaches de 6 mm de diamètre (fournies par le client). La boîte murale peut être orientée tel qu'illustré ou autrement selon les besoins.
2. Enlever les obturateurs de l'ouverture de conduit selon les besoins et installer une conduit de 19 mm (fourni par le client).
3. Ouvrir le compartiment de connexion (enlever deux vis).
4. Visser le luminaire et son tuyau de 32 mm à la boîte murale. Utiliser un scellant approprié pour sceller tous les joints filetés, y compris l'ouverture de conduit sur le dessus, contre les infiltrations d'eau (dans les endroits mouillés). S'assurer que les câbles du luminaire soient tirés dans la boîte.
5. Serrer les vis de blocage pour fixer le luminaire dans la position verticale.
6. Tirer les câbles d'alimentation et les connecter aux câbles du luminaire. S'assurer que la tension du luminaire correspond à la tension d'alimentation. Connecter le fil de MALT du luminaire à la mise à la terre de l'alimentation. Insérer tous les fils connectés dans le compartiment de connexion.
7. Refermer le compartiment de connexion (avec deux vis).



MONTAGE SUR POTENCE - LUMINAIRE SÉRIE LW2S

1. Visser la potence et le tuyau prolongateur de 32 mm dans le luminaire tel qu'illustré. Utiliser un scellant approprié pour sceller tous les joints filetés contre les infiltrations d'eau (dans les endroits mouillés). S'assurer que les fils du luminaire sont tirés jusqu'au compartiment de connexion.
2. Ouvrir le compartiment de connexion (enlever deux vis).
3. Visser le luminaire et l'ensemble de fixation sur un tuyau vertical fileté de 32 mm (fourni par le client).
4. Orienter le luminaire et serrer toutes les vis de blocage (trois vis).
5. Tirer les câbles d'alimentation et les connecter aux câbles du luminaire. S'assurer que la tension du luminaire correspond à la tension d'alimentation. Connecter le fil de MALT du luminaire à la mise à la terre de l'alimentation. Insérer tous les fils connectés dans le compartiment de connexion.
6. Refermer le compartiment de connexion (avec deux vis).



REMPLACEMENT DE L'AMPOULE

1. S'assurer que la tension et la puissance de l'ampoule DHI de remplacement conviennent au luminaire. Des renseignements importants concernant le type et la puissance de l'ampoule sont donnés sur l'étiquette.
2. Insérer l'ampoule dans la douille. Tenir la douille en vissant l'ampoule solidement.
3. Enlever les empreintes de doigts et la saleté de l'ampoule.

MAINTENANCE ET NETTOYAGE

1. Brosser et épousseter régulièrement les surfaces horizontales du compartiment du ballast et nettoyer le réflecteur et le réfracteur avec un savon doux non abrasif, de l'eau ou un nettoyant pour verre, avec un chiffon doux.
2. Établir un programme de maintenance et de remplacement d'ampoule par groupe ou par section afin de maximiser la luminosité des luminaires et optimiser le coût par lumen produit.
3. ATTENTION - Ne pas effectuer de maintenance de routine ou de nettoyage alors que le luminaire est sous tension.

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RECHERCHE DE PANNE SUR UN LUMINAIRE QUI NE FONCTIONNE PAS

1. S'assurer que l'ampoule installée est celle qui convient et qu'elle n'est pas vieille ni usée.
2. Vérifier la tension d'alimentation au luminaire pour s'assurer qu'elle est la bonne et en deçà des tolérances.
3. Vérifier que les raccordements aux câbles d'alimentation sont corrects.
4. S'assurer que le luminaire est bien mis à la terre.
5. Si tout ce qui précède a été vérifié et que le luminaire ne fonctionne pas correctement, communiquer avec le représentant local, le distributeur ou l'agent de Hubbell pour une intervention plus élaborée.

RETENUE DU LUMINAIRE

1. La bride coudée sur le dessus du boîtier du luminaire peut être utilisée pour y fixer une chaîne de retenue.
2. Attacher la chaîne à la bride au moyen d'un crochet en «S». Enrouler la chaîne autour d'une poutre de la structure pour établir le support.
3. Tendre la chaîne en l'enroulant plusieurs fois autour de la poutre ou en plaçant le crochet en «S» dans un maillon qui convient.
4. Refermer le crochet en «S» avec des pinces pour retenir la chaîne en place.

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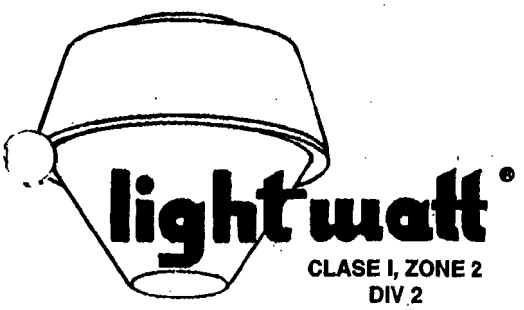


Leer atentamente antes de instalar

INSTRUCCIONES PARA LA LUMINARIA LIGHTWATT[MR] SERIE LW2 EN SITIOS PELIGROSOS DE CLASE I DIV 2,

Números de catálogo series LW2C, LW2B, LW2S
Para fijación colgante, en el cielorraso con cable pasante, en brazo mural y en poste

Lugar(es) y tipo de instalación: _____

Código(s) de lámparas: _____ Instalado por: _____ Fecha : _____

ADVERTENCIA

- Las luminarias que no estén instaladas correctamente pueden provocar choques, electrocución y riesgos de incendio.
- Instalar, hacer funcionar y mantener de conformidad con todos los códigos y reglamentos aplicables.
- Desconectar la energía antes de instalar o reparar.
- La tensión de reactancia elegida debe corresponder a la tensión de alimentación.
- Proteger todos los extremos de cable no utilizados con aislantes aprobados.
- Manipular y fijar de modo que la luminaria no pueda caerse.
- Todo servicio de mantenimiento debería estar a cargo de personal competente.
- Verificar los límites de temperatura de funcionamiento marcados en la luminaria antes de instalarla, para asegurarse de que se ajusta a las limitaciones ambientales determinadas por las autoridades locales de inspección y las clasificaciones de la Norma oficial mexicana.
- Conectar a tierra la luminaria mediante el cable de tierra de la alimentación.
- Leer y respetar los avisos del fabricante de las lámparas y utilizar esa información antes de instalar o cambiar las lámparas de esta luminaria.
- Todas las instalaciones y cableados deberían ajustarse a la Norma oficial mexicana y a los reglamentos locales.
- Los electricistas instaladores son responsables de evaluar las condiciones locales y garantizar un funcionamiento seguro.

FIJACIÓN COLGANTE RÍGIDA – SERIE DE ARTEFACTOS LW2C

1. Abrir el compartimiento de empalme en la parte superior del artefacto (quitar dos tornillos).
2. Unir el artefacto al conducto roscado de 19 mm (provisto por el cliente), de modo que los cables de alimentación queden colgando afuera. Usar un lubricante de rosca apropiado para sellar todas las juntas roscadas contra las filtraciones de agua (en sitios mojados).
3. Ajustar el tornillo de apriete situado dentro del compartimiento de empalme para fijar el artefacto.
4. Conectar los cables de alimentación con los cables del artefacto correctamente marcados correspondientes a la tensión de alimentación. Conectar el cable de tierra del artefacto al cable de tierra de la alimentación. Volver a pasar todos los cables conectados y excedentes dentro del compartimiento de empalme.
5. Cerrar el compartimiento de empalme (con dos tornillos).

FIJACIÓN EN CABLE PASANTE DE SUPERFICIE - SERIE DE ARTEFACTOS LW2C

1. Quitar el (los) tapón(es) de la(s) abertura(s) lateral(es) para conducto en la pieza fundida superior.
2. Cerrar la abertura superior para conducto con uno de los tapones retirados.
3. Abrir el compartimiento de empalme (quitar dos tornillos).
4. Unir el artefacto a un conducto roscado de 19 mm. Usar un sellador de rosca apropiado para sellar todas las juntas roscadas contra las filtraciones de agua (en sitios mojados), incluso la abertura superior del conducto.
5. Jalar todos los cables de alimentación y unirlos a los cables del artefacto correctamente marcados correspondientes a la tensión de alimentación. Conectar el cable de tierra del artefacto al cable de tierra de la alimentación. Volver a pasar todos los cables conectados y excedentes dentro del compartimiento de empalme.
6. Cerrar el compartimiento de empalme (con dos tornillos).
7. Sostener el artefacto mediante grapas de conducto colocadas a menos de 45 cm de la pieza fundida de empalme superior (Norma oficial mexicana, 370-13).

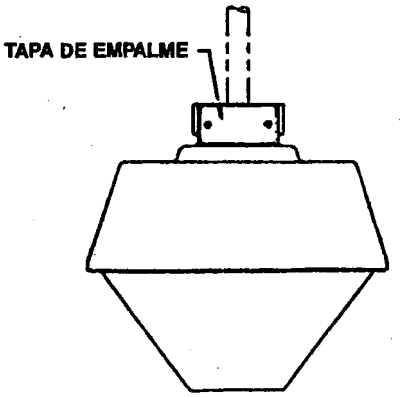
CONSERVAR ESTA PÁGINA DE INSTRUCCIONES PARA USO Y REFOREN CIA FUTUROS

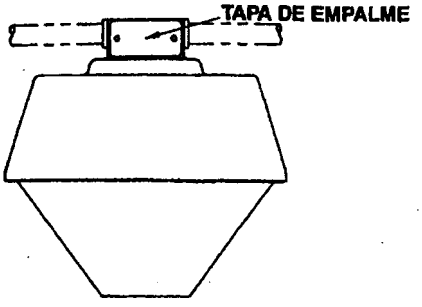
INFORMACIÓN GENERAL:

- No es necesario retirar la base del refractor para instalar y cablear la luminaria. Generalmente la lámpara se provee instalada en la luminaria.
- Esta luminaria es apropiada para aplicaciones en lugares mojados, en ambientes de 40°C.
- Leer la etiqueta sobre lugares peligrosos en la caja de la luminaria, donde se encontrará información acerca de la clave de temperaturas. Asegurarse de que esa clave de temperaturas sea inferior a la clasificación nominal de la Norma oficial mexicana para ese sitio de instalación en particular.
- Las luminarias no están destinadas a usarse en orientaciones que excedan la provista normalmente por el tipo de montaje. El funcionamiento al margen de esas orientaciones anulará las claves de temperaturas enumeradas en la etiqueta.

INFORMACIÓN GENERAL SOBRE LA INSTALACIÓN:

- Aplicar un compuesto sellador impermeable para cañerías (no incluido) en todas las entradas de cables y enchufes, para cualquier tipo de fijación.
- Las luminarias se entregan montadas para los tipos de fijación al techo y colgante, y parcialmente montadas para la fijación a la pared y en poste. Montar estas últimas antes de la instalación.
- Dejar que el cable de alimentación sobresalga 15 cm, como mínimo, fuera de la tapa de empalme, para acoplarlo debidamente.





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FIJACIÓN CON BRAZO MURAL – SERIE DE ARTEFACTOS LW2B

1. Montar la caja de fijación mural sobre la superficie de fijación con cuatro tornillos de retén de 6 mm de diámetro (provistos por el cliente). La caja de fijación mural puede orientarse como se muestra en el diagrama o en cualquier otra orientación que se estime conveniente.
2. Quitar el (los) tapón(es) de la(s) abertura(s) para conducto según sea necesario, para instalar un conducto roscado de 19 mm (provisto por el cliente).
3. Abrir la tapa del compartimiento de empalme (quitar dos tornillos).
4. Enroscar el artefacto y su prolongación de caño de 32 mm en la caja de fijación mural, como se muestra en el diagrama. Usar un sellador de rosca apropiado para sellar todas las juntas roscadas contra las filtraciones de agua (en sitios mojados). Asegurarse de que los cables del artefacto entren en la caja de fijación mural.
5. Ajustar los tornillos de apriete para colocar firmemente el artefacto en posición vertical (dos tornillos).
6. Jalar los cables de alimentación y conectarlos a los cables del artefacto. Asegurarse de que la tensión para los cables del artefacto corresponda a la tensión de alimentación. Conectar el cable de tierra del artefacto al cable de tierra de la alimentación. Volver a pasar todos los cables conectados dentro del compartimiento de empalme.
7. Cerrar el compartimiento de empalme (con dos tornillos).

FIJACIÓN SOBRE POSTE – SERIE DE ARTEFACTOS LW2S

1. Enroscar la pieza fundida para fijación en poste y la prolongación de caño de 32 mm al artefacto, como se muestra en el diagrama. Usar un sellador de rosca apropiado para sellar todas las juntas roscadas contra las filtraciones de agua (en sitios mojados). Asegurarse de que los cables del artefacto entren a la pieza fundida para fijación en poste.
2. Abrir la tapa del compartimiento de empalme (quitar dos tornillos).
3. Enroscar el artefacto y el conjunto de fijación a un caño vertical con rosca de 32 mm (provisto por el cliente).
4. Orientar el conjunto del artefacto y ajustar todos los tornillos de apriete (tres tornillos).
5. Jalar los cables de alimentación y conectarlos a los cables del artefacto. Asegurarse de que la tensión de los cables del artefacto corresponda a la tensión de alimentación. Conectar el cable de tierra del artefacto al cable de tierra de la alimentación. Volver a pasar todos los cables conectados dentro del compartimiento de empalme.
6. Cerrar el compartimiento de empalme (con dos tornillos).

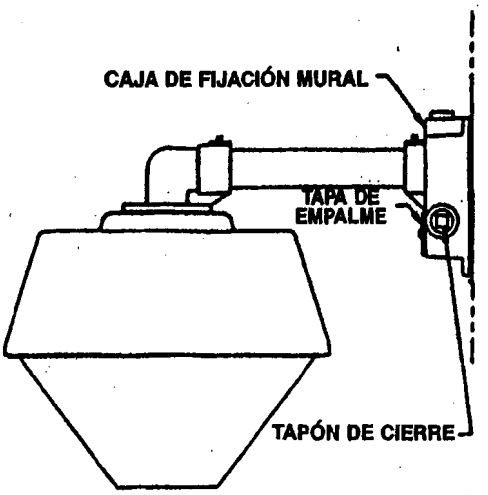
PARA CAMBIAR LA LÁMPARA DEL ARTEFACTO

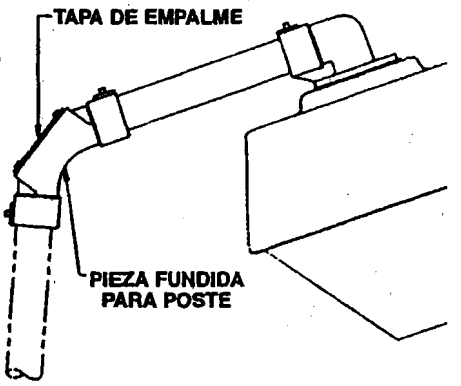
1. Asegurarse de que la lámpara HID que se va a instalar es del tipo y potencia apropiados para el artefacto. En la etiqueta del artefacto se ofrece información importante sobre el tipo y potencia de la lámpara.
2. Insertar la lámpara en el portalámparas y sujetarlo mientras se enrosca la lámpara hasta que quede firme.
3. Limpiar las huellas digitales y la suciedad de la lámpara.

MANTENIMIENTO Y LIMPIEZA

1. Quitar periódicamente el polvo acumulado en las superficies horizontales de la caja de reactancia y limpiar el refractor y el reflector con un detergente suave no abrasivo, agua o limpiavidrios, empleando un paño limpio.
2. Mantener un programa de limpieza y cambio de lámparas por grupo o sección, para maximizar el rendimiento lumínico de los artefactos y optimizar el costo por lumen generado.
3. CUIDADO: No proceder al mantenimiento o limpieza de rutina mientras el artefacto esté energizado.

CONSERVAR ESTA PÁGINA DE INSTRUCCIONES PARA USO Y REFERENCIA FUTUROS





PARA REPARAR DESPERFECTOS EN UN ARTEFACTO QUE NO FUNCIONE

1. Asegurarse de que la lámpara instalada es apropiada y de que no es antigua ni está gastada.
2. Verificar la tensión de línea en el artefacto, para comprobar si es correcta y está dentro de la tolerancia de la tensión de línea.
3. Verificar si el artefacto está correctamente cableado a los conductores de entrada de energía.
4. Verificar si el artefacto está debidamente conectado a tierra. Una vez comprobado todo lo anterior, si el artefacto no funciona correctamente, comunicarse con el representante, distribuidor o agente de Hubbell para obtener solución al problema.

SUJECIÓN DE LA LUMINARIA EN LA PARTE SUPERIOR

1. El eslabón fijo sobre la caja del artefacto permite enganchar una cadena para sujetar la luminaria.
2. Enganchar la cadena en el eslabón con un gancho en S. Enlazar la cadena alrededor de un elemento estructural, para asegurar el sostén.
3. Si la cadena queda floja, ajustarla enrollándola varias veces en torno al elemento estructural o colocando el gancho en S que la sujeta en una posición apropiada sobre la cadena.
4. Cerrar los extremos del gancho en S con tenazas grandes para que la cadena de seguridad quede firme en su sitio.

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COOK

Propeller Wall

Propeller Wall Fans

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

This publication contains the installation, operation and maintenance procedures for standard units of the *Propeller Wall and X.Stream- Propeller Wall Fans.*

- **APD**
- **SPB**
- **EWBSM**
- **SWDS**
- **XLW/XMW/XLWS/XMWS**
- **XLP/XMP/XLPS/XMPS**
- **XLWHS/XMWHS**
- **XLWH/XMWH**
- **XLPH/XMPH**
- **APB**
- **AWBS/AWBE**
- **SPD**
- **EWB**
- **EWD**
- **EPB**
- **EPD**
- **SWD**
- **XLPHS/XMPHS**

Carefully read this publication prior to any installation or maintenance procedure.

Loren Cook catalog, *Propeller Wall* and *X.Stream*, provides additional information describing the equipment, fan performance, available accessories and specification data.

For additional safety information, refer to AMCA publication 410-96, *Safety Practices for Users and Installers of Industrial and Commercial Fans.*

All of the publications listed above can be obtained from Loren Cook Company by phoning 417/869-6474, extension 166; by FAX at 417/832-9431; or by e-mail at info@lorencook.com.

For information and instructions on special equipment, contact Loren Cook Company at 417/869-6474.

Receiving and Inspection

Carefully inspect the fan and accessories for any damage and shortage immediately upon receipt of the fan.

- Turn the propeller by hand to ensure it turns freely and does not bind.
- Record on the *Delivery Receipt* any visible sign of damage.

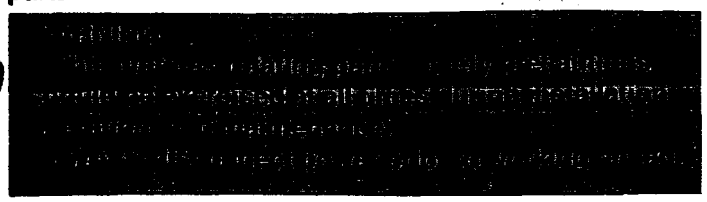
Handling

Lift propeller wall fans by attachment to the power assembly or by the shipping carton. Never lift by the shaft, motor or housing.

Storage

If the fan is stored for any length of time prior to installation, coat the shaft with grease or a rust preventative compound. Store it in its original shipping crate and protect it from dust, debris and the weather.

Rotate the wheel several revolutions every three to five days to keep a coating of grease on all internal bearing parts.



Installation

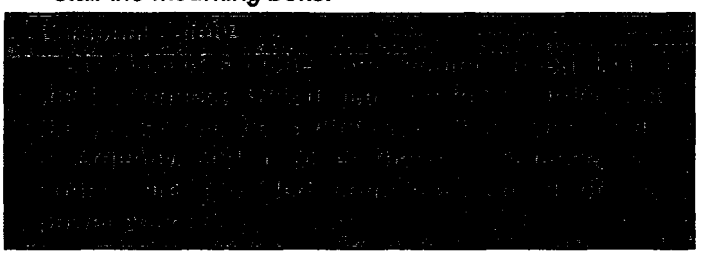
Fans mounted to a wall require a different wall opening size than fans mounted in wall collars or wall housings. For specific dimensions, refer to the submittal drawing for the specific fan type.

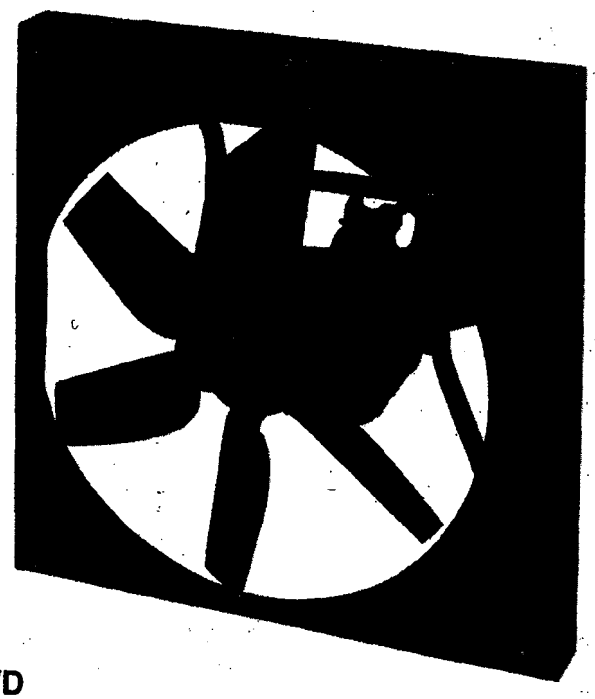
Motor Installation

To prevent damage to the fan during shipping, motors 5 HP and larger, and extremely heavy motors (cast iron or severe duty) are shipped loose and must be field mounted by bolting the motor on the motor mounting plate in the existing slots.

The motor should be mounted in order that the motor plate is between the fan shaft and the motor shaft.

a. Remove the motor plate mounting bolts and motor plate.
b. Remove the motor mounting bolts from the motor plate.
c. Mount the motor to the motor plate aligning the appropriate holes.
d. Place the motor plate on the power assembly and reinstall the mounting bolts.





AWD

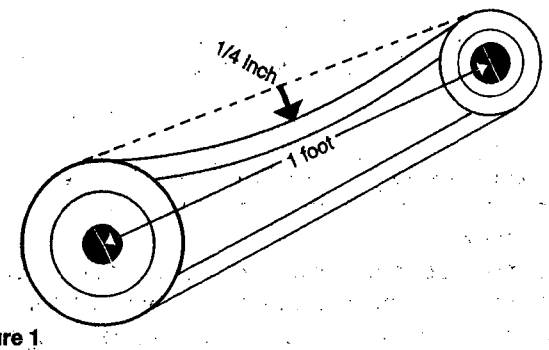


Figure 1

Belt and Pulley Installation

Belt tension is determined by the sound of the belts when the fan is first started. The belts will produce a loud squeal, which dissipates after the fan is operating at full capacity. If belt tension is too tight or too loose, lost efficiency and damage can occur.

Do not change the pulley pitch diameter to change tension. The change will result in a different fan speed.

a. Loosen the motor plate adjustment nuts on motor base and move motor plate in order that the belts can easily slip into the grooves on the pulleys. Never pry, roll, or force the belts over the rim of the pulley.
b. Adjust the motor plate until proper tension is reached. For proper tension, a deflection of approximately 1/4" per foot of center distance should be obtained by firmly pressing the belt. Refer to *Figure 1.*
c. Lock the motor plate adjustment nuts in place.
d. Ensure pulleys are properly aligned. Refer to *Figure 2.*

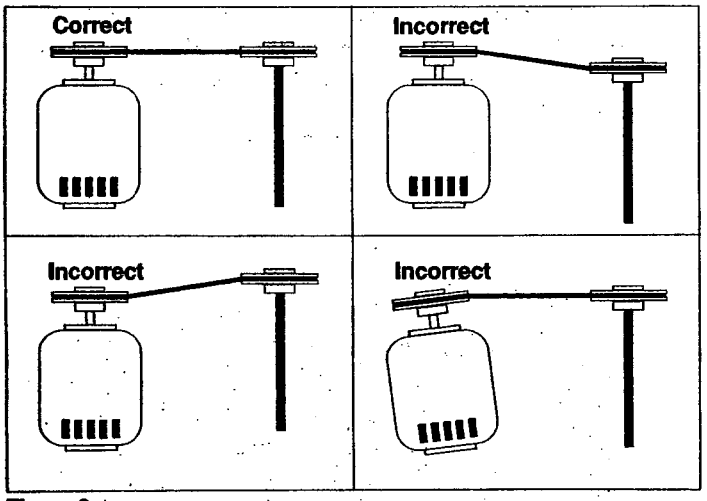


Figure 2

Pulley Alignment

Pulley alignment is adjusted by loosening the motor pulley setscrew and by moving the motor pulley on the motor shaft or by moving the entire motor along the motor mounting bracket.

Figure 2 illustrates correct and incorrect pulley alignment. A recommended method of inspecting the pulley alignment is shown in Figure 3. With the shorter leg of a carpenter's square or other straight edge lying along the case of the motor, adjust the position of the motor pulley (or the motor) until the longer leg of the square is parallel to the belt.

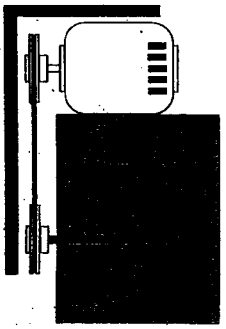


Figure 3

Fan Installation

Insert the fan into the wall opening and secure with lag screws, anchor bolts, or other suitable fasteners.

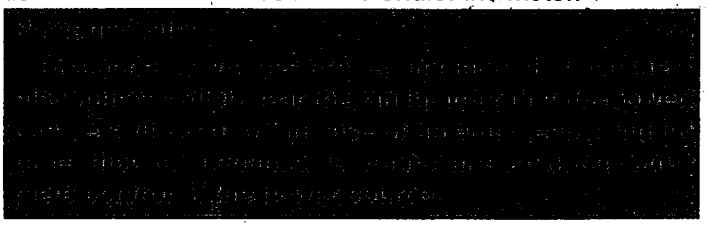
Always mount belt drive wall fans in order that the motor base is below the fan shaft.

Wiring Installation

All wiring should be in accordance with local ordinances and the National Electrical Code, NFPA 70. Ensure the power supply (voltage, frequency, and current carrying capacity of wires) is in accordance with the motor nameplate. Refer to the *Wiring Diagrams*, next page.

Lock off all power sources before unit is wired to power source.

Leave enough slack in the wiring to allow for motor movement when adjusting belt tension. Some fractional motors have to be removed in order to make the connection with the terminal box at the end of the motor.



Follow the wiring diagram in the disconnect switch and the wiring diagram provided with the motor. Correctly label the circuit on the main power box and always identify a closed switch to promote safety (i.e., red tape over a closed switch).

Wall Fans

a. Extend wires to the fan.
b. Prevent excess wire from entering the shaft and propeller area by restraining the excess wire to a point outside the base.

Wall Fans with Wire Guard

a. Remove end panel from the wire guard to gain access to the motor.
b. Extend wires through a side panel of the wire guard to gain access to the motor.
c. Prevent excess wire from entering the shaft and propeller area by restraining the excess wire to a point outside the base.

Wall Fans with Wall Housing

a. Remove end guard from the wall housing.
b. Drill a hole through either side panel at a convenient location and pull the wires through. Do not pull wires through wire guard at the back panel.
c. Restrain the incoming wire at the side panel to prevent excess wire from entering the shaft and propeller area.

Shutter Installation

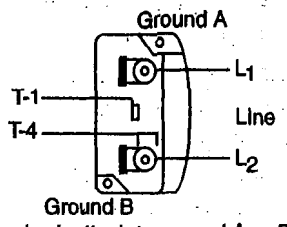
If your fan is supplied with a shutter, follow the direction below. If your fan is not supplied with a shutter, proceed to *Final Installation Steps.*

To ensure long-life, make a weather-proof seal by using a good quality silicon caulking under the shutter flange.

a. Place the shutter into the wall opening.

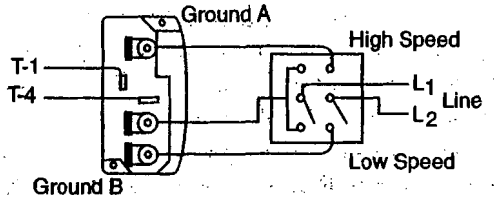
Wiring Diagrams

Single Speed, Single Phase Motor



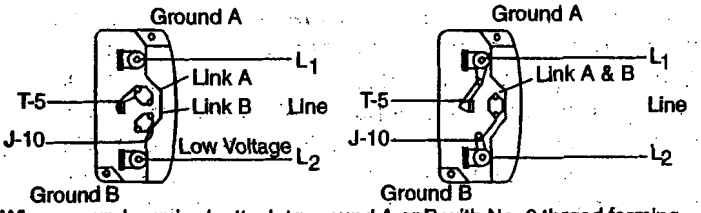
When ground is required, attach to ground A or B with no. 6 thread forming screw. To reverse, interchange T-1 and T-4.

2 Speed, 2 Winding, Single Phase Motor



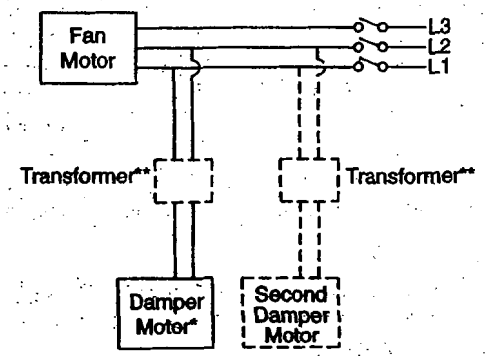
When ground required, attach to ground A or B with No. 6 thread forming screw. To reverse, interchange T-1 and T-4 leads.

Single Speed, Single Phase, Dual Voltage



When ground required, attach to ground A or B with No. 6 thread forming screw. To reverse, interchange T-5 and J-10 leads.

Typical Damper Motor Schematic



b. Mount the shutter to the supporting surface using Number 12 sheet metal screws on six inch centers around the perimeter.

c. Manually operate the shutter to ensure the blades move freely.

Typical Installation

Refer to page 5.

Final Installation Steps

a. Inspect fasteners and setscrews, particularly fan mounting and bearing fasteners, and tighten according to the recommended torque shown in the table on page 4, *Recommended Torque for Setscrews/Bolts.*

b. Inspect for correct voltage with voltmeter.

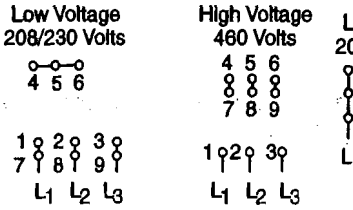
c. Ensure all accessories are installed.

d. Test the fan to be sure the rotation is the same as indicated by the arrow marked **Rotation.**

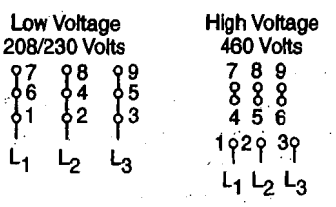
Wiring Diagrams

3 Phase, 9 Lead Motor

3 Phase, 9 Lead Motor Y-Connection

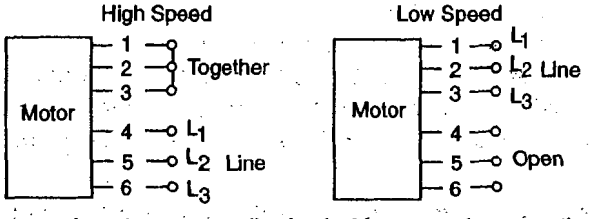


3 Phase, 9 Lead Motor Delta-Connection



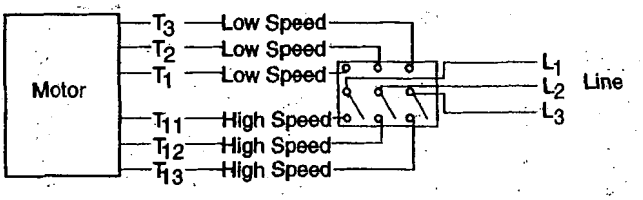
To reverse, interchange any 2 line leads.

2 Speed, 1 Winding, 3 Phase Motor



To reverse, interchange any 2 line leads. Motors require magnetic con-

2 Speed, 2 Winding, 3 Phase



To reverse: High Speed-Interchange leads T_{11} and T_{12}.
Low Speed-Interchange leads T_1 and T_2. Both Speeds-Interchange any 2 line leads.

For 3 phase, damper motor voltage should be the same between L_1 and L_2. For single phase application, disregard L_3. *Damper motors may be available in 115, 230 and 460 volt models. The damper motor nameplate voltage should be verified prior to connection. **A transformer may be provided in some installations to correct the damper motor voltage to the specified voltage.

Do not allow the fan to run in the wrong direction. This will overheat the motor and cause serious damage. For 3-phase motors, if the fan is running in the wrong direction, check the control switch. It is possible to interchange two leads at this location so that the fan is operating in the correct direction.

Operation

Pre-Start Checks

a. Lock out all the primary and secondary power sources.

b. Inspect fasteners and setscrews, particularly those used for mounting the unit, and tighten if necessary.

c. Inspect belt tension and pulley alignment. (Remember, if belt tension is correct, a loud squeal occurs as the fan increases to full power.)

d. Inspect motor wiring.

e. Ensure the belt touches only the pulleys.

f. Rotate the prop to ensure it does not rub against the venturi.

g. Ensure fan and ductwork are clean and free of debris.
h. Test the fan to ensure the rotation of the propeller is the same as indicated by the rotation label.
i. Close and secure all access doors.
j. Restore power to unit.

Start Up

Turn the fan on. In variable speed units, set the fan to its lowest speed. Inspect for the following:

- Direction of rotation.
- Excessive vibration.
- Unusual noise.
- Bearing noise.
- Improper belt alignment or tension (listen for a continuous squealing noise).
- Improper motor amperage or voltage.

If a problem is discovered, immediately shut off the fan. Lock out all electrical power and check for the cause of the trouble. Refer to *Troubleshooting*, page 7.

Recommended Torque for Setscrews/Bolts (IN/LB.)

Setscrews				Hold Down Bolts	
Size	Key Hex Across Flats	Recommended Torque Inch-lbs.			
		Min.	Max.	Size	Wrench Torque (Inch-lbs)
No.10	3/32"	28	33	3/8"-16	240
1/4"	1/8"	66	80	1/2"-13	600
5/16"	5/32"	126	156	5/8"-11	1200
3/8"	3/16"	228	275	3/4"-10	2100
7/16"	7/32"	348	384	7/8"-9	2040
1/2"	1/4"	504	600	1"-8	3000
5/8"	5/16"	1104	1200	1-1/8"-7	4200
3/4"	3/8"	1440	1800	1-1/4"-7	6000

Inspection

Inspection of the fan should be conducted at the first **30 minute, 8 hour** and **24 hour** intervals of satisfactory operation. During the inspections, stop the fan and inspect as per directions below.

30 Minute Interval

Inspect bolts, setscrews, and motor mounting bolts. Adjust and tighten as necessary.

8 Hour Interval

Inspect belt alignment and tension. Adjust and tighten as necessary.

24 Hour Interval

Inspect belt tension. Adjust and tighten as necessary.

Maintenance

Establish a schedule for inspecting all parts of the fan. The frequency of inspection depends on the operating conditions and location of the fan.

Inspect fans exhausting corrosive or contaminated air within the first month of operation. Fans exhausting contaminated air (airborne abrasives) should be inspected every three months. Clean the propeller and air inlets if material build-up is excessive. Excessive build-up can cause imbalance and failure of the propeller.

Regular inspections are recommended for fans exhausting non-contaminated air.

It is recommended the following inspections be conducted twice per year.

- Inspect bolts and setscrews for tightness. Tighten as necessary.
- Inspect belt wear and alignment. Replace worn belts with new belts and adjust alignment as needed. See *Belt and Pulley Installation*, on page 2.
- Bearings should be inspected as recommended in the *Conditions Chart*, below.
- Inspect for cleanliness. Clean exterior surfaces only. Removing dust and grease on motor housing assures proper motor cooling.

Lubricants

Loren Cook Company uses petroleum lubricant in a lithium base conforming to NLGI grade 2 consistency. Other grades of grease should not be used unless the bearings and lines have been flushed clean. If another grade of grease is used, it should be lithium-based.

A NLGI grade 2 grease is a light viscosity, low-torque, rust-inhibiting lubricant that is water resistant. Its temperature range is from -30°F to +200°F and capable of intermittent highs of +250°F.

Motor Bearings

Motor bearings are pre-lubricated and sealed. Under normal conditions they will not require further maintenance for a period of ten years. However, it is advisable to have your maintenance department remove and disassemble the motor, and lubricate the bearings after three years of operation in excessive heat and or in a contaminated airstream consisting of airborne abrasives.

Conditions Chart

RPM	Temperature	Fan Status	Greasing Interval
Up to 100	Up to 120°F	Clean	6 to 12 months
Up to 500	Up to 150°F	Clean	2 to 6 months
Up to 1000	Up to 210°F	Clean	2 weeks to 2 months
Up to 1500	Over 210°F	Clean	Weekly
Any Speed	Up to 150°F	Dirty	1 week to 1 month
Any Speed	Over 150°F	Dirty	Daily to 2 weeks
Any Speed	Any Temperature	Very Dirty	Daily to 2 weeks
Any Speed	Any Temperature	Extreme Conditions	Daily to 2 weeks

Fan Bearings

Greasable fan bearings are lubricated through a grease connector and should be lubricated by the schedule, *Conditions Chart*, on page 4.

For best results, lubricate the bearing while the fan is rotating. Slowly pump grease into the bearing until a slight bead forms around the bearing seals. Excessive grease can burst seals thus reduce bearing life.

In the event the bearing cannot be seen, use no more than three injections with a hand-operated grease gun.

Motor Services

Should the motor prove defective within a one-year period, contact your local Loren Cook representative or your nearest authorized electric motor service representative.

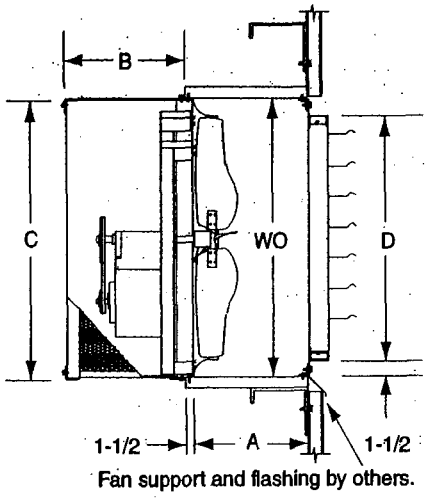
Changing Shaft Speed

All belt driven Propeller Wall fans with motors up to and including 5HP are equipped with variable pitch pulleys. To change the fan speed, perform the following:

a. Loosen setscrew on driver (motor) pulley and remove key, if equipped.

Exhaust wall fan with OSHA wire guard and shutter

Illustrated is the typical installation of an exhaust wall fan with an OSHA wire guard and shutter in a steel structure with corrugated siding. The installer will provide a sleeve of suitable material to support the fan at a correct distance from the shutter (minimum distance is the "A" dimension).

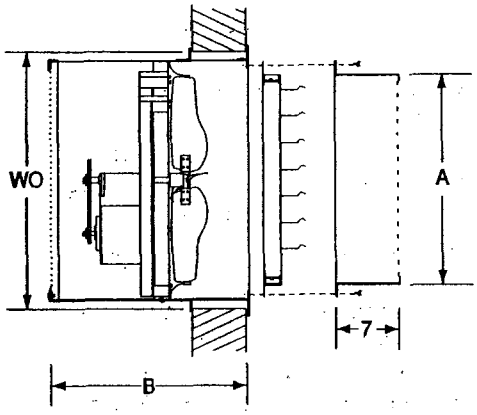


Fan support and flashing by others.

AWB, AWD SWD	XLW, XLWH XMW, XMWH	EWB EWD	A	B	C	D	E	WO	
								Std. Fan	Wire Gd.
8	-	-	11	13	12-3/4	10	1	12-1/2	13-1/4
10-12	-	-	12	13	16-3/4	14	1	16-7/16	17-1/4
14-16	-	-	12	13	20-3/4	18	1	20-7/16	21-1/4
18-20	-	-	13	12	24-3/4	22	1	24-7/16	25-1/4
-	20	-	13	21	24-3/4	22	1	24-7/16	25-1/4
24	-	-	15	21	30-3/4	27	1-1/2	30-7/16	31-1/4
-	24	-	15	13	30-3/4	27	1-1/2	30-7/16	31-1/4
30	30	24	16	21	36-3/4	33	1-1/2	36-7/16	37-1/4
36	36	30	16	21	42-3/4	39	1-1/2	42-7/16	43-1/4
42	42	36	17	26	48-7/8	45	1-1/2	48-7/16	49-1/4
48	48	42	17	26	54-7/8	51	1-1/2	54-7/16	55-5/16
-	54	48	17	28	60-7/8	57	1-1/2	60-7/16	61-5/16
-	60	54	17	28	66-7/8	63	1-1/2	66-7/16	67-1/2
-	-	60	17	28	72-7/8	69	1-1/2	72-7/16	73-1/2
-	-	72	17	31	84-7/8	81	1-1/2	84-7/16	85-1/2

Exhaust Pac-Fan with shutter guard

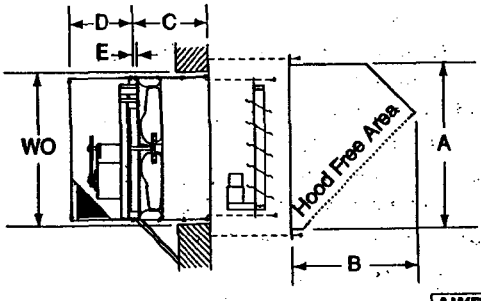
Illustrated is the typical installation of an exhaust PAC-Fan in a masonry wall with a shutter guard. The installer provides suitable fasteners (Hex bolts or Lag screws) to support the fan. It is recommended that 5/16" minimum bolts on 6" to 10" centers be used on the perimeter of the housing. Mounting flange should be caulked to exterior of the wall. Fans with motors in excess of 80 lbs. should be additionally supported by hanging rods or supports placed underneath the fan.



APB, APD, SPD	XLP, XLPH, XMP, XMPH	EPB, EPD	A	B- Direct	B-Belt	WO
8	-	-	10-5/8	13-5/8	-	13-1/4
10-12	-	-	14-5/8	17-5/8	-	17-1/4
14-16	-	-	18-5/8	20	-	21-1/4
18-20	20	-	22-5/8	22	34-1/4	25-1/4
24	24	-	27-7/8	23	34-1/4	31-1/4
30	30	24	33-7/8	24-3/8	37-7/8	37-1/4
36	36	30	39-7/8	28-3/8	39-3/8	43-1/4
42	42	36	45-7/8	33-5/8	40-5/8	49-1/4
48	48	42	51-7/8	39-5/8	50-5/8	55-5/16
-	54	48	57-7/8	40-1/8	47-3/4	61-5/16
-	60	54	63-7/8	44-3/4	47-3/4	67-1/2
-	-	60	69-7/8	-	47-3/4	73-1/2
-	-	72	81-7/8	-	50-3/4	85-1/2

Supply wall fan with wall collar, OSHA wire guard, motorized supply shutter and weather hood

Illustrated is the typical installation of a supply wall fan in a masonry wall with a wall collar, OSHA wire guard, motorized supply shutter and weather hood. The installer provides suitable fasteners to support the fan. Fasteners should be placed on 6" to 10 centers on the perimeter of the wall collar. Wall collar should be caulked to the exterior of the wall. The weather hood should be securely fastened and sealed to the wall. Fans with motors in excess of 80 lbs. should be additionally supported by hanging rods or supports placed underneath the fan.



AWB, AWD, SWD	XLW, XLWH XMW, XMWH	EWB, EWD	A	B	C	D	E	WO
8	-	-	18	16	12	13	1	13-1/4
10-12	-	-	22	18-3/4	14-3/8	13	1	17-1/4
14-16	-	-	26	21-3/4	15-3/8	13	1	21-1/4
18-20	-	-	30	24-1/2	17-5/8	13	1	25-1/4
-	20	-	30	24-1/2	17-5/8	21	1	25-1/4
24	-	-	30	24-1/2	17-5/8	13	1-1/2	31-1/4
-	24	-	34	27-1/4	18-3/4	21	1-1/2	31-1/4
30	30	24	40	31-1/2	18-3/4	21	1-1/2	37-1/4
36	36	30	46	35-3/4	19-1/2	21	1-1/2	43-1/4
42	42	36	52	40	19-1/2	26	1-1/2	49-1/4
48	48	42	58	44-1/4	19-3/4	26	1-1/2	55-5/16
-	54	48	64	48-1/2	19-3/4	28	1-1/2	61-5/16
-	60	54	70	52-3/4	19-3/4	28	1-1/2	67-1/2
-	-	60	76	57	19-3/4	28	1-1/2	73-1/2
-	-	72	88	67-1/2	19-3/4	31	1-1/2	85-1/2

Changing Shaft Speed continued

b. Turn the pulley rim to open or close the groove facing. If the pulley has multiple grooves, all must be adjusted to the same width.

c. After adjustment, inspect for proper belt tension.

Speed Reduction

Open the pulley in order that the belt rides deeper in the groove (smaller pitch diameter).

Speed Increase

Close the pulley in order that the belt rides higher in the groove (larger pitch diameter). Ensure that the RPM limits of the fan and the horsepower limits of the motor are maintained.

Pulley and Belt Replacement

Maximum RPM

SWD Size	Maximum RPM	EWB Size	Maximum RPM	AWB Size	Maximum RPM
8	1690	24	1675	24	1510
10	1550	30	1370	30	1145
12	1615	36	1310	36	990
14	1130	42	1175	42	905
16	1115	48	1215	48	900
18	1095	54	960	-	-
20	1075	60	890	-	-
24	1050	72	700	-	-

Maximum RPM

APB Size	Maximum RPM	XLP/XLPS Size	Maximum RPM	XLPH/XLPHS Size	Maximum RPM
24	1005	20	1280	-	-
30	800	24	1012	24	1110
36	645	30	666	30	930
42	660	36	566	36	714
48	605	42	424	42	610
-	-	48	356	48	512
-	-	54	316	54	472
-	-	60	260	60	446

Maximum RPM

XMP/XMPS Size	Maximum RPM	XMPH/ XMPHS Size	Maximum RPM	XLW/ XLWS Size	Maximum RPM
20	1280	-	-	20	1276
24	1276	24	1410	24	1018
30	830	30	1172	30	674
36	680	36	838	36	570
42	498	42	716	42	422
48	414	48	596	48	356
54	346	54	516	54	320
60	318	60	474	60	256

Maximum RPM

XLWH/ XLWHS Size	Maximum RPM	XMW/ XMWHS Size	Maximum RPM	XMWH/ XMWHS Size	Maximum RPM
-	-	20	1462	-	-
24	1126	24	1272	24	1400
30	932	30	860	30	1184
36	720	36	672	36	864
42	610	42	498	42	718
48	516	48	416	48	600
54	478	54	350	54	522
60	438	60	320	60	476

a. Clean the motor and fan shafts.

b. Loosen the motor plate mounting bolts to relieve the belt tension. Remove the belt.

c. Loosen the pulley setscrews and remove the pulleys from the shaft.

If excessive force is required to remove the pulleys, a three-jaw puller can be used. This tool, however, can easily warp a pulley. If the puller is used, inspect the trueness of the pulley after it is removed from the shaft. The pulley will need replacement if it is more than 0.020 inch out of true.

d. Clean the bores of the pulleys and place a light coat of oil on the bores.

e. Remove grease, rust and burrs from the shaft.

f. Place fan pulley on the fan shaft and the motor pulley on the motor shaft. Damage to the pulleys can occur when excessive force is used in placing the pulleys on their respective shafts.

g. After the pulleys have been correctly placed back onto their shafts, tighten the pulley setscrews.

h. Install the belts on the pulleys. Align and adjust the belts to the proper tension as described in *Belt and Pulley Installation*, page 2.

Bearing Replacement

The fan bearings are pillow block ball bearings.

a. Mark the position of the shaft in reference to both the bearing races and the propeller and pulley. Make a note of the clearance between the propeller and the frame.

b. Remove the pulley.

c. Remove the propeller from the shaft. A two-jaw puller may be needed to remove the propeller from the shaft.

d. Remove the bearing hold-down bolts. Remove the shaft and the bearings as one unit.

e. Remove the anti-corrosion coating from the shaft with a suitable degreaser.

f. Remove the bearing from the shaft using a bearing puller. If a bearing puller is not available, remove the bearing by using a wood block and hammer. An emery cloth or file may be needed to remove imperfections in the shaft left by the setscrews.

g. Clean the shaft and bearing bore thoroughly.

h. Place the bearings into position ensuring they are not on a worn section of the shaft. Tapping the inner ring face with a soft driver may be required. Do not hammer on the housing.

i. The outer ring of the bearing is spherical and swivels in the housing to compensate for misalignment. Slightly tighten the hold down bolts.

j. Align the setscrews on the bearings and tighten one setscrew on each bearing.

k. Rotate the shaft to allow the bearing outer rings to find the center of free movement.

l. Install the propeller on the shaft and adjust the bearing position to center the propeller in the opening.

m. Tighten the hold-down bolts to the proper torque. Refer to the *Torque Chart*, page 4.

n. Turn the shaft by hand. Resistance should be the same as it was before the hold-down bolts were fully tightened.

o. Tighten the bearing setscrews to the specified torque.

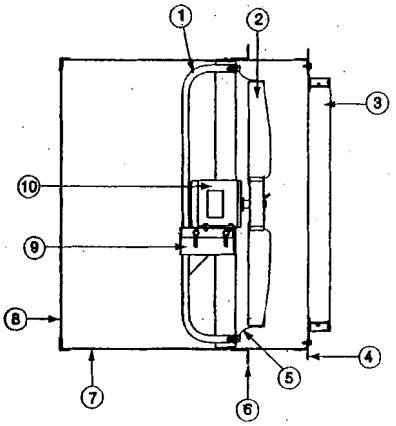
p. Install the pulley and adjust the belt tension.

After 24 hours of continuous operation, tighten the setscrews to the appropriate torque. This assures the full locking of the inner race to the shaft. Ensure the socket key or driver is in good condition with no rounded corners. The key should be fully engaged in the setscrew and held squarely to prevent the rounding out of the setscrew socket when applying maximum torque.

Troubleshooting

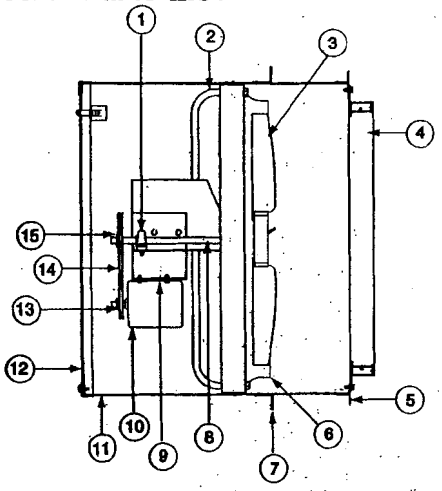
Problem and Potential Cause	
Low Capacity or Pressure •Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly. •Poor fan inlet conditions. There should be a straight clear duct at the inlet. •Improper propeller alignment.	**Overheated Motor** •Motor improperly wired. •Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly. •Cooling air diverted or blocked.
Excessive Vibration and Noise •Damaged or unbalanced propeller. •Belts too loose; worn or oily belts. •Speed too high. •Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly. •Bearings need lubrication or replacement. •Fan surge.	**Overheated Bearings** •Improper bearing lubrication •Excessive belt tension.

APD Parts List



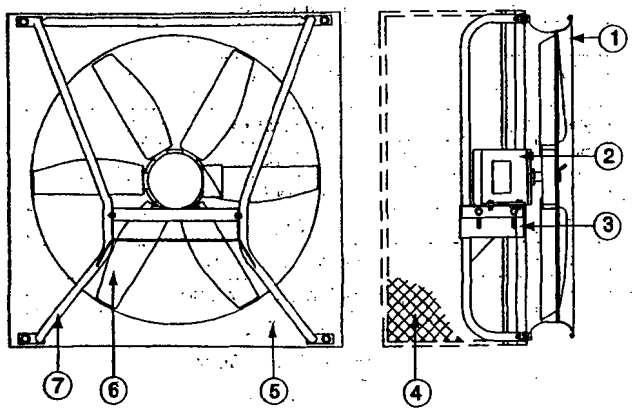
Parts No.	Description APD Sizes 16-36	Parts No.	Description APD Sizes 16-36
1	Power Assembly	6	Anchor Angles (2)
2	Propeller	7	Fan Box Panel (4)
3	Shutter Assembly	8	End Wire Guard
4	Mounting Collar Angles (4)	9	Motor Plate
5	Wall Base	10	Motor

APB Parts List



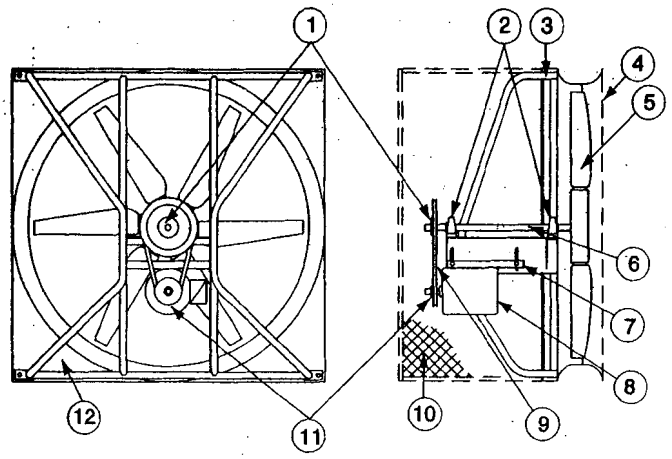
Parts No.	Description APB Sizes 24-48	Parts No.	Description APB Sizes 24-48
1	Bearings (2)	9	Motor Plate
2	Power Assembly	10	Motor
3	Propeller	11	Fan Box Panel (4)
4	Shutter Assembly	12	End Wire Guard
5	Mounting Collar Angles (4)	13	Driver Sheave
6	Wall Base	14	Belt Set
7	Anchor Angles (2)	15	Driven Sheave
8	Shaft		

AWDS and AWDE Parts List



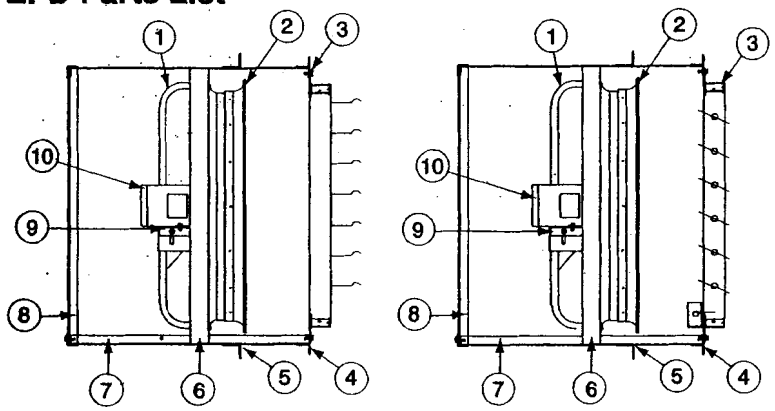
Parts No.	Description	
	AWDS	AWDE
1	Supply Venturi	—
2	Motor	Motor
3	Motor Plate	Motor Plate
4	Optional Wire Guard	Birdscreen
5	Wall Base	Wall Base
6	Cast Aluminum Propeller	Cast Aluminum Propeller
7	Power Assembly	Power Assembly

AWBS and AWBE Parts List



Part No.	Description	
	AWBS	AWBE
1	Driven Sheave	Driven Sheave
2	Bearings (2)	Bearings (2)
3	Power Assembly	Power Assembly
4	Supply Venturi	–
5	Propeller	Propeller
6	Shaft	Shaft
7	Motor Plate	Motor Plate
8	Motor	Motor
9	Belt Set	Belt Set
10	Optional Wire Guard	Birdscreen
11	Driver Sheave	Driver Sheave
12	Wall Base	Wall Base

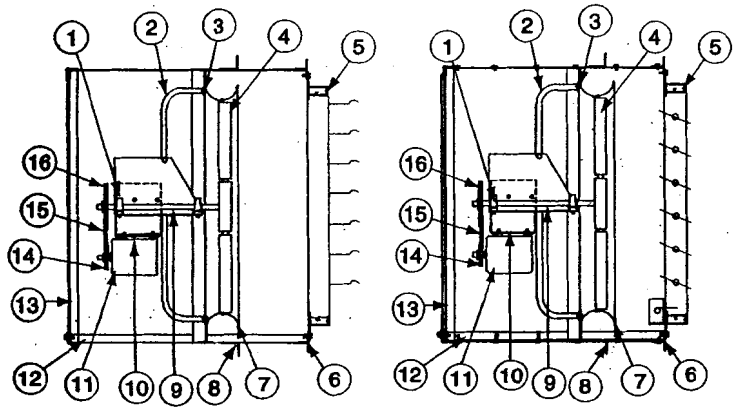
EPD Parts List



Supply

Part No.	Description
	EPD
1	Power Assembly
2	Supplemental Venturi
3	Shutter Assembly
4	Mounting Collar Angles (4)
5	Anchor Angles (2)
6	Wall Base
7	Fan Box Panel (4)
8	End Wire Guard
9	Motor Plate
10	Motor
11	Wall Base
	Propeller (Not Shown)

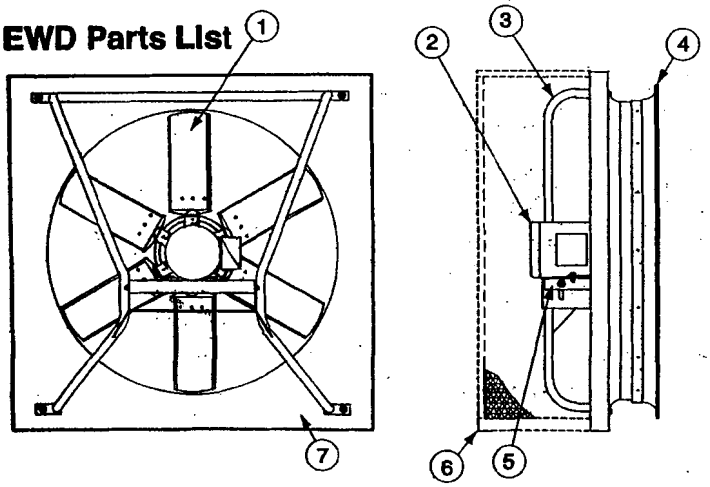
EPB Parts List



Supply

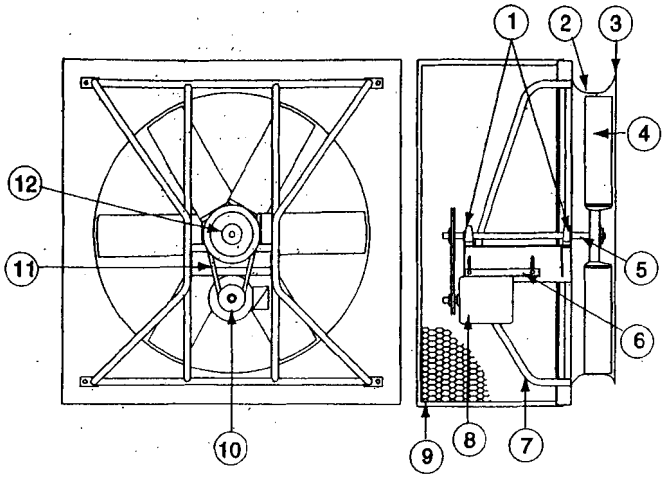
Part No.	Description
	EPB
1	Bearings (2)
2	Power Assembly
3	Wall Base
4	Propeller
5	Shutter Assembly
6	Mounting Collar Angles (4)
7	Supplemental Venturi
8	Anchor Angles (2)
9	Shaft
10	Motor Plate
11	Motor
12	Fan Box Panel (4)
13	End Wire Guard
14	Driver Sheave
15	Belt Set
16	Driven Sheave

EWD Parts List



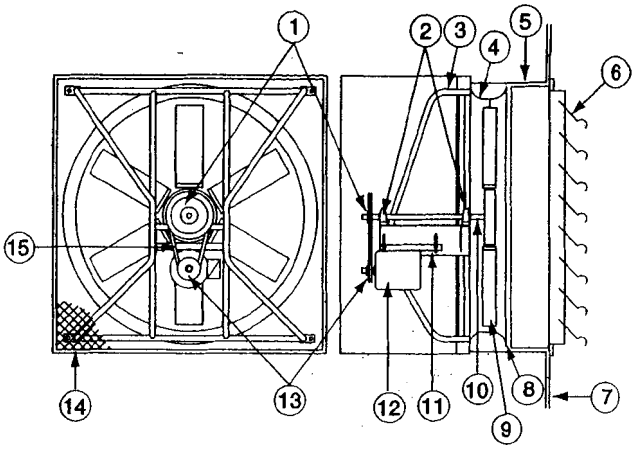
Part No.	Description
	EWD
1	Propeller
2	Motor
3	Power Assembly
4	Supplemental Venturi
5	Motor Plate
6	Optional Wire Guard
7	Wall Base

EWB Parts List



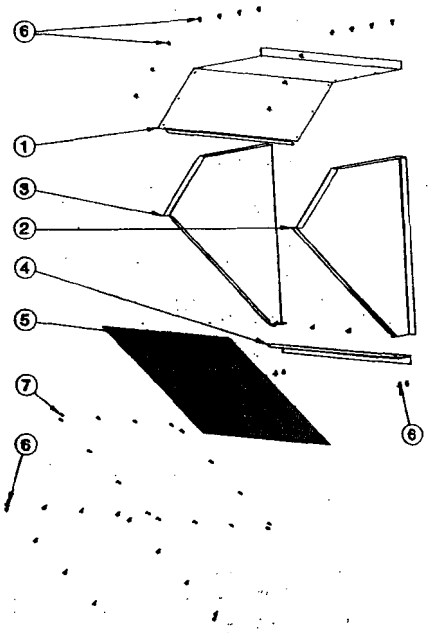
Part No.	Description EWB
1	Bearings (2)
2	Wall Base
3	Supply Venturi
4	Steel Propeller
5	Shaft
6	Motor Plate
7	Power Assembly
8	Motor
9	Optional Wire Guard
10	Driver Sheave
11	Belt Set
12	Driven Sheave

EWBSM Parts List



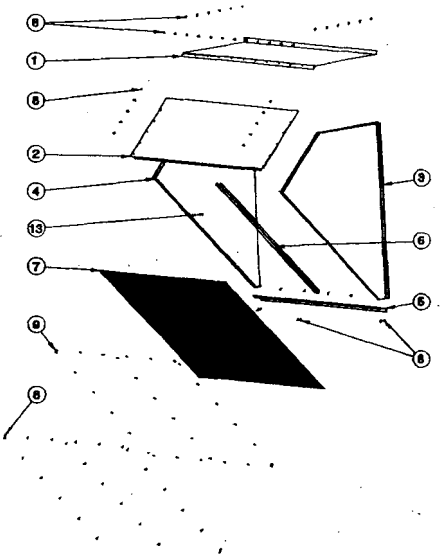
Part No.	Description EWBSM
1	Driven Sheave
2	Bearings (2)
3	Power Assembly
4	Wall Base
5	Fan Box Panel (4)
6	Shutter Assembly
7	Mounting Collar Angles (4)
8	Supply Venturi
9	Steel Propeller
10	Shaft
11	Motor Plate
12	Motor
13	Driver Sheave
14	Optional Wire Guard
15	Belt Set

8-48 EWB/EWD Weather Hood Parts List



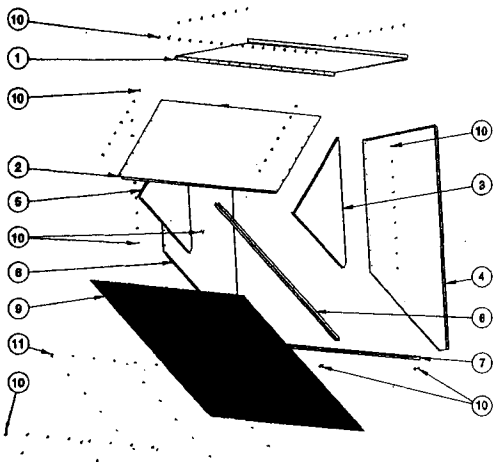
Part No.	Description 8-48 EWB/EWD
1	Top Panel
2	Right Side Panel
3	Left Side Panel
4	Bottom Panel
5	1/2" Mesh Galvanized Bird Screen
6	1/4" X 1/2" Speed Screw
7	5/16 SAE Steel Washer

54-60 EWB/EWD Weather Hood Parts List



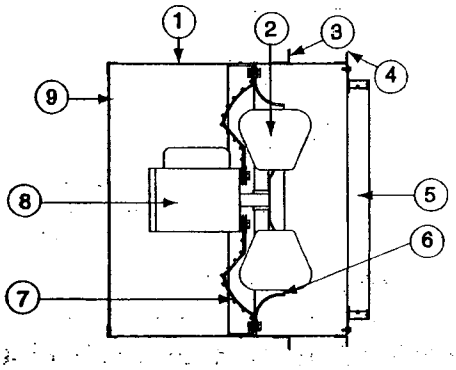
Part No.	Description 54-60 EWB/EWD
1	Top Panel, Piece 1
2	Top Panel, Piece 2
3	Right Side Panel
4	Left Side Panel
5	Bottom Panel
6	Bird Screen Support
7	1/2" Mesh Galvanized Bird Screen
8	1/4" X 1/2" Speed Screw
9	5/16 SAE Steel Washer

72 EWB/EWD Weather Hood Parts List



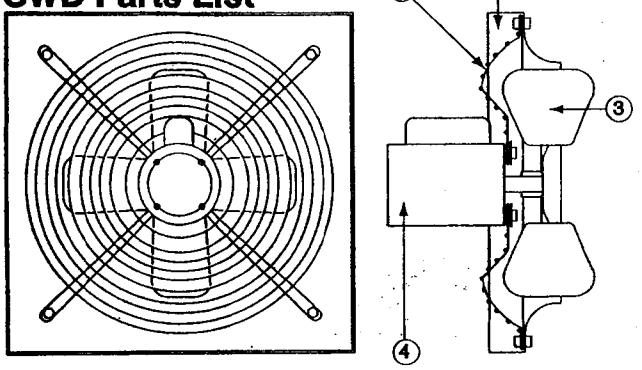
Part No.	Description
	72 EWB/EWD
1	Top Panel, Piece 1
2	Top Panel, Piece 2
3	Right Side Panel Tip
4	Right Side Panel
5	Left Side Panel Tip
6	Left Side Panel
7	Bottom Panel
8	Bird Screen Support
9	1/2" Mesh Galvanized Bird Screen
10	1/4" X 1/2" Speed Screw
11	5/16 SAE Steel Washer

SPD Parts List



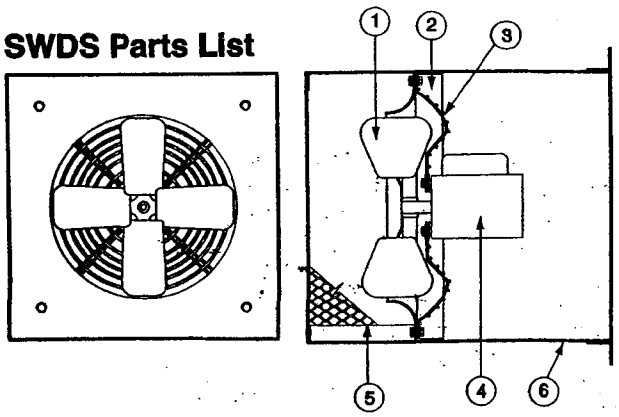
Part No.	Description
	SPD
1	Fan Box Panel (4)
2	Stamped Aluminum Propeller
3	Anchor Angle (4)
4	Mounting Collar Angle (2)
5	Automatic Louver
6	Wall Base
7	Mounting Grille
8	Motor
9	Mesh Guard

SWD Parts List



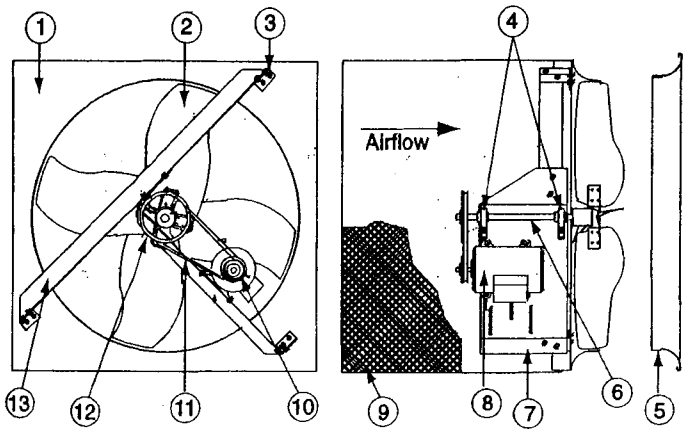
Part No.	Description
	SWD
1	Wire Guard
2	Wall Base
3	Stamped Aluminum Propeller
4	Motor

SWDS Parts List



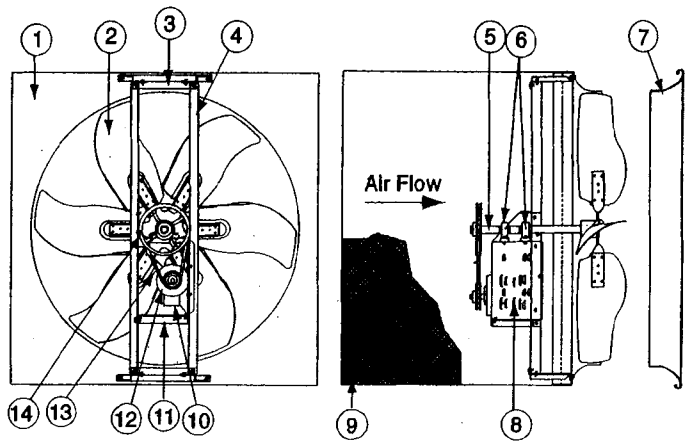
Part No.	Description
	SWDS
1	Stamped Aluminum Propeller
2	Wall Base
3	Wire Guard
4	Motor
5	End Wire Guard
6	Wall Collar

XLW, XMW, XLWS, XMWS 20 - 36 Parts List



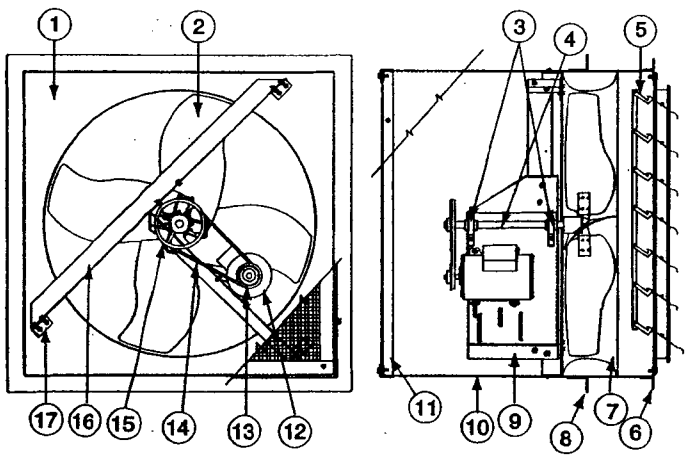
Part No.	Description	Part No.	Description
1	Wall Venturi Base	8	Motor
2	Prop Assembly	9	Optional Wire Guard
3	Power Assembly Foot (3)	10	Drive Sheave
4	Bearings (2)	11	Belt Set
5	Inlet Venturi (Supply only)	12	Driven Sheave
6	Fan Shaft	13	Power Assembly Rail
7	Motor/Bearing Plate		

XLW, XMW, XLWS, XMWS 42 - 60 Parts List



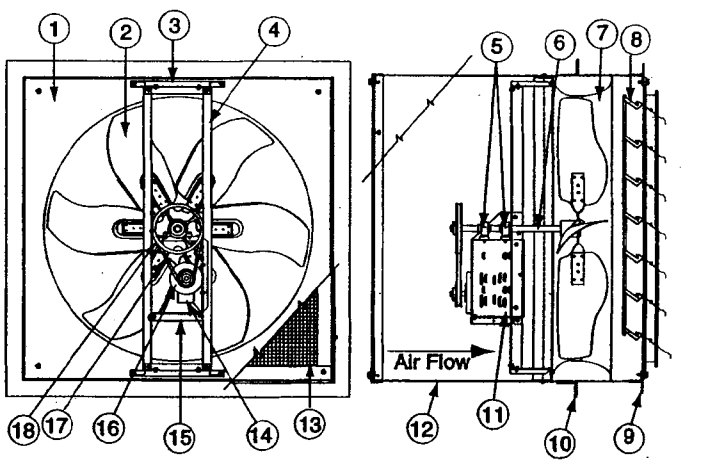
Part No.	Description	Part No.	Description
1	Wall Venturi Base	8	Motor/Bearing Plate
2	Prop Assembly	9	Optional Wire Guard
3	Power Assembly Foot (2)	10	Motor
4	Power Assembly Rail (2)	11	Motor Plate Brace
5	Fan Shaft	12	Drive Sheave
6	Bearings (2)	13	Belt Set
7	Inlet Venturi (Supply Only)	14	Driven Sheave

XLP, XMP, XLPS, XMPS 20 -36 Parts List



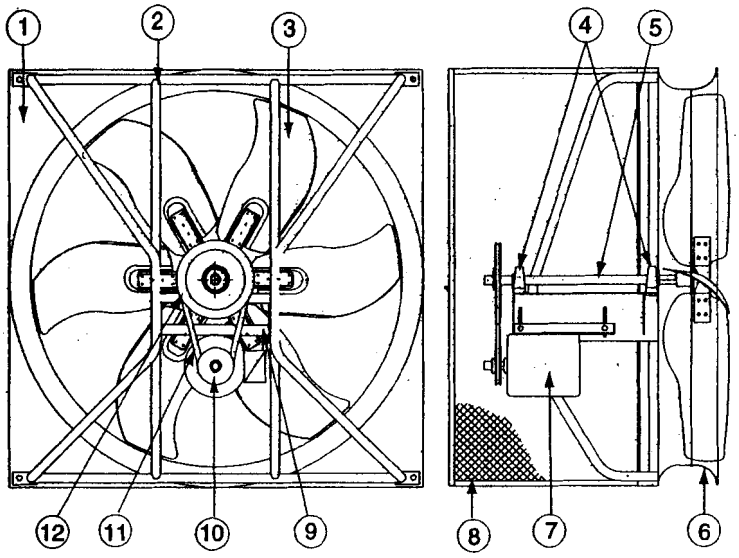
Part No.	Description	Part No.	Description
1	Wall Venturi Base	9	Motor/Bearing Plate
2	Prop Assembly	10	Housing Wrapper Panel (4)
3	Bearings (2)	11	End Safety Guard
4	Fan Shaft	12	Motor
5	Exhaust Shutter (Exhaust Only) Supply Shutter (Supply Only)	13	Drive Sheave
		14	Belt Set
6	Mounting Collar Angle (4)	15	Driven Sheave
7	Inlet Venturi (Supply Only)	16	Power Assembly Rail
8	Wall Mounting Angle (2)	17	Power Assembly Foot (3)

XLP, XMP, XLPS, XMPS 42 - 60 Parts List



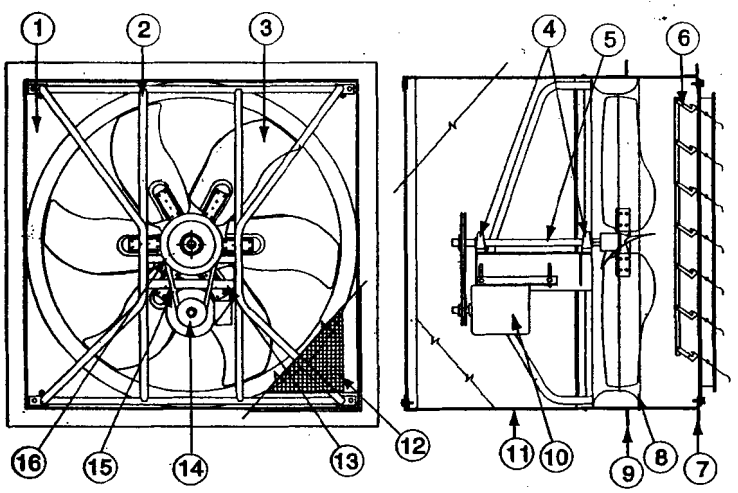
Part No.	Description	Part No.	Description
1	Wall Venturi Base	10	Wall Mounting Angle (2)
2	Prop Assembly	11	Motor/Bearing Plate
3	Power Assembly Foot (2)	12	Housing Wrapper Panel (4)
4	Power Assembly Rail (2)	13	End Safety Guard
5	Bearings (2)	14	Motor
6	Fan Shaft	15	Motor Plate Brace
7	Inlet Venturi (Supply Only)	16	Drive Sheave
8	Exhaust Shutter (Exhaust Only) Supply Shutter (Supply Only)	17	Belt Set
		18	Driven Sheave
9	Mounting Collar Angle (4)		

XLWHS, XMWHS, XLWH, XMWH
24 - 60 Parts List



Part No.	Description	Part No.	Description
1	Wall Venturi Base	7	Motor
2	Power Assembly	8	Optional Wire Guard
3	Prop Assembly	9	Motor Plate
4	Bearings (2)	10	Drive Sheave
5	Fan Shaft	11	Belt Set
6	Inlet Venturi (Supply Only)	12	Driven Sheave

XLPH, XMPH, XLPHS, XMPHS
24 - 60 Parts List



Part No.	Description	Part No.	Description
1	Wall Venturi Base	9	Wall Mounting Angle (2)
2	Power Assembly	10	Motor
3	Prop Assembly	11	Housing Wrapper Panel
4	Bearings	12	End Safety Guard
5	Fan Shaft	13	Motor Plate
6	Exhaust Shutter (Exhaust Only)	14	Drive Sheave
	Supply Shutter (Supply Only)	15	Belt Set
7	Mounting Collar Angle (4)	16	Driven Sheave
8	Inlet Venturi (Supply Only)		

Limited Warranty

Loren Cook Company warrants that your Loren Cook fan was manufactured free of defects in materials and workmanship, to the extent stated herein. For a period of one (1) year after date of shipment, we will replace any parts found to be defective without charge, except for shipping costs which will be paid by you. This warranty is granted only to the original purchaser placing the fan in service. This warranty is void if the fan or any part thereof has been altered or modified from its original design or has been abused, misused, damaged or is in worn condition or if the fan has been used other than for the uses described in the company manual. This warranty does not cover defects resulting from normal wear and tear. To make a warranty claim, notify Loren Cook Company, General Offices, 2015 East Dale Street, Springfield, Missouri 65803-4637, explaining in writing, in detail, your complaint and referring to the specific model and serial numbers of your fan. Upon receipt by Loren Cook Company of your written complaint, you will be notified, within thirty (30) days of our receipt of your complaint, in writing, as to the manner in which your claim will be handled. If you are entitled to warranty relief, a warranty adjustment will be completed within sixty (60) business days of the receipt of your written complaint by Loren Cook Company. This warranty gives only the original purchaser placing the fan in service specifically the right. You may have other legal rights which vary from state to state.

LOREN COOK COMPANY

Corporate Offices: 2015 E. Dale Street Springfield, MO 65803 417.869.6474

www.lorencook.com

APPENDIX B

REVENUE METER INSTALLATION AND INSTRUCTION MANUAL

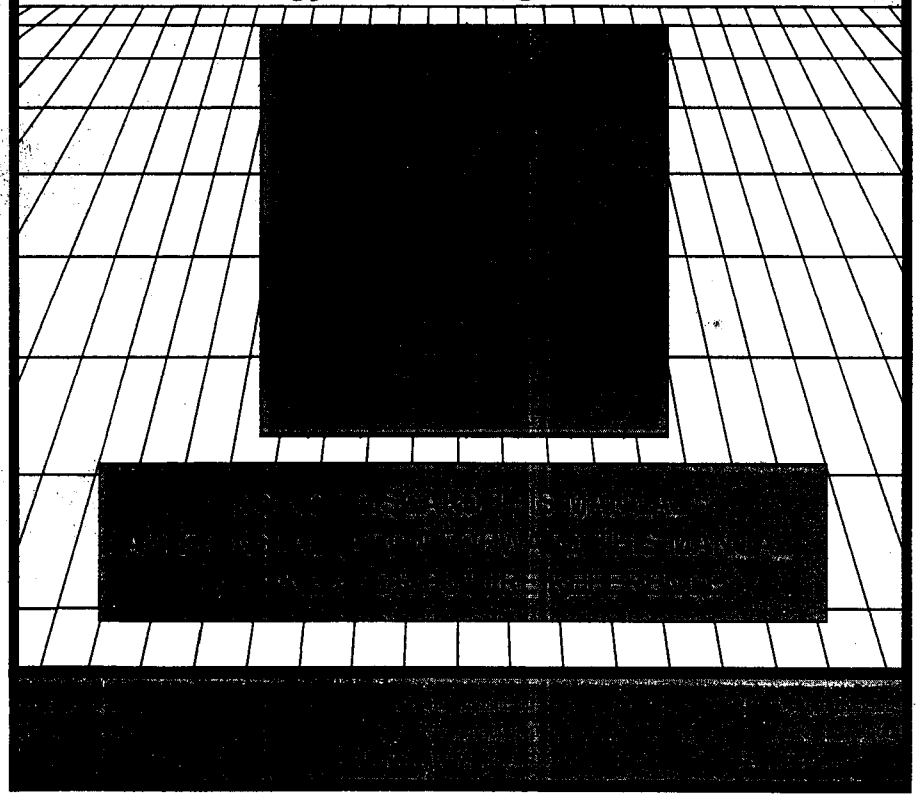
Installation and Instruction Manual for

E-MON D-MON®

Stand Alone KWH Meters

E-MON Corporation

Energy Monitoring Products



Energy Monitoring Products Corporation

Dear Valued Customer:

We are pleased that you chose to buy one of our products and want you to be just as pleased with it. To be sure that you are 100% satisfied with our products, we provide toll-free technical and sales information Monday through Friday 8:00 am to 7:30 pm, eastern time. The toll-free numbers are: Eastern Region: (800) 334-3666 and Western Region: (800) 810-3666. You may also reach us via E-Mail at: info@emon.com.

Before installing your new E-MON product, please read the information on the following pages carefully.

We believe that you will find the E-MON D-MON Kilowatt hour/demand meters easy to install and use for monitoring and evaluating your electrical usage.

Be sure to forward this manual to the owner after installation is complete, so that they may use it as a reference guide when reading the E-MON meters.

Thank you.

E-MON Corporation
Manufacturer of Energy Monitoring Products

Index

Chapter 1
Pre-Installation Information

The E-MON D-MON KWH meter is a three element meter that is used to monitor electric power to individual loads after the utility meter. Installation should be performed by qualified personnel and **only** according to these instructions and local electrical codes. E-MON Corporation or its representatives assume no responsibility for damage or injury resulting from the improper installation of this meter.

Check the rating and configuration on the meter label to ensure it is suitable for the intended service. Meters listed for use on 115/208 volt **cannot** be used on 277/480 volt services and vice versa.

Verify that the meter rating (amperage) is suitable for the intended load. Compare the color of the arrows on the red coils to the chart below to find the amperage of the current sensors.

SENSOR ARROW COLOR CODE		SENSOR RATING
Purple	-	25 Amp
White	-	50 Amp
Brown	-	100 Amp
Red	-	200 Amp
Yellow	-	400 Amp
Black	-	800 Amp
Blue	-	1600 Amp
(2) Blue	-	3200 Amp

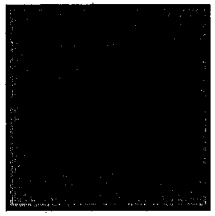
Mount the meter in desired location using the mounting flanges located on the top and bottom of the meter enclosure. E-MON meters must be installed indoors where they will not be affected by the elements.

Assemble and install current sensors around conductors to be monitored (Chapter 2).

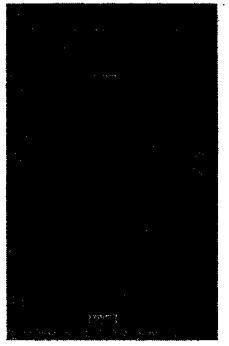
NOTE: The modular jacks located on the meter board are to be used only in conjunction with E-MON supplied peripherals. *The jacks contain neutral accessible circuits.*

Chapter 2
Current Sensor Assembly

STEP 1: For each phase being monitored you will need one two-piece current sensor assembly (A three phase meter will require three (3) current sensor assemblies.) Open the two-piece current sensor assembly by releasing the nylon clamp using a flathead screwdriver.



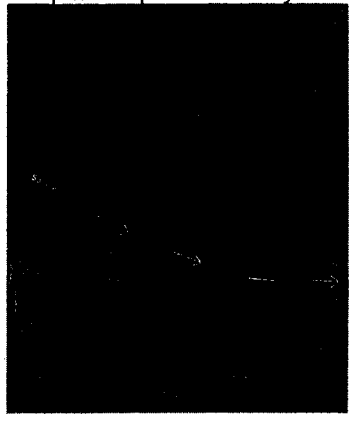
25-400 Amp



800-3200 Amp

Using a flathead screwdriver, press the tab on the nylon clamp to open the current sensor assembly.

STEP 2: Reassemble current sensor assembly around the conductor(s) to be monitored. Be sure that the current sensor halves marked "Load" are both facing the load side of the conductor. The colored arrow will be on the source side of the conductor being monitored and **MUST** be pointed in a clockwise direction around the conductor being monitored. Tighten nylon clamp to complete assembly.



**** IMPORTANT****

When looking from the source side of the conductor(s) being monitored, you should see the arrow on the current sensor assembly, and the arrow should be pointing clockwise around the conductor(s) being monitored.

If the arrow is not on the source side inaccurate readings may result.

Current Sensor Connections

STEP 1: Connect the black and white leads from the current sensor assembly to the meter terminal block. The current sensor leads can be extended up to 2,000 feet using 14-22 AWG wire and do not have to be twisted (consult your local electrical codes for proper sizing). When extending the sensor leads, be sure to note what color lead on the extension is connected to the black lead from the sensor, and what color lead on the extension is connected to the white lead from the sensor. There is no hazardous voltage across the current sensor wires and there will be no damage if the sensor wires are shorted together.

When connecting current sensor leads to the meter terminal block be sure to note which phase you bring into the "A" phase terminals, and the same for the "B" and "C" phase terminals. Also be sure that the white wire is connected to the "W" terminal, and the black wire is connected to the "B" terminal for that phase.

STEP 2: Proceed to Chapter 4, Various Installation Diagrams, for further information on current sensor connections.

Voltage Connections

STEP 1: Connect the line voltage input wires to the meter terminal block. **Do not connect the voltage wires to the unit while they are live.** These wires are normally #14 AWG (consult your local codes for proper sizing). Voltage input conductors require protection, it is recommended that in-line fuses with a five amp rating be installed to protect all phases. Line voltage inputs must correspond to the same phase being monitored by the current sensor inputs.

****IMPORTANT****
Phasing correspondence between the line voltage and the current sensors must correspond. ("A" phase on the voltage side must be "A" phase on the current sensor side.) If the phasing between the voltage and the current sensors does not correspond, inaccurate readings may result.

Chapter 3
Meter Terminal Block Connections

Voltage Connections

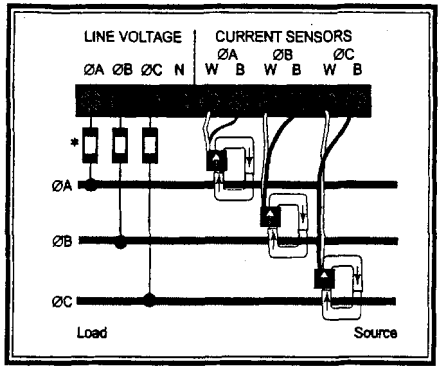
STEP 1: The line voltage input may be taken from wherever it is most convenient (lugs, another breaker, another subpanel, etc.) as long as it is the same power source as the items being monitored. Line voltage **cannot** be pulled from a subpanel powered from a different transformer than the item(s) being monitored.

STEP 2: Push insulating cover down over the terminal block inside meter. Apply voltage to meter only after installation is complete.

Refer to Chapter4, Various Wiring Diagrams for further details.

This chapter provides you with various installation diagrams depending on your monitoring needs. The diagrams below are **standard** Installation Diagrams using (1) set of current sensors. For special monitoring needs see Chapter 5.

3 Phase, 3 Wire Connection
[Delta System (on 4 wire Delta, Neutral is not used)]

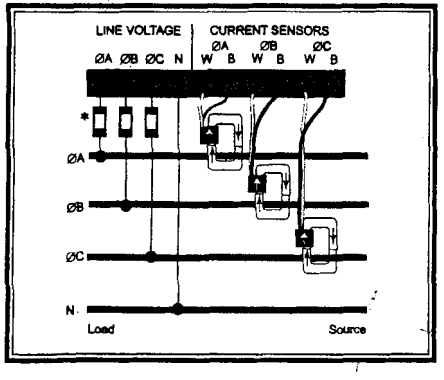


Line Voltage Connections: # 14 AWG

Sensor Connections: B=Black Lead
W=White Lead

*Five-amp Inline fuses recommended

3 Phase, 4 Wire Connection [Wye System]



Line Voltage Connections: # 14 AWG

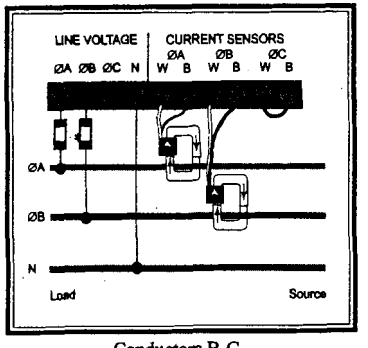
Sensor Connections: B=Black Lead
W=White Lead

* Five-amp Inline fuses recommended

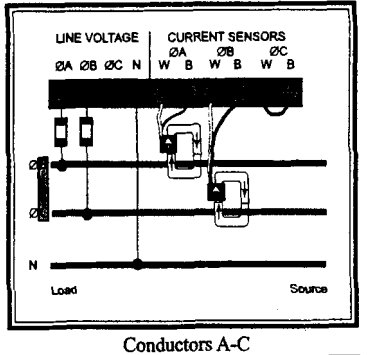
Chapter 4
Various Wiring Diagrams-Standard Wiring Diagrams

1 Phase, 3 Wire Connection (Monitoring conductors A-B, B-C, A-C)

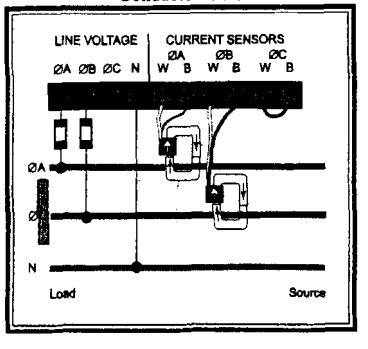
Conductors A-B



Conductors B-C



Conductors A-C



Line Voltage Connections: # 14 AWG

Sensor Connections: B=Black Lead
W=White Lead

* Five-amp Inline fuses recommended

IMPORTANT: Line voltage MUST be present at the A & B phase voltage terminals (e.g. you cannot bring power to A & C phase terminals only, or B & C phase terminals only.

Shorting link MUST be installed on C phase current sensor terminals.

For other applications (120 V, 1-Phase, 2 Wire, High Voltage Metering, etc.), contact E-MON Corporation at: Eastern Region: (800) 334-3666 or Western Region: (800) 810-3666

Chapter 5
Monitor Multiple Loads with One E-MON Meter

The E-MON D-MON® KWH meter provides extreme flexibility by allowing additional sets of current sensors to be used in parallel so multiple locations can be monitored by one meter. This feature allows a totalized display from two or more loads.

You may use parallel sensors to monitor specific breakers from one panel, specific breakers from more than one panel, two or more complete panels, etc. You may also monitor 3 phase and single phase loads for a totalized reading, provided they are from the same power source.

When paralleling current sensors, the following rules must be followed for accurate readings.

RULE 1: Current sensors must be installed in complete sets of three. This is necessary even when paralleling poly phase with single phase loads.

RULE 2: All sensors used in parallel must be of the same amperage rating (i.e. all 100 amp, or all 400 amp, etc.). The rating will be determined by the current rating (amperage) of the meter. A 200 amp meter, for example must use extra sets of 200 amp current sensors.

RULE 3: All locations being monitored must have the same power source. A 480 volt meter, for example, cannot monitor a 208 volt load, nor can a meter monitor two 480 volt loads if they are from a different originating power source (or from different transformers).

RULE 4: The multiplier on the meter display is affected by the paralleling of current sensors. When using parallel sets of current sensors, the meter and pulser (if used) multiplier must be factored by the number of sets of current sensors in parallel to provide the correct reading.

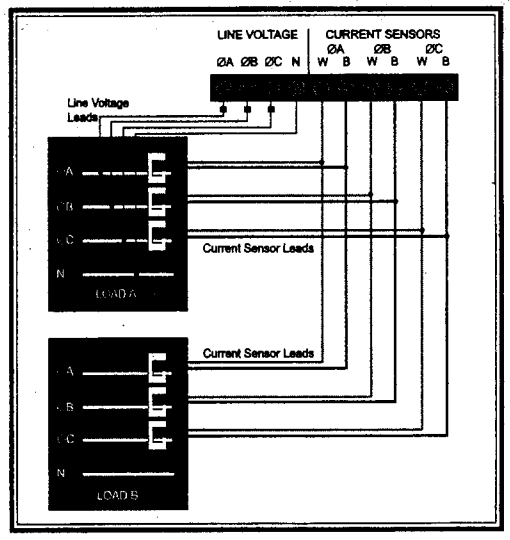
Example: meter multiplier of 32 with 2 sets (of 3) current sensors . . .
32 x 2 = 64 (new multiplier)
Example: meter multiplier of 8 with 3 sets (of three) current sensors . . .
8 x 3 = 24 (new multiplier

NOTE: Sets of current sensors consist of three sensors, one per phase. The multiplier change only applies when extra sets of sensors are installed on one meter. <u>If you are only using one set of three sensors, this multiplier change does not apply.</u>

Chapter 5
Monitor Multiple Loads with One E-MON Meter

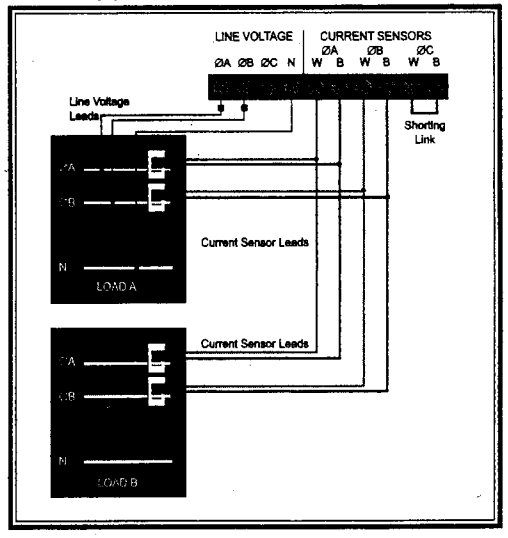
Parallel Current Sensor Installation Diagrams

Monitoring (2) Three Phase loads



When reading the E-MON meter, be sure to multiply the meter multiplier by the number of sets of sensors in parallel (See Chapter 8 for details)

Monitor (2) Single Phase loads



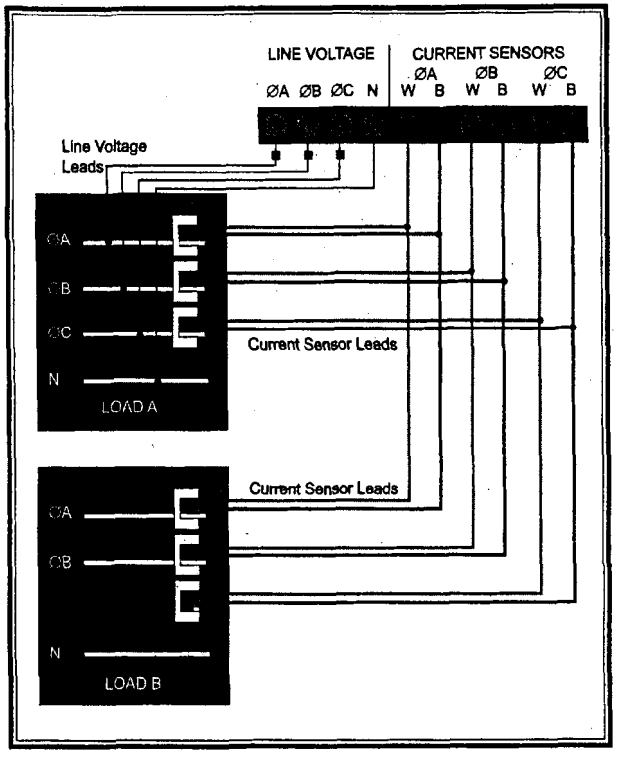
IMPORTANT!
Line voltage must be provided to the A & B Line voltage terminals in the E-MON Meter (e.g. you can not bring power to only the B & C phase, or the A & C phase)

Shorting Link must be installed on the C phase current sensor terminals

When reading the E-MON meter, be sure to multiply the meter multiplier by the number of sets of sensors in parallel (See Chapter 8 for details)

Chapter 5
Monitor Multiple Loads with One E-MON Meter

Monitor (1) three phase load and (1) single phase load



NOTE: Three Phase line voltage **MUST** be provided to the E-MON meter. When reading the E-MON meter, be sure to multiply the meter multiplier by the number of sets of sensors in parallel (See Chapter 8 for details)

IMPORTANT!
Current sensors MUST be installed in complete sets of (3), bring the third sensor into the terminal block at the meter, but **do not** clamp the actual sensor assembly around any conductors or the neutral

For other applications contact E-MON Corporation Engineering Department at: Eastern Region: (800) 334-3666 or Western Region: (800) 810-3666.

Chapter 6
Troubleshooting Guide

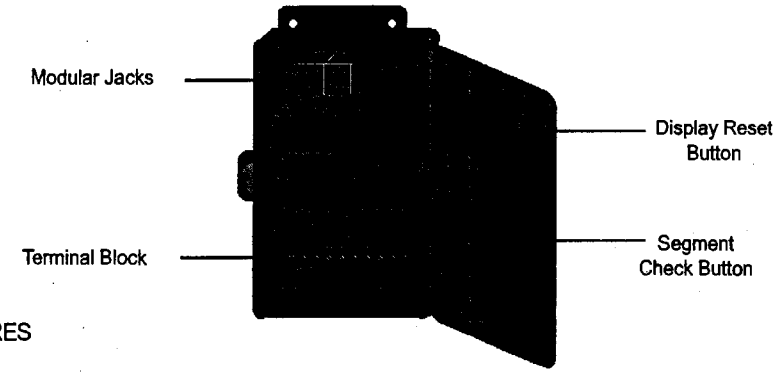
The E-MON D-MON electronic KWH/Demand meter is calibrated and tested at the factory before being packaged and shipped. If installed properly and in accordance with these installation instructions, the E-MON meter should provide years of trouble-free service. If the meter should not function, the following guide will assist in troubleshooting the installation.

PROBLEM	PROCEDURE TO FOLLOW
1. Display window is blank.	A. check wiring to voltage terminals B. check circuit breaker or fuses C. verify that power is turned on D. test source for correct voltage E. press RESET button located on the door inside the meter (5 sec.)
2. Display shows incomplete figures or numbers other than zeros when power is turned on.	A. press RESET button located on the door inside the meter (5 sec.)
3. Display reading all zeros (0000)	A. determine if load is sufficient to update the display (a load of at least 1% of the meter rating for a period of 24 hrs.) B. check RESET button to be sure there are no wires or other objects pressing against it when the door is closed. C. check the current sensors for installation and polarity (see chapters 2 for instructions) D. be sure the current and voltage inputs have the proper phase relationship (see chapter 4 for instructions) E. check wiring to voltage terminals F. check circuit breaker or fuses G. test source for correct voltage
4. Display reads only a fraction of the power consumption	A. check the supply voltage to be sure that it is on continuously 24 hrs./day B. check current sensor installation and polarity (see chapters 2 for instructions) C. check sensor wiring to the terminal strip in meter (color coding W & B)

If you have any questions contact E-MON at (800) 334-3666 or (800) 810-3666 BEFORE removing the E-MON meter.

Chapter 7
Operating Gulde-E-MON KWH Meters (One 4-Digit Display)

THIS PAGE APPLIES ONLY TO THE E-MON KWH METER.



FEATURES

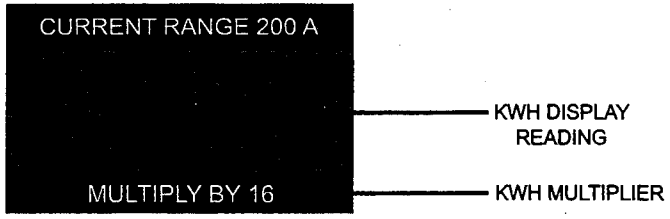
Display Reset Button	Reset the meter by depressing this button for at least five (5) seconds. After the meter is reset, the display will read all zeros.
Segment Check Button	When this button is depressed, the display will read "8888". This This is used to verify the integrity of the display segments. Upon release, the display will return to the original reading.
Terminal Block	Used for installation of the E-MON meter. See Chapters 2-5 for information.
Modular Jacks:	The left jack (8-pin) is designed to be used with the CE-MON Automatic meter Reading system only. All other peripherals (pulsers, D/A converters, etc.) plug into the right jack (6-pin).
Blinking Dots between digits on the display (not shown)	The dots between the digits on the display are **not** decimal points. The display should be read as whole numbers only. These dots provide a visual pulse signal of the load of the meter. A heavier load will increase the frequency of the blinking.

NOTE: Depending on the amount of power being used, a period of time will elapse before the meter registers readings. In the case of light loading, this may be as much as 24 hours.

Chapter 8
Reading the E-MON Meter-(4 Digit) KWH Reading

This page refers to reading your 4-digit KWH display.

4-Digit KWH Display
on Front of E-MON Meter



The KWH display is the 4-digit display on the front of your E-MON meter. The number on the 4-digit kilowatt hour (KWH) window is in full units, **the decimals (dots) are used as a load indicator only and do not affect the reading**. The reading in the display must be multiplied by the number that is printed on the bottom of the clear window. (This number is preceded by the statement 'MULTIPLY BY"). The resultant figure is in KILOWATT HOURS.

EXAMPLE: The KWH multiplier on a 200 amp meter is 16. If the 4-digit display reading is 25, multiply 25 by 16 for a total of 400 KWH.

To find the dollar cost for the power used by the loads being monitored, you must first find out what the cost per KWH is in your area (this cost can be found on your utility electric bill, or call your local utility and ask for their cost per kilowatt hour). Simply multiply this cost per KWH by the KWH reading from the E-MON meter. The resultant figure is the dollar cost for power used by the load(s) being monitored by this meter.

EXAMPLE:		
	4-DIGIT DISPLAY READING	25
	4-DIGIT DISPLAY MULTIPLIER	16
	COST PER KWH FROM UTILITY	.02169762

25 X 16 X .02169762 = $8.68 (cost for power used by loads on meter)

NOTE: THE FOLLOWING ONLY APPLIES TO METERS USING MORE THAN ONE SET (OF 3) CURRENT SENSORS. For meters using parallel current sensors the multiplier of the KWH display must be multiplied again by the number of sets of sensors in parallel.

EG. Meter multiplier of 8, two sets of sensors installed,
8 X 2 = 16 (new KWH display multiplier)

Chapter 8
Reading the E-MON Meter-Meter Multiplier Chart -4-Digit Display

The chart below applies to the 4-digit display on E-MON KWH Meters

KWH MULTIPLIERS FOR ALL E-MON D-MON KWH METERS
NOTE: When paralleling current sensors, sensors must be installed in complete sets of three.

How to find your KWH Multiplier:

1. Find the model number listed on the front of your E-MON Meter in the chart below.
2. Find the number of sets of the current sensors installed on your meter in the chart below. **If you are only using the one set of sensors supplied with your E-MON meter, use the multiplier/divisor in the gray column. The remaining columns only apply if extra sets of current sensors are being installed in addition to the set supplied with the meter.** (NOTE: One set of current sensors consists of 3 individual sensors, one on each phase)
3. Cross reference the model number to the number of sets of current sensors to see your KWH Multiplier.

Model No.	Sets (3 sensors per set) of Current Sensors Installed			
		2	3	4
20825 48025 60025		X 4	X 6	X 8
20850 48050 60050		X 8	X 12	X 16
208100 480100 600100		X 16	X 24	X 32
208200 480200 600200		X 32	X 48	X 64
208400 480400 600400		X 64	X 96	X 128
208800 480800 600800		X 128	X 192	X 256
2081600 4801600 6001600		X 256	Not Recommended	Not Recommended
2083200 4803200 6003200		Not recommended	Not Recommended	Not Recommended

Chapter 9
Frequently Asked Questions

Q. When providing line voltage to the E-MON meter, can I tap off of the same breaker I am monitoring?

A. Yes, the voltage can be pulled off the same breaker being monitored. The meter draws .025 amps, so the load from the meter will have minimal affect on your readings (refer to proper fusing instructions.)

Q. Can the meter line voltage wires be run in the same conduit as the current sensor leads?

A. Yes, there will be no effect on the meter if the sensor leads and the meter line voltage wires are run in the same conduit.

Q. What size wire do I use for the line voltage leads.

A. These wires are normally # 14 AWG, but be sure to check your local electrical codes for proper sizing.

Q. What size wire do I use to extend the current sensor leads. Do they have to be twisted?

A. These wires are normally 14-22 AWG wire (consult your local electrical codes for proper sizing. The wires do not have to be twisted, and can be extended up to 2,000 feet.

Q. The load I need to monitor has parallel feeds. How do I install the sensors for this application?

A. There are two ways you can monitor parallel feeds. The easiest (and preferred) way to monitor parallel feeds is to clamp the sensors around all feed wires for that phase, if the core supplied with your meter is not large enough, contact your local distributor and ask them to order a larger core size for your meter. The second way to monitor parallel feeds is to clamp the sensor around one of the feed wires. When you read the meter, the final reading must be multiplied by the number of feed wires for each phase. (e.g. 6 conductors in parallel per phase. Clamp current sensors around one of the conductors of each phase. When you read the meter take the reading from the display, times the multiplier printed on the window, times six (6) for the parallel conductors, to get your consumption.)

Q. I have two subpanels that I would like to monitor with one meter. These subpanels are fed by different transformers in the building. Can I parallel sensors & monitor both panels with one meter?

A. No. These panels cannot be monitored by one meter because the are from different power sources. When you parallel current sensors, all loads being monitored must be from the same voltage source.

Q. I have 5 breakers in one subpanel I would like to monitor with one meter. Can this be done without having to parallel current sensors?

A. Yes. Simply run all the breaker wires through one set of current sensors. Make sure all A phase circuits are through the A phase sensor, and the same for B phese and C phase. The meter should be sized by the highest amount being monitored by one sensor.

Q. I've gone through the troubleshooting guides, and I still can't get my meter to work. What should I do?

A. Contact E-MON's Engineering Department at: Eastern Region: (800) 334-3666 or Western Region: (800) 810-3666 before removing the meter. E-MON's engineering department will help you do detailed troubleshooting of the meter installation in the field and assist you in getting the meter up and running without you having to remove the meter and return it.

Chapter 9
Frequently Asked Questions

Q. How accurate are the E-MON Meters?

A. E-MON meters are Certified to ANSI C12.1 metering standards. (+/- 1% from 1-100% of the rated load)

Q. What are the plugs inside the meter used for?

A. The plugs inside the E-MON meter are used to interface E-MON meters with several options that are available including Pulse output, D/A output, high resolution displays, and Automatic Meter Reading systems.

Q. I have an E-MON KWH Meter. There are 3 decimal points between the digits that blink. When I read the meter, which dot is the decimal point?

A. The dots between the digits on the KWH meter are NOT decimals. These dots provide a visual pulse showing the load being monitored by the meter. When a higher load is monitored, the dots will blink faster. The display should be read as whole numbers.

Q. Can I get demand readings without having the demand meter?

A. The only way to get demand readings without having a demand meter is to interface the KWH meter with an energy management system that can interpret the KWH readings to KW. E-MON's CE-MON Automatic Meter Reading System, for example, has this capability.

Q. I have 3 current sensors installed on my meter, one sensor on each phase of a three phase load, when I read the meter, do I have to multiply again by 3?

A. No. There are 3 sensors in a set of current sensors. One sensor on each phase equates to one set of current sensors, so to read the meter simply take the display reading and multiply by the number printed on the display window. You would only multiply again by 3 if you have three sets of sensors (9 sensors, three on each phase) installed on the meter.

Q. How do I find the cost for KWH to bill my tenants.

A. Your local utility bill should list the cost per KWH, if it does not, simply give your utility a call and ask them the cost per KWH.

Q. I have a 48025 meter that is monitoring a 25 amp load. I want to move the meter and now monitor a 480 volt 100 amp load. Can I use the 48025 to do this, or do I need to order a new meter?

A. To use the 48025 meter on a 100 amp load, you must change the current sensors used with the meter. Simply contact your local distributor and order one set of 100 amp current sensors. Be sure that when you read the meter with 100 amp current sensors you use the multiplier for the 100 amp meter (X 8).

Q. I have an existing meter that I would like to interface with my Energy Management System. Can I field install the pulse output into the E-MON meter?

A. Yes, simply contact your local distributor and order the Pulser option.

Important Information
About your New E-MON Product

E-MON Corporation is committed to producing and delivering quality products in appearance and performance. That is why our meters are covered with a *Five Year Limited Warranty* against defects in workmanship and material (see below for details).

If you have questions, we can handle them quickly and effectively with a telephone call. Please let us try to help you by phone, **before** you remove and return your E-MON product. Call our technical department at: Eastern Region: (800) 334-3666 or Western Region: (800) 810-3666 between the hours of 8:00 am and 7:30 pm, eastern time. To help us help you, please have all relevant information on hand when you call (model or part numbers, nature of difficulty, etc.)

E-MON® CORPORATION
FIVE-YEAR LIMITED WARRANTY

Subject to the exclusions listed below, E-MON Corporation will either repair or replace (at it's option) any product that it manufactures and which contains a defect in material or workmanship. The following exclusions apply:

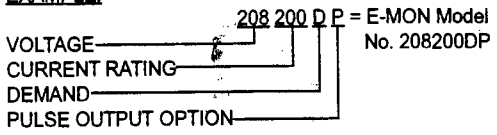
1. This Limited Warranty is effective for a period of five (5) years following the date of manufacture (as indicated on the Limited Warranty).
2. E-MON Corporation must be notified of the defect within ninety (90) days after the defect becomes apparent.
3. All freight costs are the responsibility of the product owner.
4. This Limited Warranty does not cover installation, removal, reinstallation, or labor costs, and excludes the battery and normal wear and tear.
5. This Limited Warranty does not cover any product which has been altered from its original manufactured condition, improperly installed, abused or misused, or used in connection with equipment or materials not supplied or recommended by E-MON Corporation.
6. This Warranty is limited to the obligation to repair and/or replace the manufactured product. This is the exclusive remedy afforded by this Limited Warranty. IN NO EVENT SHALL E-MON CORPORATION BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, such as property damage or economic losses caused by a product.
7. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, AS TO QUALITY, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

TECHNICAL SPECIFICATIONS

Ordering Information:

Simply state voltage, current rating and any options required:

EXAMPLE:



Voltage Input Configuration:

2-wire, 3-wire and 4-wire
This covers all secondary voltage supplies: single-phase, split secondary and three-phase, both grounded and ungrounded.

Voltage Input:

Up to 600 volts rms A.C. available

Current Input:

Up to 3200 amps rms A.C. available

Power Factor:

0.5 leading or lagging

Frequency:

50 Hz to 400 Hz

Accuracy:

Certified to ANSI C12.16

Voltage Operating Range:

+/-25% of rated voltage.

Temperature Range:

-20 degrees C to +50 degrees C.

Voltage Overload:

+25% continuously; +100% for 20 cycles.

Current Overload:

Can be overloaded 100% without damaging meter.

Display:

Fully electronic, 4-digit display and 2-digit display on KWH/Demand meters, visible and retained during loss of power. Manual reset to zero.

Standard Ranges:

120/240 volts; 25, 50, 100, 200, 400, 800, 1600, or 3200 amps
115/208 volts; 25, 50, 100, 200, 400, 800, 1600, or 3200 amps
277/480 volts; 25, 50, 100, 200, 400, 800, 1600, or 3200 amps
Other voltages available as options.

High Voltage Metering:

Call E-MON Engineering Department for 2300 V, 4160 V and higher voltage applications. Eastern Region: (800) 334-3666 or Western Region: (800) 810-3666

APPENDIX C

EXAMPLE SITE VISIT FORM AND PROCESS MONITORING FORM

National Heatset Printing

1 Adams Boulevard, Farmingdale, New York

Personnel: _____ Time: _____

Weather: _____ Date: _____

System Status:

Arrival: _____

Departure: _____

Run Timer Reading: _____

Electric Meter Reading: _____

System Data:

Extraction Well F Gate Valve: _____ % Open

Dilution Valve: _____ % Open

Pre-Bleed Air (Extraction Well):

Flow: _____ CFM

Vacuum: _____ "H2O

PID Reading: _____ PPM

Draeger Tube: _____ PPM

Temperature: _____ °F

Post-Bleed Air (SVE Influent):

Flow: _____ CFM

Vacuum: _____ "H2O

PID Reading: _____ PPM

Draeger Tube: _____ PPM

Temperature: _____ °F

Carbon Monitoring:

Mid: _____ PPM _____ CFM _____ Temp. (°F) _____ PPM (Drager)

Effluent: _____ PPM _____ CFM _____ Temp. (°F) _____ PPM (Drager)

Carbon effluent sample collected & shipped to lab? _____

Knockout Tank Drained? _____

Gallons: _____

Purge water drums on-site: _____

Monitoring Well Gauging / Vapor Point Monitoring:

Well/V.P. ID:	MW-C	MW-E	MW-F	MW-G	VP-1	VP-2	VP-3	VP-4	VP-5	VP-6
DTW (ft):										
Vac. (" H2O):	–	–	–	–						

Comments:

_____

_____

_____

_____

Soil Vapor Extraction Pilot Test Data Sheet

Project Name:
Project Number:
Test Well:

Date:
On-site Personnel:

	Blower Operating Data		Point										
	SVE Flow	SVE Vacuum (wellhead)	Distance from test well (feet)										
Time	(fpm or cfm)	(inches H2O)	Monitoring Parameters										
			DTW (feet)										
Background Data			VOCs (ppm)										
			Vacuum (in H2O)										
			DTW (feet)										
(start time + 30 min)			VOCs (ppm)										
			Vacuum (in H2O)										
			DTW (feet)										
(start time + 45 min)			VOCs (ppm)										
			Vacuum (in H2O)										
			DTW (feet)										
(start time + 60 min)			VOCs (ppm)										
			Vacuum (in H2O)										
			DTW (feet)										
(start time + 90 min)			VOCs (ppm)										
			Vacuum (in H2O)										
			DTW (feet)										
(start time + 120 min)			VOCs (ppm)										
			Vacuum (in H2O)										
			DTW (feet)										
(start time + 150 min)			VOCs (ppm)										
			Vacuum (in H2O)										

APPENDIX D

VELOCICALC PLUS AIR VELOCITY METER MODEL 8360
OPERATION AND SERVICE MANUAL

Model 8360/8382/8383/8388

VELOCICALC® Plus

Air Velocity Meters

Operation and Service Manual

September 1998
PIN 1980253 Rev C

SHIP TO:
TSI Incorporated
500 Cardigan Road
Shoreview, MN 55126-3996
USA

MAIL TO:
TSI Incorporated
P.O. Box 64394
St. Paul, MN 55164-0394
USA

U.S.
Sales and Customer Service:
(800) 777-8356 / (651) 490-2711
Fax:
(651) 490-2874

INTERNATIONAL
Sales and Customer Service:
(1) 651 490-2711
Fax:
(1) 651 490-2874

Address
TSI Incorporated/P.O. Box 64394/St. Paul, MN 55164/USA
Fax No.
(651) 490-2874

LIMITATION OF WARRANTY AND LIABILITY. Seller warrants that this product, under normal use and service as described in the operator's manual, shall be free from defects in workmanship and material for a period of twenty-four (24) months, or the length of time specified in operator's manual, from the date of shipment to the customer. This limited warranty is subject to the following exclusions:

a. Batteries and certain other components when indicated in specifications are warranted for a period of 90 days from the date of shipment to the customer.
b. With respect to any repair services rendered, Seller warrants that the parts repaired or replaced will be free from defects in workmanship and material, under normal use, for a period of 90 days from the date of shipment to the customer.
c. Seller does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies.
d. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, any goods which are incorporated into other products or equipment by the Buyer. All goods returned under warranty shall be at the Buyer's risk of loss, Seller's factory prepaid, and will be returned at Seller's risk of loss, Buyer's factory prepaid.

The foregoing is IN LIEU OF all other warranties and is subject to the conditions and LIMITATIONS stated herein. NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE.

THE EXCLUSIVE REMEDY OF THE USER OR PURCHASER, AND THE LIMIT OF THE LIABILITY OF SELLER FOR ANY AND ALL LOSSES, INJURIES, OR DAMAGES IN CONNECTION WITH THIS PRODUCT (INCLUDING CLAIMS BASED ON CONTRACT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT, OR OTHERWISE) SHALL BE THE RETURN OF THE PRODUCT TO THE FACTORY OR DESIGNATED LOCATION AND THE REFUND OF THE PURCHASE PRICE, OR, AT THE OPTION OF SELLER, THE REPAIR OR REPLACEMENT OF THE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES. SELLER SHALL NOT BE RESPONSIBLE FOR INSTALLATION, DISMANTLING, REASSEMBLY OR REINSTALLATION COSTS OR CHARGES. NO ACTION, REGARDLESS OF FORM, MAY BE BROUGHT AGAINST THE SELLER MORE THAN ONE YEAR AFTER THE CAUSE OF ACTION HAS ACCRUED.

The purchaser and all users are deemed to have accepted the terms of this LIMITATION OF WARRANTY AND LIABILITY, which contains the complete and exclusive limited warranty of Seller. This LIMITATION OF WARRANTY AND LIABILITY may not be amended or modified nor may any of its terms be waived except by a writing signed by an authorized representative of Seller.

Service Policy

Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call TSI's Customer Service department at (800) 777-8356 (USA) and (1) 651 490-2711 :(International).

CONTENTS

Chapters

Available Application Notes

- Constant Temperature Thermal Anemometry Theory .....#TI-105
- Traversing a Duct to Determine Average Air Velocity or Volume .....#TI-106
- Applications Using the VELOCICALC Plus to Measure Pressure .....#TI-107
- VELOCICALC Serial Interface Connections .....#TI-108

To obtain any of the listed Application Notes contact TSI at
U.S. (800) 777-8356/(651) 490-2711 Fax: (651) 490-2874
International (1) 651-490-2711 Fax: (1) 651-490-2874

Chapter 1

Unpacking and Parts Identification

Carefully unpack the instrument and accessories from the shipping container. Check the individual parts against the list of components in Table 1. If any are missing or damaged, notify TSI or your local distributor immediately.

Table 1. List of components

Qty	Item Description	Part/model
1	Model 8360 VELOCICALC Plus or	8360
	Model 8382 VELOCICALC Plus or	8382
	Model 8383 VELOCICALC Plus (Articulating Probe) or	8383
	Model 8388 VELOCICALC Plus	8388
1	Carrying Case	800277
4	AA Alkaline batteries	1208013
1	AC Adapter (Optional)	
	115 V, NEMA-5	2613033
	230 V, European, CEE 7/16	2613078
	230 V, Great Britain	800169
	240 V, Australian	2613105
1	Operation and Service Manual	1980253
1	Static pressure tip	3002017
8 ft.	Rubber tubing	801039

Parts Identification

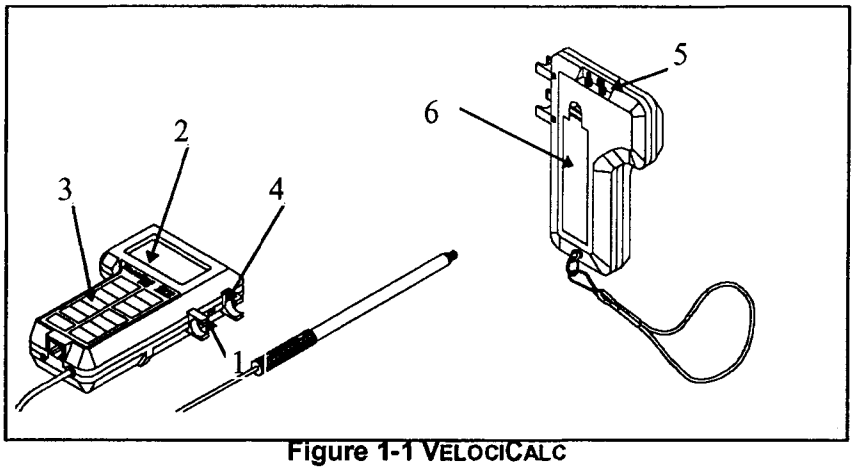


Figure 1-1 VELOCICALC

1. On/Off Switch
2. Display
3. Function Keys
4. Probe Mounting Clips
5. Pressure Measurement Ports
6. Battery Access Cover

Chapter 2

Setting-Up

Supplying Power to the VELOCICALC

The VELOCICALC can be powered in one of two ways: four size AA batteries or the optional AC Adapter.

Installing the Batteries

Insert four AA batteries as indicated by the diagram located on the inside of the battery compartment. TSI ships the unit with alkaline batteries. The VELOCICALC is designed to operate with either alkaline or NiCd rechargeable batteries. Carbon-zinc batteries are not recommended because of the danger of battery acid leakage.

Table 2-1 Typical Battery Life at 20°C

Air Velocity (ft/min)	Air Velocity (m/s)	Alkaline (hrs)	NiCd (hrs)
100	0.5	7.0	5.0
1000	5.0	4.4	3.5
9000	45.0	2.4	2.4

Using the AC Adapter

When using the AC adapter, the batteries (if installed) will be bypassed. The AC adapter is not a battery charger.

Selecting the Display Units

The VELOCICALC is capable of displaying the measured values in several different measurement units. The choices of measurement units are shown in Table 2-2.

Table 2-2. Choices of Measurement Units

Velocity	Temperature/ Dew Point	Flow Rate	Pressure
ft/min m/s	°F °C	ft^3/min m^3/hr l/s	in. H_2O mm Hg kPa

To change the display units on your VELOCICALC, refer to Appendix B, DIP Switch Settings.

Using The Telescoping Probe

The telescoping probe, mounted on the side of the VELOCICALC, contains the velocity, temperature, and humidity sensors (humidity sensor, Model 8360 and 8388 only). The probe is shipped pointing downward in the stowed position. The probe can be used either mounted on the VELOCICALC

or held in your hand. If the probe is to be used mounted to the VELOCICALC, remove the probe from its stowed position, turn it 180°, and reinstall (pointing upward) in the probe mounting brackets.

Extending The Probe

To extend the probe, hold the handle in one hand while pulling on the probe tip with the other hand. Do not hold the cable while extending the probe as this prevents the probe from moving.

Retracting The Probe

To retract the probe, hold the handle in one hand while pushing on the probe tip with the other hand. If you feel the probe antenna binding, pull gently on the probe cable until the smallest antenna section is retracted. Collapse the rest of the antenna by pressing the probe tip.

When using the probe, make sure the sensor window is fully exposed and the red orientation dot is facing upstream.

Chapter 3

Operation

Overview

The Model 8360/8382/8383/8388 VELOCICALC PLUS measures air velocity, temperature, differential pressure, and calculates volumetric flow rates. In addition the 8360/8388 VELOCICALC PLUS measures relative humidity and calculates dew point from the temperature and relative humidity readings. The Model 8383 VELOCICALC PLUS has an articulating probe. The VELOCICALC PLUS can store individual readings and compute the average of these readings.

Keypad Functions

When pressing the keys on the front panel, the VELOCICALC will beep to confirm the function. If you press a key and the VELOCICALC does not beep, then the VELOCICALC does not allow that function during the selected mode. The beep function can be disabled by changing the internal DIP switch (refer to Appendix B).

ON/OFF Switch

Slide the switch upward to the ON position. The power switch is marked in the international symbols '|' for *on* and 'O' for *off*. When the instrument is first turned on it goes through a preprogrammed power-up sequence that includes an internal self-check. First, all displayable items will appear for a few seconds. If a problem is detected, the display will light 'CAL' to indicate that it should be returned for servicing and calibration. When the VELOCICALC completes the internal self-check, it will display the approximate percentage of battery life remaining. This feature is accurate for alkaline batteries only.

Measuring Velocity

Press the VELOCITY key to display velocity measurements (the VELOCICALC will automatically start in velocity mode). The velocity will be displayed in ft/min or m/s depending on the DIP switch settings (refer to Appendix B). Place the end of the probe in the location where you want to make the measurement. Make sure the sensor window is fully opened and the red orientation dot is facing upstream.

Measuring Temperature

Press the TEMP key to display air temperature readings. The VELOCICALC will display temperature readings in either degrees Celsius (°C) or degrees Fahrenheit (°F), depending on the DIP switch settings (refer to Appendix B). Allow about 30 seconds for the temperature reading to stabilize after

switching to temperature mode. This is necessary because the velocity sensor is heated during velocity mode, and some heat is conducted down to the temperature sensor.

Measuring Pressure

Press the PRESSURE key to measure differential pressure. To measure pressure, tubing must be connected to the pressure ports on the top back of the unit. When the pressure source is connected the same way the pressure ports are marked, the meter will display a positive number.

Zeroing Pressure

If the zero reading of pressure has drifted, the pressure function can be easily re-zeroed. To reset the zero, make sure that the pressure ports are exposed to the exact same pressure. The easiest way to do this is to remove the pressure hoses and leave both ports exposed to ambient pressure.

Press and hold the PRESSURE key down for at least three seconds. The VELOCICALC will give a double beep and the display will show "0 in. H_2O" (or whatever units have been selected). When the key is released the display will be re-zeroed.

Measuring Humidity (Model 8360 and 8388 Only)

Press the HUMIDITY key to display humidity readings. The readings will be in units of percent relative humidity (%RH). The reading may need time to stabilize if the ambient conditions have recently changed.

In order to see if the humidity reading has stabilized, extend the probe and gently wave it back and forth (or place it in a location where there is a sufficient quantity of moving air), while checking the display for an upward or downward trend in the readings. When no particular trend is apparent, the reading has stabilized.

Situations that may require time to stabilize the sensor would be when moving the instrument from a cold vehicle or storage place into a heated building. Also, if the end of the probe has been warmed by being handled, it will need to cool to ambient temperature. Another example would be when moving from a location with low humidity to high humidity, or vice versa.

Dew Point Function (Model 8360 and 8388 Only)

Press the DEW POINT key to display the dew point temperature. The dew point is calculated using the temperature and relative humidity measurements. Because dew point is not measured directly, accuracy of this calculation depends on both ambient temperature and relative humidity. The dew point reading will be most accurate when the relative humidity is 50% and above (and dew point temperature is closer to the actual temperature). It

will be less accurate when the relative humidity is less than 50% (and dew point temperature is farther away from the actual temperature).

Flow Rate Function

The VELOCICALC's flow rate function can calculate flow rate using a known area. The Model 8382/8383/8388 VELOCICALC can also calculate flow rate through diffusers by multiplying the square root of the pressure reading by a manufacturer-supplied flow factor. The VELOCICALC displays the volumetric flow rate in ft^3/min, m^3/hr, or l/s, depending on the DIP switch setting (refer to Appendix B).

Flow Rate (Calculated Using Velocity and Duct Area)

The flow rate can be calculated for a round, square or rectangular duct. The shape and size of the duct or other area through which the flow will be measured must be entered.

Entering Shape and Size

Press the FLOWRATE key to put the VELOCICALC in flow rate mode. The VELOCICALC will prompt the user to enter the shape and size, if this has not been done since the instrument was turned on. The VELOCICALC will request entry of the shape by alternately flashing the circle and rectangle (and pressure units, if DIP switch #6 is ON) on the display. If shape and size have been entered, the VELOCICALC will go directly to displaying flow rate.

Press the SHAPE key to select the shape of the area, rectangular (square) or circular, to measure. Each time the SHAPE key is pressed the shape will change back and forth between the circle and rectangle. When the desired shape appears on the display press the ENTER key. This will enter the shape and the VELOCICALC will then ask for the size.

Use the LARGER and SMALLER keys to select the size of the flow rate area. For a circular flow shape the VELOCICALC will ask for one size, the diameter of the circular area. Select the size and press ENTER to accept it. For a rectangular area the VELOCICALC will ask for two dimensions. First select the horizontal dimension and press the ENTER key, then select the vertical dimension and press ENTER.

To change the shape, press the SHAPE key to select the desired shape. Proceed as above to enter the shape and dimensions. To change the size, hold the LARGER or SMALLER key to enter the new dimensions, then press the ENTER key to accept them.

Flow Rate (Calculated Using Pressure and Flow Factor, Model 8382, 8383, and 8388 Only)

This option is available with Model 8382/8383/8388 only when DIP switch #6 is ON (refer to Appendix B). The flow rate through a diffuser is calculated by multiplying a pressure reading by a manufacturer-supplied flow factor. This flow rate measurement method is applicable for diffusers that contain pressure taps designed for this purpose.

NOTE: When using this option, make sure that the VELOCICALC pressure measurement units and flow rate measurement units are set using the DIP switches to correspond to those provided by the diffuser manufacturer (refer to Appendix B). If using kPa to do this measurement, flow factors should be entered using Pa, not kPa. If they are set incorrectly, the calculated flow rate will be incorrect.

The VELOCICALC will display flow rate and pressure units simultaneously to indicate that the flowrate is being measured from pressure and not from velocity and area. To zero the pressure transducer while in this measurement mode, press and hold the PRESSURE key. The pressure will zero and the VelociCalc will return to flow rate from pressure measurement mode.

Entering Flow Factor

Press the FLOWRATE key to put the VELOCICALC in flow rate mode. The VELOCICALC will prompt you to enter the shape, size, or flow factor if this has not been done since the instrument was turned on. The VELOCICALC will alternately flash the circle, rectangle, and pressure units on the display. If shape, size, or flow factor <u>have</u> been entered, the VELOCICALC will go directly to displaying flow rate.

Press the SHAPE key to select the pressure-flow rate measurement method. Each time the SHAPE key is pressed the shape will change between the circle, rectangle, and pressure units. When the pressure units appear on the display, press the ENTER key. The VELOCICALC will then ask for the flow factor.

The VELOCICALC will display 'FAct = ' and the current flow factor. Use the LARGER and SMALLER keys to select the value of the flow factor and press ENTER to accept it.

To change the flow factor, press the SHAPE key to select the pressure units. Proceed as above to enter the value.

Time Constant Function

Momentarily press and release the TIME CONSTANT key to view the current time-constant. To change the time-constant, press and hold the key. The available time-constant choices (1, 5, 10, 15 and 20 seconds) will sequence on the display. When the desired value is displayed immediately release the key. The VELOCICALC will always reset the time constant to 1 second when turned off.

The time-constant is actually an averaging period. The VELOCICALC display is always updated every second, however, the reading displayed is the average reading over the last time-constant period. For example, if the current time-constant is set to 10 seconds, the display will show readings averaged over the previous 10 seconds, updated every second. This is also called a 10 second "moving average."

Using the Clear, Store and Average Functions

The VELOCICALC has the ability to compute the average of a number of individual stored readings. Every time the STORE key is pressed, the currently displayed reading is added to a store buffer. When the AVERAGE key is pressed, the readings in the store buffer are divided by the number of stored readings to get the average. The CLEAR key is used to clear out the store buffer in order to start taking a new average.

Store Function

Press and hold the STORE key to store the currently displayed measurement. The display will show "STORE" and the number of stored data points that are in memory for about two seconds, and then the recorded value will be displayed until the STORE key is released.

The individual stored values can not be recalled. Only the average of the stored values can be recalled. There are five different store buffers: one for both velocity and flow rate from area, one for temperature, one for humidity, one for pressure, and one for dew point. Models 8382, 8383, and 8388 have a sixth storage buffer for flow rate from pressure. You can switch between measuring modes and store data without affecting data stored in the buffer for another measuring mode. You can later return to any mode and add additional values to the already stored values.

The flow rate from area function (measures and stores velocity readings, calculates flow rate) and velocity function use the same storage buffer. Measurements made in one mode are added to those made in the other mode.

When using the flow rate from pressure measurement mode, changing the flow factor value will automatically clear the flow rate storage buffer.

Average Function

Press the AVERAGE key to display the average of the stored values of the current operating mode. The message "AVG" will appear along with a number (between 1 and 255) indicating how many stored values are in the memory buffer. The average value is then displayed for one second. To keep displaying the average value, press and hold the AVERAGE key. Additional values can be stored after the AVERAGE key has been pressed. The next time the AVERAGE key is pressed, the additional values are averaged with those already accumulated.

Clear Function

Press the CLEAR key to erase the stored value in the buffer of the currently active function. Pushing the CLEAR key in one function will not affect the values stored in other buffers. However, velocity and flow rate from area use the same buffer, so clearing velocity will also clear the flow rate. Flow rate from pressure is not affected by clearing velocity. For example, pushing CLEAR while measuring velocity will not affect the values stored for temperature.

Printer Port

While pushing the STORE, AVERAGE or CLEAR key the data is automatically transmitted to the printer port. If the optional Model 8925 Portable Printer is connected the readings will be printed.

Chapter 4

Maintenance

Probe Tip

Periodically inspect the probe tip to ensure that it is clean. Dust and oil deposits on the velocity sensor decrease the accuracy of the VELOCICALC.

Caution:	The VELOCICALC must be switched off for cleaning. Do not use high-pressure air, strong solvents, or brushes to clean the sensor tip; damage to the sensors could result.

To remove dust, blow it off with a gentle stream of air or rinse it off with a gentle stream of water. To remove a combination of dust and oil, rinse the probe tip in isopropyl alcohol and then blow it off with a gentle stream of air. ***Be careful not to get the humidity sensor wet!*** (The humidity sensor on Models 8360 and 8388 is located at the base of the probe window, just inside the antenna tube.) Also, for the 8383, be careful not to allow water to enter the articulating probe joint.

Caution:	Never use heat to dry the probe. Permanent damage to the sensor could result.

Recalibration

To maintain a high degree of accuracy in your measurements, TSI recommends that you return your instrument for annual recalibration. For a nominal fee, we will recalibrate the unit and return it to you with a certificate of calibration and US National Institute of Standards Technology (NIST) traceability. This 'annual checkup' assures you of consistently accurate readings; it is especially important in applications where strict calibration records must be maintained.

Cases

If the instrument case or storage case needs cleaning, wipe it off with a soft cloth and isopropyl alcohol or a mild detergent. Never submerge the VELOCICALC.

Storage

When storing the VELOCICALC for more than a month, it is recommended to remove the batteries. This prevents damage due to battery leakage.

Chapter 5

Troubleshooting

Table 5 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the VELOCICALC. If your symptom is not listed, or if none of the solutions solves your problem, please contact TSI.

Table 5. Troubleshooting the VELOCICALC

Symptom	Possible Causes	Corrective Action
No display	Unit not switched on	Switch on the unit.
	Low or dead batteries	Replace the batteries or plug in the AC adapter.
	Dirty battery contacts	Clean the battery contacts.
BAT is blinking	Batteries are low	Replace or recharge batteries.
Display reads "LO BAT"	Low battery charge	Replace or recharge batteries.
	Wrong AC adapter	Replace with the correct AC adapter.
	Low AC line voltage	Correct the AC line voltage or use batteries.
	Dirty battery contacts	Clean the battery contacts.
Temperature initially reads high	Temperature sensor is still warm from velocity mode	Allow about 30 seconds before reading temperature.
Display reads "ERR"	You are trying to enter more than 255 readings	Read or record the average; clear the storage register and proceed.
Display reads "CAL"	The VELOCICALC has detected an internal fault	Return to factory for service.
Velocity reading fluctuates badly	The flow is fluctuating	Reposition the probe in a less turbulent section of the flow or use a longer time constant.
Display says "OVER"	The velocity, temperature or pressure is too high	Use an alternate measurement method.

Warning!	Remove the probe from excess temperature immediately: excessive heat can damage the sensor. The pressure sensor is protected from damage up to 10 psi. (75 kPa or 560 mm Hg) At higher pressures it can burst!

Notice:	There is sometimes confusion between dew point temperature and wet-bulb temperature when comparing VELOCICALC humidity readings to sling psychrometer readings. (Dew point temperature and wet bulb temperature are not the same thing.) On the psychometric chart used with a sling psychrometer, dew point temperature is a flat horizontal line, wet bulb temperature is a straight line angling downwards from the left, dry bulb temperature is a straight vertical line and relative humidity is a curved line angling upwards from the left.

Appendix A

Specifications

	Model 8360/8388 VelociCalc Plus	Models 8382/8383 VelociCalc Plus
Velocity		
Measurement Range	30 to 9,999 ft/min (0.15 to 50 m/s)	Same
Accuracy.[1]	3% of reading or 3 ft/min (0.02 m/s), whichever is greater	Same
Temperature		
Measurement Range	14 to 140°F (-10 to 60°C)	0 to 200°F (-17.8 to 93.3°C)
Resolution	0.1°F (0.1°C)	Same
Accuracy	±0.5°F (0.3°C)[2]	Same
Instrument Temp. Range		
Electronics		
Operation	40 to 113°F (5 to 45°C)	Same
Storage	-4 to 140°F (-20 to 60°C)	-22 to 194°F (-30 to 90°C)
Probe		
Operation	14 to 140°F (-10 to 60°C)	0 to 200°F (17.8 to 93.3°C)
Storage	-4 to 140°F (-20 to 60°C)	-22 to 194°F (-30 to 90°C)
Relative Humidity Range	0 to 95%	N/A
Accuracy	±3% rh[3]	N/A
Dew point Range	5 to 120°F (-15 to 49°C)	N/A
Static/Differential Pressure		
Range[4]	-10.00 to +10.00 inches H_2O (-2.500 to +2.500 kPa or -20.00 to +20.00 mm Hg)	Same
Accuracy[5]	±0.5% of rdg ±0.01 in H_2O (±0.002 kPa or ±0.02 mm Hg)	Same
Volumetric Flow Rate	0.2 to 4,50,000 ft^3/min (0.0424 to 1,170,000 m^3/hr or 0.1 to 325,000 l/s)	Same
Duct Sizes	1 to 100 inches in increments of 0.5 inch, 100 to 255 inches in increments of 1 inch (1 to 100 cm in increments of 0.5 cm, 100 to 255 cm in increments of 1 cm)	Same
Averaging Capability	Up to 255 values each of velocity, temperature, pressure, humidity, or pressure flow	Up to 255 values each of velocity, temperature, pressure, or pressure flow

	Model 8360/8388 VELOCICALC Plus (Cont.)	Models 8382/8383 VELOCICALC Plus (Cont.)
Response Time (63% of final value)		
To Velocity	200 milliseconds	Same
To Temperature	8 seconds	Same
Time Constant	Adjustable from 1 to 20 sec.	Same
Physical Dimensions		
External Dimensions	4.2 in x 7.2 in x 1.5 in (107 mm x 183 mm x 38 mm)	Same
Probe Length	29 in (735 mm)	37 in (940 mm)
Weight (with batteries)	1.2 lbs (0.54kg)	1.1 lbs (0.5 kg)
Display	4-digit LCD, 0.6 in (15 mm) digit height	Same
Printer Interface	Type: Serial BAUD Rate: 1200	Same
Power	Four AA-size NiCd rechargeable or Alkaline Batteries (included) or AC adapter	Same

1 Temperature compensated over an air temperature range of 40 to 150°F (5 to 65°C)
2 Accuracy with instrument case at 77°F (25°C).
Add uncertainty of 0.05°F/°F (0.03°C/°C) for change in instrument temperature.
3 Accuracy with probe at 77°F (25°C).
Add uncertainty of 0.1%rh/°F (0.2%rh/°C) for change in probe temperature. Includes 1% hysteresis.
4 Overpressure range = 300 inches H_2O (75 kPa, 560 mm Hg)
Specifications within parentheses indicate metric equivalents.
5 Add uncertainy of ±0.02%/°F (±0.03%/°C) for change in instrument temperature.

Appendix B

DIP Switch Settings

To access the DIP switches, remove the batteries from the battery compartment. On the inside of the battery compartment, there is a window with eight DIP switches. The table below shows the functions for each switch.

Caution:	Make certain that power is turned off before changing DIP switch settings.

Switch	Function	OFF	ON
1	Velocity	ft/min & ft^3/min	m/s
2	Flow Rate*	l/s	m^3/hr
3	Pressure	in. H_2O	kPa and mm Hg
4	Pressure**	kPa	mm Hg
5	Temperature	Degrees Fahrenheit (°F)	Degrees Celsius (°C)
6	Flow Rate (8382, 8383, 8388 only)	Flow rate from velocity and area	Flow rate from pressure and flow factor or from velocty and area
7		Reserved	Reserved
8	Beep	Beep Disabled	Beep Enabled

- The ON position is away from the batteries and OFF is towards the batteries.
- Always leave DIP switch #7 in the OFF position.

* To select flow rate to display l/s or m^3/hr, DIP switch #1 must be in the ON position.

** To select Pressure to display kPa or mm Hg, DIP switch #3 must be in the ON position.

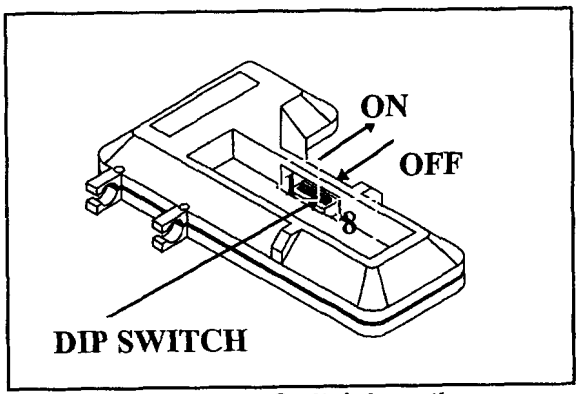


Figure B - 1: DIP Switch Location

Appendix C

Standard Velocity vs. Actual Velocity

Since thermal air velocity sensors are sensitive to changes in air density and air velocity, all thermal anemometers indicate velocities with reference to a set of standard conditions. For TSI instruments, standard conditions are defined as 70° F (21.1° C) and 14.7 psia (101.4 kPa). Other manufacturers may use different values.

Standard velocity is the velocity the air would be moving if the temperature and pressure were at standard conditions. It is usually the most useful measure of airflow because it defines the heat-carrying capacity of the air.

Actual velocity is the velocity at which a microscopic particle of dust would be traveling if it were in the air stream.

In some instances, actual air velocity rather than standard velocity may be of interest. To obtain the value for actual velocity, multiply your standard velocity by the following density correction factor:

$$Actual\,Velocity = (Standard\,Velocity)\left[\frac{460+T}{460+70}\right]\left[\frac{14.7}{P}\right]$$

Where

T = Ambient temperature in degrees Fahrenheit

P = Ambient pressure in psia

If you use metric units, the equation becomes:

$$Actual\,Velocity = (Standard\,Velocity)\left[\frac{273+T_m}{273+21.1}\right]\frac{101.4}{P_m}$$

Where

T_m = Ambient temperature in degrees Celsius

P_m = Ambient pressure in kPa

Example No. 1:

You want to measure the actual velocity in a duct. The air temperature in the duct is 55°F and the pressure is 14.24 psia. You take a measurement and the display reads 1200 feet per minute (ft/min).

$$ActualVelocity = 1200\left[\frac{460+55}{460+70}\right]\frac{14.7}{14.24} = 1203.7\,ft/min$$

Example No. 2:

You need to measure the actual velocity in a plenum. The air pressure is 99.4 kPa and the temperature is 27°C. The display reading is 2.3 meters per second (m/s).

$$ActualVelocity = 2.3\left[\frac{273+27}{273+21.1}\right]\frac{101.4}{99.4} = 2.39\,m/s$$

APPENDIX E

COMPLETED NYSDEC AIR PERMIT APPLICATION

New York State Department of Environmental Conservation
Air Permit Application

DEC ID	APPLICATION ID	FOR OFFICE USE ONLY
- - -	- - /	

Section I - Certification

Title V Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information [required pursuant to 6 NYCRR 201-6.3(d)] I believe the information is, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Responsible Official	Title
Signature	Date / /

State Facility Certification

I certify that this facility will be operated in conformance with all provisions of existing regulations.

Responsible Official	Title
Signature	Date / /

Section II - Identification Information

Title V Facility Permit	State Facility Permit
• New • Significant Modification • Administrative Amendment • Renewal • Minor Modification General Permit Title:	• New • Modification General Permit Title:
• Application involves construction of new facility	• Application involves construction of new emission unit(s)

Owner/Firm

Name: Adams Boulevard Corporation

Street Address: 195 Marine Street

City: Farmingdale | State: NY | Country: US | Zip: 11735-0560

Owner Classification: • Federal • State • Municipal • Corporation/Partnership • Individual

Taxpayer ID:

Facility • Confidential

Name:

Location Address: 1 Adams Boulevard

• City / • Town • Village: Babylon, NY | Zip: 11735

Project Description • Continuation Sheet(s)

Installation and operation of a soil vapor extraction system for the remediation of PCE-impacted soil. The purpose of this application is to provide a record of the technical specifications and proposed emissions of the system.

Owner/Firm Contact Mailing Address

Name (Last, First, Middle Initial): Adamowicz, Michael		Phone No.: (631) 293-7393
Affiliation: Adams Boulevard Corporation	Title:	Fax No.: ( )
Street Address: 195 Marine Street		
City: Farmingdale	State: NY	Country: US	Zip: 11735-0560

Facility Contact Mailing Address

Name (Last, First, Middle Initial): Stoll, David		Phone No.: (518) 783-1996
Affiliation: Shaw Environmental + Infrastructure Inc	Title: Project Manager	Fax No.: (518) 783-8397
Street Address: 13 British American Boulevard		
City: Latham	State: NY	Country: US	Zip: 12110-1405

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
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Section III - Facility Information

Classification

• Hospital • Residential • Educational/Institutional • Commercial • Industrial • Utility

Affected States (Title V Only)

• Vermont	• Massachusetts	• Rhode Island	• Pennsylvania	Tribal Land:_____
• New Hampshire	• Connecticut	• New Jersey	• Ohio	Tribal Land:_____

SIC Codes

2752												

Facility Description • Continuation Sheet(s)

The site is currently operated as light industry, and is currently listed as a Class 2 Site in the New York State Registry of Inactive Hazardous Waste Disposal Site due to PCE-impacted soil and groundwater.

Compliance Statements (Title V Only)

I certify that as of the date of this application the facility is in compliance with all applicable requirements: • YES • NO

If one or more emission units at the facility are not in compliance with all applicable requirements at the time of signing this application (the 'NO' box must be checked), the noncomplying units must be identified in the "Compliance Plan" block on page 8 of this form along with the compliance plan information required. For all emission units at this facility that are operating in compliance with all applicable requirements complete the following:

- This facility will continue to be operated and maintained in such a manner as to assure compliance for the duration of the permit, except those units referenced in the compliance plan portion of Section IV of this application.
- For all emission units, subject to any applicable requirements that will become effective during the term of the permit, this facility will meet all such requirements on a timely basis.
- Compliance certification reports will be submitted at least once a year. Each report will certify compliance status with respect to each requirement, and the method used to determine the status.

Facility Applicable Federal Requirements • Continuation Sheet(s)

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Facility State Only Requirements • Continuation Sheet(s)

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
6	NYCRR	201	3.3	C	29	—	—	—	—

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
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Section III - Facility Information (continued)

Facility Compliance Certification • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

• Applicable Federal Requirement
• State Only Requirement
• Capping

CAS No. - -

Contaminant Name

Monitoring Information

• Ambient Air Monitoring • Work Practice Involving Specific Operations • Record Keeping/Maintenance Procedures

Description

Activities are to be conducted 2 and 4 weeks after startup, and monthly thereafter. Tasks include O&M of equipment and influent and effluent air sampling. Monthly reports will be submitted to the Division of Environmental Remediation - Eastern Bureau.

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description

Facility Emissions Summary • Continuation Sheet(s)

CAS No.	Contaminant Name	PTE (lbs/yr)	PTE Range Code	Actual (lbs/yr)
NY075 - 00 - 5	PM-10			
NY075 - 00 - 0	PARTICULATES			
7446 - 09 - 5	SULFUR DIOXIDE			
NY210 - 00 - 0	OXIDES OF NITROGEN			
630 - 08 - 0	CARBON MONOXIDE			
7439 - 92 - 1	LEAD			
NY998 - 00 - 0	VOC	B		
NY100 - 00 - 0	HAP [Total]	A		
00127 - 18 - 4	Tetrachloroethene	A		
00156 - 59 - 2	cis-1,2-Dichloroethene	A		
00079 - 01 - 6	Trichloroethene	A		
00156 - 60 - 5	trans-1,2-Dichloroethene	A		
00067 - 66 - 3	Chloroform	A		

New York State Department of Environmental Conservation
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Section III - Facility Information (continued)

Facility Compliance Certification • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

• Applicable Federal Requirement
• State Only Requirement

• Capping

CAS No.	Contaminant Name
- -	

Monitoring Information

• Ambient Air Monitoring • Work Practice Involving Specific Operations • Record Keeping/Maintenance Procedures

Description

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description

Facility Emissions Summary • Continuation Sheet(s)

CAS No.	Contaminant Name	PTE (lbs/yr)	PTE Range Code	Actual (lbs/yr)
NY075 - 00 - 5	PM-10			
NY075 - 00 - 0	PARTICULATES			
7446 - 09 - 5	SULFUR DIOXIDE			
NY210 - 00 - 0	OXIDES OF NITROGEN			
630 - 08 - 0	CARBON MONOXIDE			
7439 - 92 - 1	LEAD			
NY998 - 00 - 0	VOC			
NY100 - 00 - 0	HAP			
00071 - 55 - 6	1,1,1- Trichloroethane		A	
- -				
- -				
- -				
- -				

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Section IV - Emission Unit Information

Emission Unit Description • Continuation Sheet(s)

EMISSION UNIT Ø-1RM01

The emission unit is part of the Remedial Activities at the site. Polished soil vapors will be discharged from the soil vapor extraction systems.

Building • Continuation Sheet(s)

Building	Building Name	Length (ft)	Width (ft)	Orientation
1	1 Adams Boulevard	340	300	Screen 3 worst case

Emission Point • Continuation Sheet(s)

EMISSION PT.						
Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (•F)	Cross Section Length (in)	Cross Section Width (in)
Ø	30	10	84	27	—	—
Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal
37.89	200	X	X	yes	50	—

EMISSION PT.						
Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (•F)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal

Emission Source/Control • Continuation Sheet(s)

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
Carbon	K	8/02	9/02		048	Activated Carbon Ads.	EnviroSupply + Service

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description
400	118	Maximum Capacity	—	—	—	—

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description

New York State Department of Environmental Conservation
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Section IV - Emission Unit Information (continued)

Process Information

• Continuation Sheet(s)

EMISSION UNIT 0-HRM01 PROCESS SVE

Description

The SVE system will pull approximately 200 cfm soil vapor from the subsurface and 20 cfm make-up air through the carbon units.

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description
	13,200		0156	Average 220 cfm inlet

• Confidential • Operating at Maximum Capacity • Activity with Insignificant Emissions	Operating Schedule		Building	Floor/Location
	Hrs/Day	Days/Yr		
	24	365		

Emission Source/Control Identifier(s)

EMISSION UNIT - PROCESS

Description

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

• Confidential • Operating at Maximum Capacity • Activity with Insignificant Emissions	Operating Schedule		Building	Floor/Location
	Hrs/Day	Days/Yr		

Emission Source/Control Identifier(s)

New York State Department of Environmental Conservation
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Section IV - Emission Unit Information (continued)

Emission Unit	Emission Point	Process	Emission Source	Emission Unit Applicable Federal Requirements • Continuation Sheet(s)									
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-													
-													
-													
-													

Emission Unit	Emission Point	Process	Emission Source	Emission Unit State Only Requirements • Continuation Sheet(s)									
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
0-IRM01	Stack	SVE	VGAC	6	NYCRR	201	3.3	L	29				
-													
-													
-													

Emission Unit Compliance Certification • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

• Applicable Federal Requirement • State Only Requirement • Capping

Emission Unit	Emission Point	Process	Emission Source	CAS No.	Contaminant Name
-				- -	

Monitoring Information

- Continuous Emission Monitoring
- Intermittent Emission Testing
- Ambient Air Monitoring
- Monitoring of Process or Control Device Parameters as Surrogate
- Work Practice Involving Specific Operations
- Record Keeping/Maintenance Procedures

Description

Monitoring 2nd 4 weeks following startup, monthly thereafter. Monthly reports will be submitted to the New York State Department of Environmental Conservation – Eastern Bureau.

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description

New York State Department of Environmental Conservation
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Section IV - Emission Unit Information (continued)

Determination of Non-Applicability (Title V Only) • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	• Applicable Federal Requirement • State Only Requirement
-				

Description

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	• Applicable Federal Requirement • State Only Requirement
-				

Description

Process Emissions Summary • Continuation Sheet(s)

EMISSION UNIT	0-IRM01				PROCESS	S V E
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
00127-18-4	tetrachloroethene			99.7	20.7	04

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
6.2 E-2	5.43 E+2			04		

EMISSION UNIT	0-IRM01				PROCESS	S V E
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
00079-01-6	trichloro ethene			98.3	1.65	04

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
2.8 E-2	2.45 E+2			04		

EMISSION UNIT	0-IRM01				PROCESS	S V E
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
00156-59-2	cis-1,2-Dichloroethene			90	6.3	04

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
6.3 E-1	5.51 E+3			04		

New York State Department of Environmental Conservation
Air Permit Application

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Section IV - Emission Unit Information (continued)

Determination of Non-Applicability (Title V Only) • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	• Applicable Federal Requirement • State Only Requirement
-				

Description

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	• Applicable Federal Requirement • State Only Requirement
-				

Description

Process Emissions Summary • Continuation Sheet(s)

EMISSION UNIT	0-IRM01				PROCESS	SVE
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
00071-55-6	1,1,1-trichloroethene			90	0.34	04

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
3.4E-2	2.98E+2			04		

EMISSION UNIT	0-IRM01				PROCESS	SVE
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
00156-60-5	trans-1,2-Dichloroethene			90	9.2E-2	04

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
9.2E-3	8.06E+1					

EMISSION UNIT	0-IRM01				PROCESS	SVE
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
00067-66-3	Chloroform			63	7.6E-3	04

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
2.8E-3	2.45E+1			04		

New York State Department of Environmental Conservation
Air Permit Application

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Section IV - Emission Unit Information (continued)

Determination of Non-Applicability (Title V Only) • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	• Applicable Federal Requirement • State Only Requirement
-				

Description

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	• Applicable Federal Requirement • State Only Requirement
-				

Description

Process Emissions Summary • Continuation Sheet(s)

EMISSION UNIT 0-ERM01 PROCESS 5VE

CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
NY998-00-0	VOC			90	7.7	04

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
7.7E-1	6.75E+3			04		

EMISSION UNIT - PROCESS

CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -						

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)

EMISSION UNIT - PROCESS

CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -						

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)

New York State Department of Environmental Conservation
Air Permit Application

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Section IV - Emission Unit Information (continued)

EMISSION UNIT	Emission Unit Emissions Summary • Continuation Sheet(s)			
0-IRM01				
CAS No.	Contaminant Name			
00127-18-4	tetrachloroethene			
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
1.8 E+5	6.2 E-2	5.43 E+2	—	—
CAS No.	Contaminant Name			
00079-01-6	trichloroethene			
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
1.4 E+4	2.8 E-2	2.45 E+2	—	—
CAS No.	Contaminant Name			
00156-59-2	cis-1,2-Dichloroethene			
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
	6.3 E-1	5.5 E+3	—	—
CAS No.	Contaminant Name			
00071-55-6	1,1,1-trichloroethane			
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
			—	—

Compliance Plan • Continuation Sheet(s)

For any emission units which are not in compliance at the time of permit application, the applicant shall complete the following

Consent Order — Certified progress reports are to be submitted every 6 months beginning ___/___/___

Emission Unit	Process	Emission Source	Applicable Federal Requirement									
			Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-												

Remedial Measure / Intermediate Milestones	R/I	Date Scheduled

New York State Department of Environmental Conservation
Air Permit Application

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Section IV - Emission Unit Information (continued)

EMISSION UNIT	Emission Unit Emissions Summary			• Continuation Sheet(s)
0-IRM01				
CAS No.	Contaminant Name			
00156-60-5	trans-1,2-Dichloroethene			
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
	9.2 E-3	8.06 E+1		
CAS No.	Contaminant Name			
00067-66-3	chloroform			
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
6.6 E+1	2.8 E-3	2.45 E+1		
CAS No.	Contaminant Name			
NY998-00-0	VOC			
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
6.7 E+4	7.7E-1	6.75 E+3		
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)

Compliance Plan

• Continuation Sheet(s)

For any emission units which are not in compliance at the time of permit application, the applicant shall complete the following

Consent Order — Certified progress reports are to be submitted every 6 months beginning ___/___/___

Emission Unit	Process	Emission Source	Applicable Federal Requirement									
			Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-												

Remedial Measure / Intermediate Milestones	R/I	Date Scheduled

New York State Department of Environmental Conservation
Air Permit Application

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Section IV - Emission Unit Information (continued)

Request for Emission Reduction Credits • Continuation Sheet(s)

EMISSION UNIT

Emission Reduction Description

N/A

Contaminant Emission Reduction Data

Baseline Period ___/___/___ to ___/___/___

Reduction: Date ___/___/___ | Method

CAS No.	Contaminant Name	ERC (lbs/yr) Netting	ERC (lbs/yr) Offset
- -	N/A		
- -			
- -			

Facility to Use Future Reduction

Name | APPLICATION ID

Location Address

• City / • Town / • Village | State | Zip

Use of Emission Reduction Credits • Continuation Sheet(s)

EMISSION UNIT

Proposed Project Description

N/A

Contaminant Emissions Increase Data

CAS No.	Contaminant Name	PEP (lbs/yr)
- -	N/A	

Statement of Compliance

• All facilities under the ownership of this "ownership/firm" are operating in compliance with all applicable requirements and state regulations including any compliance certification requirements under Section 114(a)(3) of the Clean Air Act Amendments of 1990, or are meeting the schedule of a consent order.

Source of Emission Reduction Credit - Facility

Name N/A | PERMIT ID

Location Address

• City / • Town / • Village | State | Zip

Emission Unit	CAS No.	Contaminant Name	ERC (lbs/yr) Netting	ERC (lbs/yr) Offset
-	- -			
-	- -			
-	- -			

DEC ID
- - -

Supporting Documentation

- P.E. Certification (form attached)
- List of Exempt Activities (form attached)
- Plot Plan
- Methods Used to Determine Compliance (form attached)
- Calculations
- Air Quality Model (8 / 8 / 02) Air Guide 1/Screen 3
- Confidentiality Justification
- Ambient Air Monitoring Plan (_____ / _____ / _____)
- Stack Test Protocols/Reports (_____ / _____ / _____)
- Continuous Emissions Monitoring Plans/QA/QC (_____ / _____ / _____)
- MACT Demonstration (_____ / _____ / _____)
- Operational Flexibility: Description of Alternative Operating Scenarios and Protocols
- Title IV: Application/Registration
- ERC Quantification (form attached)
- Use of ERC(s) (form attached)
- Baseline Period Demonstration
- Analysis of Contemporaneous Emission Increase/Decrease
- LAER Demonstration (_____ / _____ / _____)
- BACT Demonstration (_____ / _____ / _____)
- Other Document(s): _____ (/ /)

_____ (/ /)
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08/09/02
10:24:49

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

NYSDEC - Heatset - 30 ft

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	9.1440
STK INSIDE DIAM (M)	=	.1020
STK EXIT VELOCITY (M/S)	=	11.5514
STK GAS EXIT TEMP (K)	=	300.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	URBAN
BUILDING HEIGHT (M)	=	6.1000
MIN HORIZ BLDG DIM (M)	=	83.8200
MAX HORIZ BLDG DIM (M)	=	106.6800

4" * (11.5514 m/s)(3.28083 ft/m) = 37.89 ft/s
300 °K - 273 = 27°C

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
VOLUME FLOW RATE = 200.00000 (ACFM)

BUOY. FLUX = .007 M**4/S**3; MOM. FLUX = .339 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 1. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	NA
100.	1809.	6	1.0	1.0	10000.0	9.33	10.79	7.46	SS
200.	859.0	6	1.0	1.0	10000.0	9.33	21.17	14.03	SS
300.	459.0	6	1.0	1.0	10000.0	9.33	31.18	19.93	SS
400.	287.7	6	1.0	1.0	10000.0	9.33	40.85	25.30	SS
500.	199.9	6	1.0	1.0	10000.0	9.33	50.21	30.24	SS
600.	148.8	6	1.0	1.0	10000.0	9.33	59.27	34.82	SS
700.	116.2	6	1.0	1.0	10000.0	9.33	68.06	39.11	SS
800.	94.09	6	1.0	1.0	10000.0	9.33	76.59	43.15	SS
900.	78.27	6	1.0	1.0	10000.0	9.33	84.89	46.97	SS
1000.	66.53	6	1.0	1.0	10000.0	9.33	92.97	50.60	SS
1100.	57.53	6	1.0	1.0	10000.0	9.33	100.83	54.06	SS
1200.	50.46	6	1.0	1.0	10000.0	9.33	108.50	57.37	SS
1300.	44.79	6	1.0	1.0	10000.0	9.33	115.99	60.55	SS
1400.	40.15	6	1.0	1.0	10000.0	9.33	123.30	63.61	SS
1500.	36.30	6	1.0	1.0	10000.0	9.33	130.44	66.56	SS
1600.	33.06	6	1.0	1.0	10000.0	9.33	137.43	69.42	SS
1700.	30.31	6	1.0	1.0	10000.0	9.33	144.27	72.18	SS
1800.	27.95	6	1.0	1.0	10000.0	9.33	150.97	74.86	SS
1900.	25.89	6	1.0	1.0	10000.0	9.33	157.54	77.47	SS
2000.	24.10	6	1.0	1.0	10000.0	9.33	163.98	80.00	SS
2100.	22.52	6	1.0	1.0	10000.0	9.33	170.30	82.47	SS
2200.	21.12	6	1.0	1.0	10000.0	9.33	176.50	84.87	SS
2300.	19.87	6	1.0	1.0	10000.0	9.33	182.59	87.22	SS
2400.	18.75	6	1.0	1.0	10000.0	9.33	188.57	89.52	SS

2500.	17.75	6	1.0	1.0	10000.0	9.33	194.45	91.77	SS
2600.	16.83	6	1.0	1.0	10000.0	9.33	200.24	93.96	SS
2700.	16.01	6	1.0	1.0	10000.0	9.33	205.93	96.12	SS
2800.	15.25	6	1.0	1.0	10000.0	9.33	211.54	98.23	SS
2900.	14.56	6	1.0	1.0	10000.0	9.33	217.05	100.30	SS
3000.	13.92	6	1.0	1.0	10000.0	9.33	222.49	102.34	SS
3500.	11.40	6	1.0	1.0	10000.0	9.33	248.52	112.00	SS
4000.	9.616	6	1.0	1.0	10000.0	9.33	272.88	120.95	SS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

30.	3082.	3	1.0	1.0	320.0	8.33	6.78	6.20	SS

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
* SUMMARY OF TERRAIN HEIGHTS ENTERED FOR *
* SIMPLE ELEVATED TERRAIN PROCEDURE *
****

TERRAIN HT (M)	DISTANCE RANGE (M) MINIMUM	MAXIMUM
1.	1.	4000.

****
*** REGULATORY (Default) ***
PERFORMING CAVITY CALCULATIONS
WITH ORIGINAL SCREEN CAVITY MODEL
(BRODE, 1988)
****

*** CAVITY CALCULATION - 1 ***		*** CAVITY CALCULATION - 2 ***	
CONC (UG/M**3) =	.0000	CONC (UG/M**3) =	.0000
CRIT WS @10M (M/S) =	99.99	CRIT WS @10M (M/S) =	99.99
CRIT WS @ HS (M/S) =	99.99	CRIT WS @ HS (M/S) =	99.99
DILUTION WS (M/S) =	99.99	DILUTION WS (M/S) =	99.99
CAVITY HT (M) =	6.10	CAVITY HT (M) =	6.10
CAVITY LENGTH (M) =	34.75	CAVITY LENGTH (M) =	33.07
ALONGWIND DIM (M) =	83.82	ALONGWIND DIM (M) =	106.68

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

****
END OF CAVITY CALCULATIONS
****

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	3082.	30.	1.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

SVE System Emissions and Impacts
NYSDEC Heatset-200 scfm-30ft
NYSDEC Heatset

Inlet flow 200 scfm

3082 ug/m3, Unit Emission Rate Impact 30ft STACK

LFG Compound	HAP	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff [b, c]	Needed Outlet Conc (ppmv)[a]	Exhaust lb/hr	Exhaust lb/yr	Unit Rate (1-hr) Impact (ug/m3)	24-hr (1-hr*0.4) Impact (ug/m3)	Annual (1-hr*0.08) Impact (ug/m3)	NYSDEC SGC (ug/m3)	NYSDEC AGC (ug/m3)
1,1,1 - Trichloroethane (methyl chloroform)	x	133.42	4.00	**0.00**	**4.00**	1.7e-2	1.5e+2	6.55	2.62	0.52	68000	1000
Chloroform	x	119.39	1.00	**0.63**	**0.37**	1.4e-3	1.2e+1	0.54	0.22	0.043	150	0.043
Perchloroethylene (tetrachloroethylene)	x	165.83	1700.00	**0.997**	**5.95**	3.1e-2	2.7e+2	12.11	4.84	0.97	1000	1
c - 1,2 - Dichloroethene (1,2 dichloroethylene)		96.94	102.50	**0.00**	**102.50**	3.1e-1	2.8e+3	121.95	48.78	9.76		1900
t - 1,2 - Dichloroethene (1,2 dichloroethylene)		96.94	1.50	**0.00**	**1.50**	4.6e-3	4.0e+1	1.78	0.71	0.14		1900
Trichloroethylene (trichloroethene)	x	131.38	195.00	**0.983**	**3.32**	1.4e-2	1.2e+2	5.35	2.14	0.428	54000	0.45

3344.82 lbs/year

Potential Flow 400 scfm

LFG Compound	Exhaust lb/hr	Exhaust lb/yr
1,1,1 - Trichloroethane (methyl chloroform)	3.4e-2	3.0e+2
Chloroform	2.8e-3	2.4e+1
Perchloroethylene (tetrachloroethylene)	6.2e-2	5.5e+2
c - 1,2 - Dichloroethene (1,2 dichloroethylene)	6.3e-1	5.5e+3
t - 1,2 - Dichloroethene (1,2 dichloroethylene)	9.2e-3	8.1e+1
Trichloroethylene (trichloroethene)	2.8e-2	2.4e+2

6689.64 lbs/year

SVE System Emissions and Impacts
NYSDEC Heatset-200 scfm-25ft
NYSDEC Heatset

Inlet flow 200 scfm

4614 ug/m3, Unit Emission Rate Impact 25ft STACK

LFG Compound	HAP	MW (lb/lb-mol)	Conc (ppmv)[a]	Control Eff [b, c]	Needed Outlet Conc (ppmv)[a]	Exhaust lb/hr	Exhaust lb/yr	Unit Rate (1-hr) Impact (ug/m3)	24-hr (1-hr*0.4) Impact (ug/m3)	Annual (1-hr*0.08) Impact (ug/m3)	NYSDEC SGC (ug/m3)	NYSDEC AGC (ug/m3)
1,1,1 - Trichloroethane (methyl chloroform)	x	133.42	4.00	**0.00**	**4.00**	1.7e-2	1.5e+2	9.81	3.92	0.78	68000	1000
Chloroform	x	119.39	1.00	**0.76**	**0.24**	9.1e-4	7.9e+0	0.53	0.21	0.042	150	0.043
Perchloroethylene (tetrachloroethylene)	x	165.83	1700.00	**0.998**	**3.40**	1.8e-2	1.6e+2	10.36	4.14	0.83	1000	1
c - 1,2 - Dichloroethene (1,2 dichloroethylene)		96.94	102.50	**0.00**	**102.50**	3.1e-1	2.8e+3	182.56	73.02	14.60		1900
t - 1,2 - Dichloroethene (1,2 dichloroethylene)		96.94	1.50	**0.00**	**1.50**	4.6e-3	4.0e+1	2.67	1.07	0.21		1900
Trichloroethylene (trichloroethene)	x	131.38	195.00	**0.989**	**2.15**	8.9e-3	7.8e+1	5.18	2.07	0.414	54000	0.45

3180.90 lbs/year

Potential Flow 400 scfm

LFG Compound	Exhaust lb/hr	Exhaust lb/yr
1,1,1 - Trichloroethane (methyl chloroform)	3.4e-2	3.0e+2
Chloroform	1.8e-3	1.6e+1
Perchloroethylene (tetrachloroethylene)	3.6e-2	3.1e+2
c - 1,2 - Dichloroethene (1,2 dichloroethylene)	6.3e-1	5.5e+3
t - 1,2 - Dichloroethene (1,2 dichloroethylene)	9.2e-3	8.1e+1
Trichloroethylene (trichloroethene)	1.8e-2	1.6e+2

6361.80 lbs/year

IT CORPORATION
A Member of The IT Group

By JAS Date 8/14/02 Subject Heatset Sheet No. 1 of

Chkd. By Date Proj. No. 80290

.25 in. X .25 in.

Heatset Air permit Calcs:

Page 7, Process Emissions Summary:

PCE: ERP (#/hr) = $\frac{6.2E-2}{0.003}$ = 20.66 ≈ 20.7 #/hr

cis-1,2-Dichloroethene: assume 90% removal efficiency

ERP = $\frac{6.3E-1}{0.10}$ = 6.3 #/hr

1,1,1-Trichloroethene = $\frac{3.9E-2}{0.10}$ = 0.39 #/hr

trans-1,2-Dichloroethene = $\frac{9.2E-3}{0.10}$ = 9.2E-2 #/hr

VOC: $\frac{7.7E-1}{0.10}$ = 7.7 #/hr

APPENDIX F

PID INFORMATION SHEET

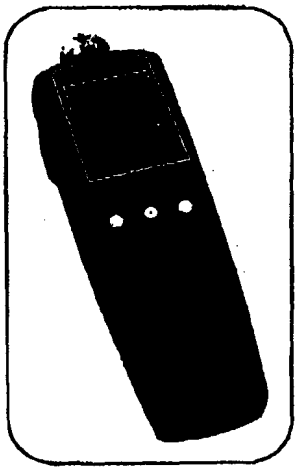
Attn: Marie Dowd
518-783-8399

Photovac

SPECIFICATIONS

2020 PHOTOIONIZATION AIR MONITOR

Size	25.4 cm (10") long, 7.6 cm. (3") wide, 5 cm (2") high
Weight	0.8 kg (1.75 lbs.)
Detector	Instant on photoionization detector with standard 10.6eV UV lamp, optional 11.7 eV lamp available
Keypad	6 keys, 3 function keys and 3 menu keys
Status Display	2-line, 16-character dot-matrix, backlit, liquid crystal display for alphanumeric readouts and menu key display
Meter Display	4-digit for real-time concentration readout with backlight
Datalogger Memory	16 kilobytes or 1000 entries
Serial Output	RS – 232, 9600 baud, 8 data bits with no parity, for tabular and graphic printouts and connection to Windows® based PC
Audio Output	95 decibels @ 2048Hz, on Alarm
Inlet Connection	1/8" compression fitting
Operating Temperature Range	0°C to 40°C (32°F to 105°F)
Operating Humidity Range	0 to 100% relative humidity (non-condensing)
Operating Concentration Range	0.5 ppm to 2000 ppm isobutylene equivalent
Response Time	Less than 3 seconds, to 90%
Accuracy	± 10 % or ± 2 ppm, whichever is greater
Low Detection Limit	0.5 ppm Isobutylene
Intrinsic Safety	Class I, Division 1, Groups A, B, C, & D Zone 1 locations, Eex ib m IICT4, Demko No. 95D 119 472



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PHOTOVAC

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APPENDIX G

SOIL SAMPLE COLLECTION PROCEDURE

The following steps may be used as a guideline for the collection of soil samples inside the site building at the National Heatset Printing Site to compare subsurface conditions to closure standards.

- Direct push drilling methods will be used to install the soil borings. The drilling equipment must be capable of coring through the concrete floor slab thickness of approximately eight inches. The soil borings will be approximately 1 to 2 inches in diameter.
- The sample collection tools must be decontaminated prior to initial use at the site. With the exception of the use of acetate liners, which are consumable materials, the sample collection tools must be decontaminated prior to reuse at subsequent soil boring locations. Decontamination of sampling equipment shall include, but not be limited to: washing and scrubbing the tools with a brush to remove adhered soil, rinsing the equipment with a water/cleaning agent mixture, and a subsequent rinse with distilled water. Liquids generated during decontamination shall be stored on-site on a drum pending disposal in accordance with State, Local and Federal regulations.
- As the borings are installed, soil samples will be collected in two-foot intervals. The soil samples shall be split vertically in half; one half shall be utilized for field screening and the other shall be stored in a jar pending laboratory analysis for VOCs.
- Each soil boring shall be advanced until the water table has been reached. Soils will be field screened for VOCs with a photo-ionization detection (PID) meter equipped with an 11.7 eV lamp. Soil descriptions with respect to geologic characteristics, lithology and field screening results will be recorded on an appropriate drill log.
- A soil sample with the highest PID reading from each boring location will be sent for laboratory analysis. Additional samples may be submitted for laboratory analysis at the discretion of the NYSDEC representative.
- Once each soil boring has been completed, it shall be filled with native soils and the concrete surface will be restored to existing grade.