

FEB '96

03-16-000301

**Job Specifications  
For The  
Remedial Action Plan  
At The  
Moose Junction Lounge**



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For The  
Remedial Action Plan  
At The  
Moose Junction Lounge**

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03-16-000301

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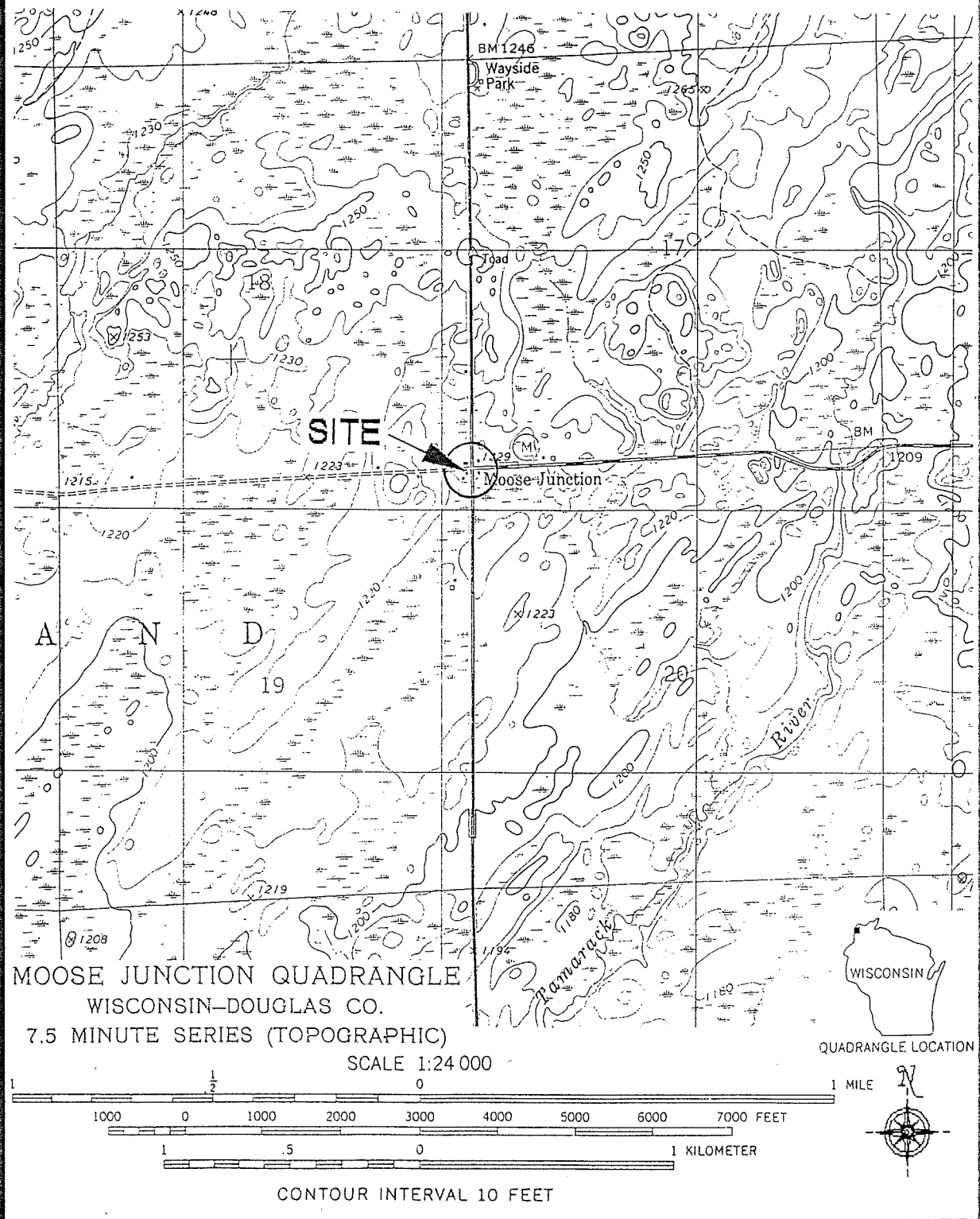
## 1.0 SUMMARY OF WORK

Earth Burners, Inc. (EBI) provides this Construction Specifications for a pilot remedial system at the Moose Junction Lounge (See Figure 1-1) to the Wisconsin Department of Natural Resources (WDNR) for their review. The air sparging/soil vapor extraction pilot system was designed after the PECFA organization (part of the Department of Industry, Labor and Human Resources (DILHR) was informed that this was the most economical comprehensive remedial system. The WDNR Unique Site # is 0301. If the pilot system is successful and the contaminant plume is outside of the pilot system zone of remediation, additional sparge point(s) and angled vapor extraction wells under the intersection of County Road M and State Highway 35 could be installed to complete the remedial efforts.

The following is a list of tasks to be completed to construct and test the proposed remedial system:

- Attain WDNR approval for the equipment proposed in this pilot system construction design.
- Contact Head of the Lakes Electric to determine if their underground electrical lines are within the remedial system boundary.
- Call Century Telephone to ensure their communication cables will not be effected.
- Measure the distance to the former (presently unoccupied) Margaret Dickman residence to determine if the migrating vapors could accumulate in the basement of the residence (WDNR guidance suggests at least 100 feet between the house and the remedial system).
- Meet with Wisconsin Department of Transportation officials to gain access for portions of the remedial system that will be on their property. Determine if the pine trees are on WisDOT property and whether they must be removed.
- Initiate a WDNR Air Quality Permit to continue the pilot system, if needed.
- Order all necessary components of the remedial system realizing the most economical suppliers.
- Arrange electrical connections for site power.
- Install the system according to approved specifications. Construct system housing and security fences as needed.

# EARTH BURNERS INC



**MOOSE JUNCTION LOUNGE  
SITE LOCATION MAP**

**FIGURE 1-1**

- Complete dissolved oxygen baseline and record monitoring well levels prior to system start-up.
- After pilot system start-up, monitor air emissions, record groundwater levels, collect dissolved oxygen data, and measure sparging/venting flow rates to determine success/failure of the system during initial 24 hours of system operation.
- Assure that migrating contaminants from the air sparging will not affect human health or affect the immediate environment.
- Reduce data, and determine any modifications needed to improve system performance. Repeat 24 hour pilot test if necessary.
- Ascertain the air sparging/vapor extraction system horizontal and vertical zone of influence.
- Obtain an air emissions permit if necessary to continue running the pilot system.
- Further monitor air emissions and complete groundwater sampling to assist in determining the remedial rates.
- Report data to the WDNR on a monthly basis.
- Install, log and sample a soil boring in near the road intersection to discover if the contaminants have remediated under the road. Install additional sparge/vapor extraction points if necessary. Monitor the remedial system on a regular basis.

## **2.0 REMEDIAL SYSTEM**

The system components will consist of :

- Regenerative blower to supply air to the two air sparge points.
- Regenerative air pump to supply a vacuum for the two horizontal vapor extraction wells.
- Two air sparge wells outfitted with a tee connection, a pressure gauge, throttle valve, check valve, and ports for an air flow meter and thermometer.
- Two lateral vapor extraction wells outfitted with a sample port, flow meter port, thermometer port, valve and threaded locking cap.

- o Two inch threaded PVC piping used for both the air sparging and the vapor extraction wells.
- o A water knock out tank will be required because of the rise in water level during system operation may cause the shallow groundwater level to rise into the vapor extraction trenches. The trenches cannot be made shallower without causing a preferential path to the surface beyond the collection system.
- o If required by air emission standards, a carbon filter/air stripping system could be used to eliminate explosive or toxic vapors. Methyl Tertiary Butyl Ether (MTBE), which may be present in the groundwater, may shorten the remedial life span of the carbon filters.

Proposed locations of the remedial system can be viewed in Figure 2-1. An overall view of the air sparging/vapor extraction flow process can be seen in Figure 2-2.

### **2.1 Air Sparging**

The heart of the air sparging system will be GAST R7100A2 oil-less regenerative blower outfitted with a 10 horsepower motor. Design of the air sparging wells are shown in Figure 2-3. The air sparging manifold diagram is located in Figure 2-4.

### **2.2 Soil Vapor Extraction**

Petroleum vapors will be collected by horizontal extraction wells installed approximately three to four feet below grade (just above the seasonal high groundwater level). A typical horizontal well can be seen in Figure 2-5 with a cross section of the trench in Figure 2-6. The soil vapor extraction manifold diagram is located in Figure 2-7.

### **2.3 Water Knock-out Tank**

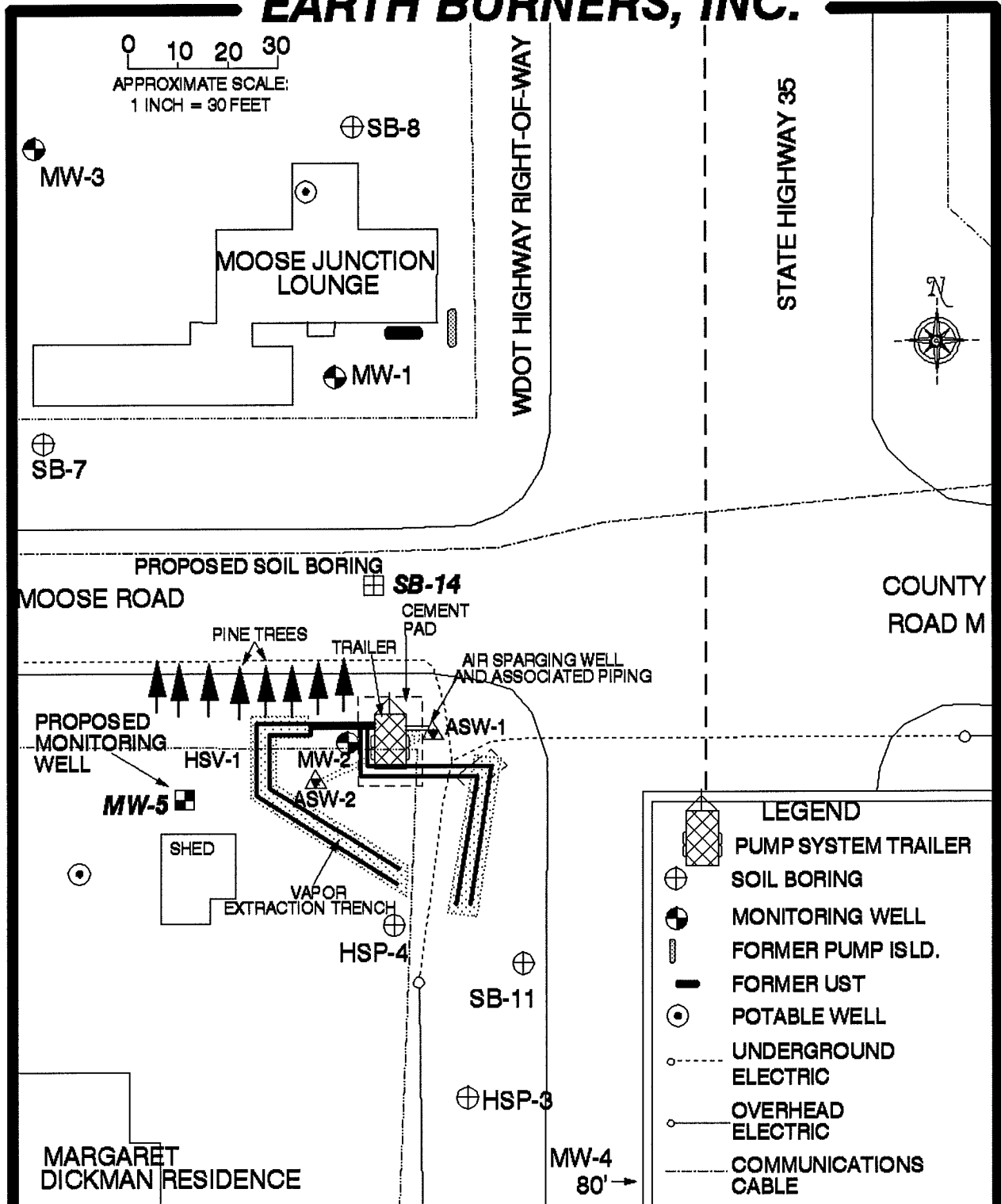
A water Knock-out tank will be required because of the near surface water conditions. The system will be located between the vapor extraction manifold and the vacuum pump. The system will consist of a 55 gallon tank with a level indicator, a drain and a high water level shut-off switch.

### **2.4 Excavation and Trenching**

Excavation of the soil vapor extraction trenches will not be accomplished until the Diggers Hotline has been contacted and all utilities are cleared. EBI expects the system will be close to both the Head of the Lakes Electrical Co-op underground power line and the Century Telephone low voltage lines. A contingency for the excavation of contaminated soils will be required unless the WDNR allows the return of the soils as trenching backfill.



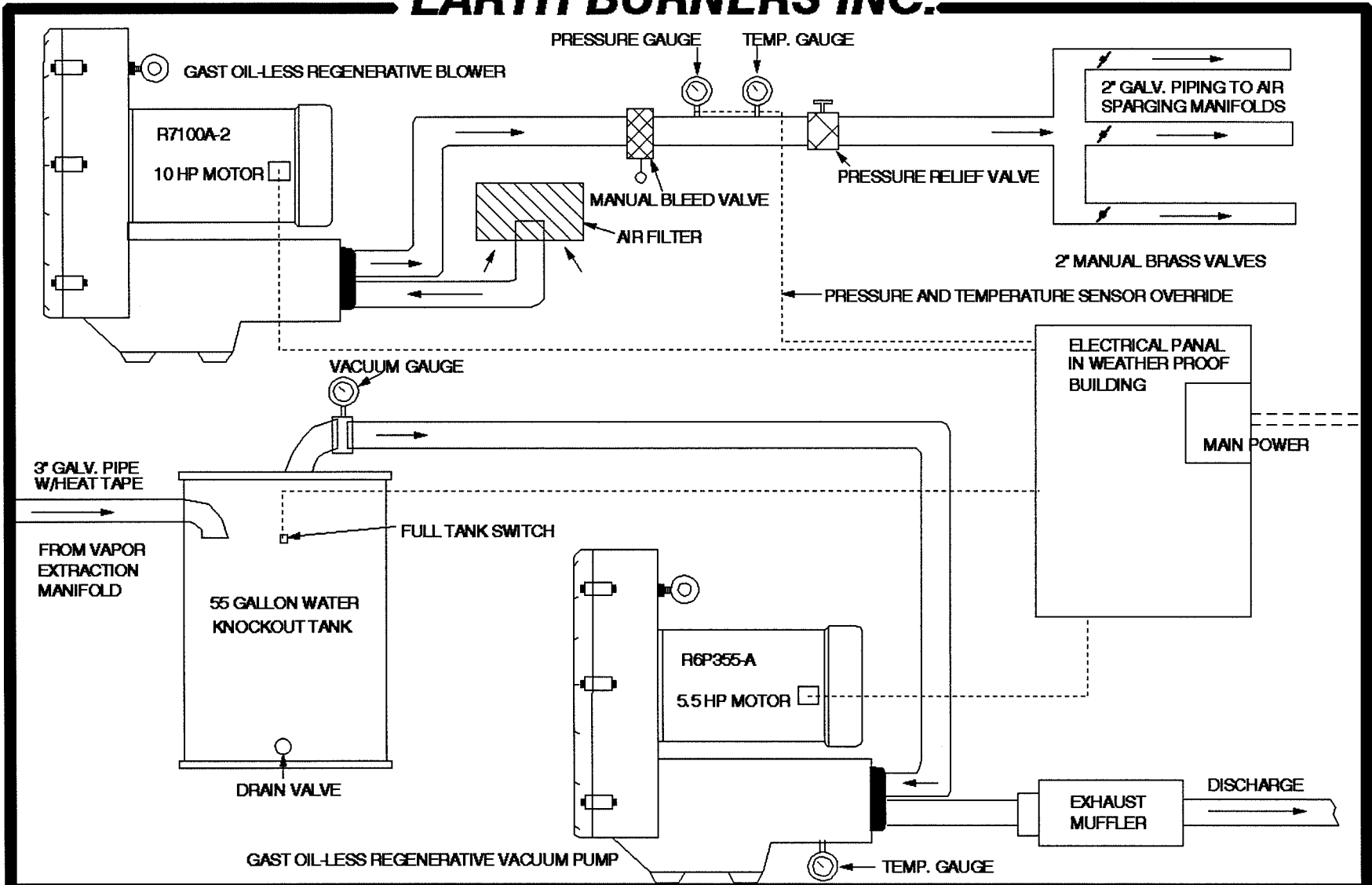
# EARTH BURNERS, INC.



**MOOSE JUNCTION LOUNGE  
AIR SPARGING/VAPOR EXTRACTION SYSTEM LOCATION**

**FIGURE 2-1**

# EARTH BURNERS INC.



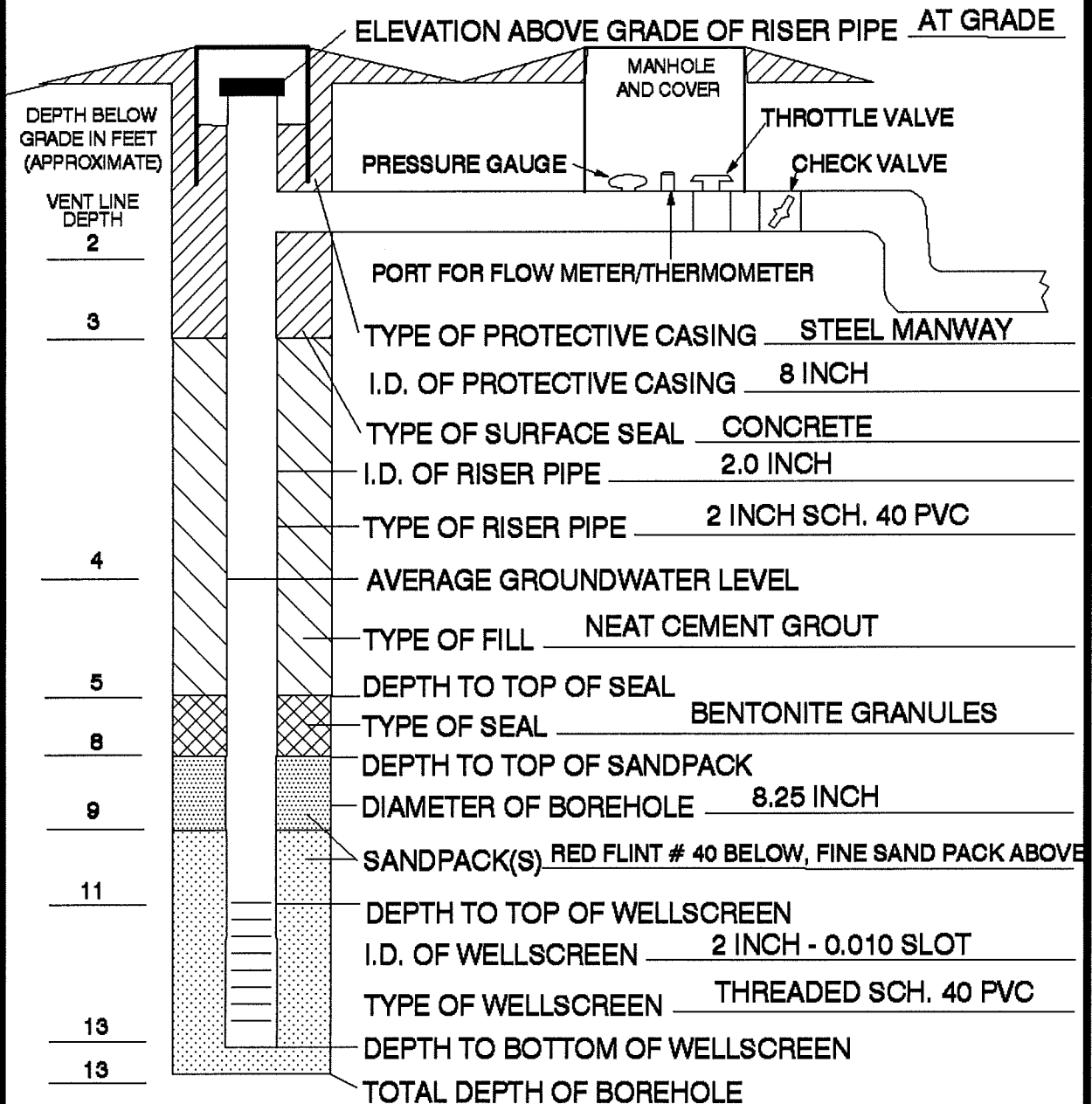
**MOOSE JUNCTION LOUNGE  
AIR SPARGING/VAPOR EXTRACTION REMEDIAL SYSTEM**

**FIGURE 2-2**

RWB 1/96

# EARTH BURNERS, INC.

UNIQUE WELL # \_\_\_\_\_ AIR SPARGING WELL # ASW-1/ASW-2  
 SITE MOOSE JUNCTION LOUNGE CONTRACTOR UNDETERMINED  
 DATE UNDETERMINED DRILLER UNDETERMINED  
 PROJECT # R424, WDNR # 0301 SITE ENGINEER LES CONWAY P.E.



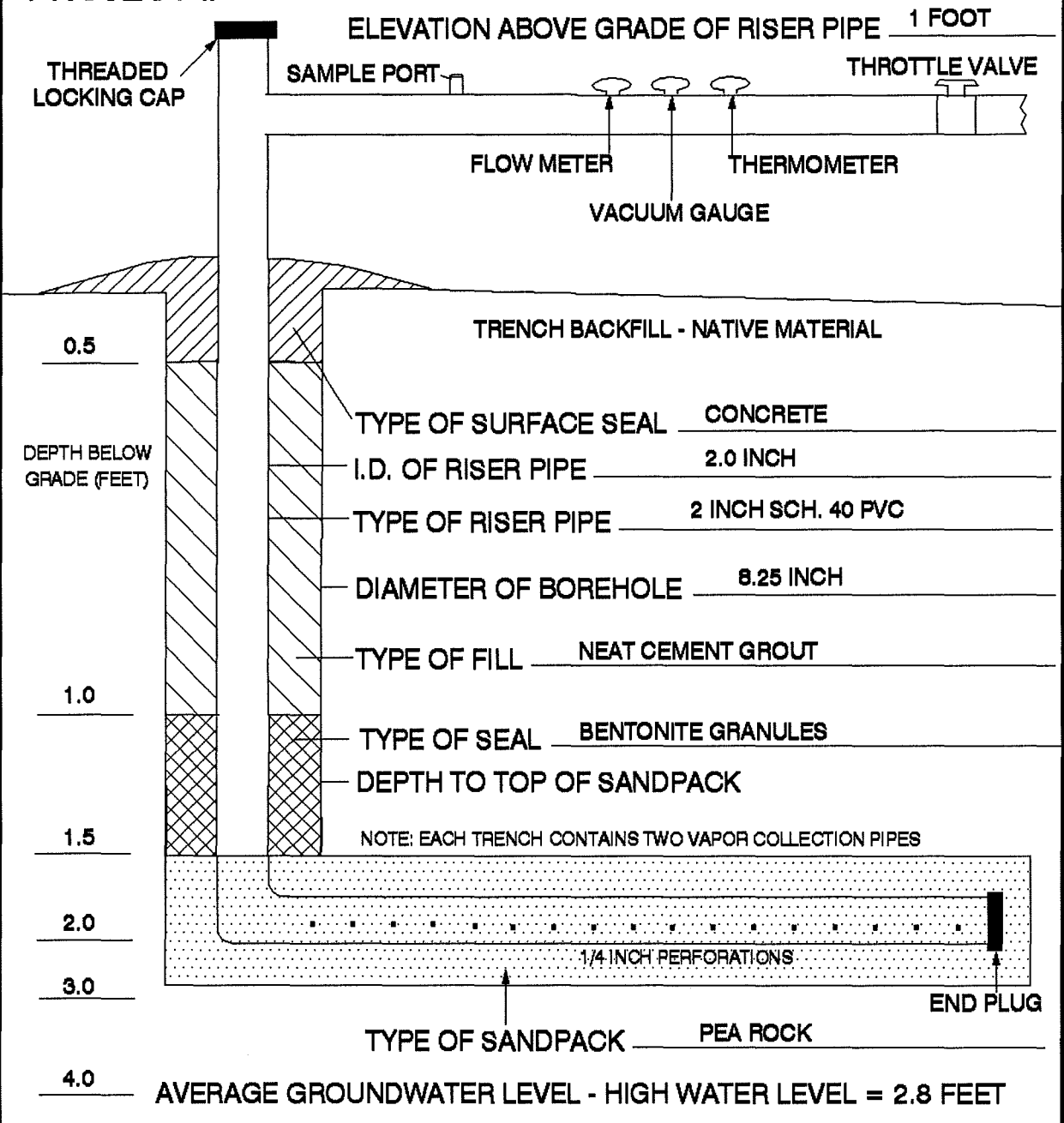
**MOOSE JUNCTION LOUNGE**  
**AIR SPARGING WELL LOG**

FIGURE 2-3



# EARTH BURNERS, INC.

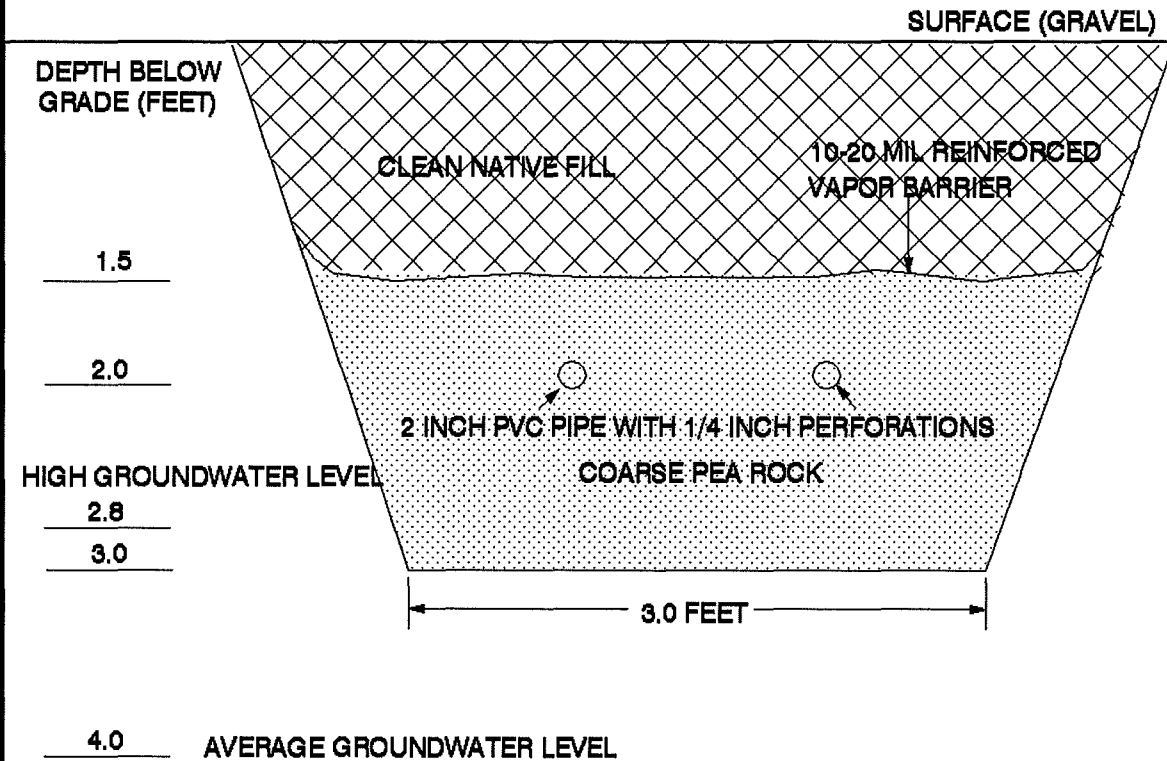
UNIQUE WELL # \_\_\_\_\_ AIR EXTRACTION WELL HSV-1, HSV-2  
 SITE MOOSE JUNCTION LOUNGE CONTRACTOR UNDETERMINED  
 DATE NA DRILLER UNDETERMINED  
 PROJECT # R424, WDNR # 301 SITE ENGINEER LES CONWAY



**MOOSE JUNCTION LOUNGE  
 HORIZONTAL VAPOR EXTRACTION WELL LOG**

**FIGURE 2-5**

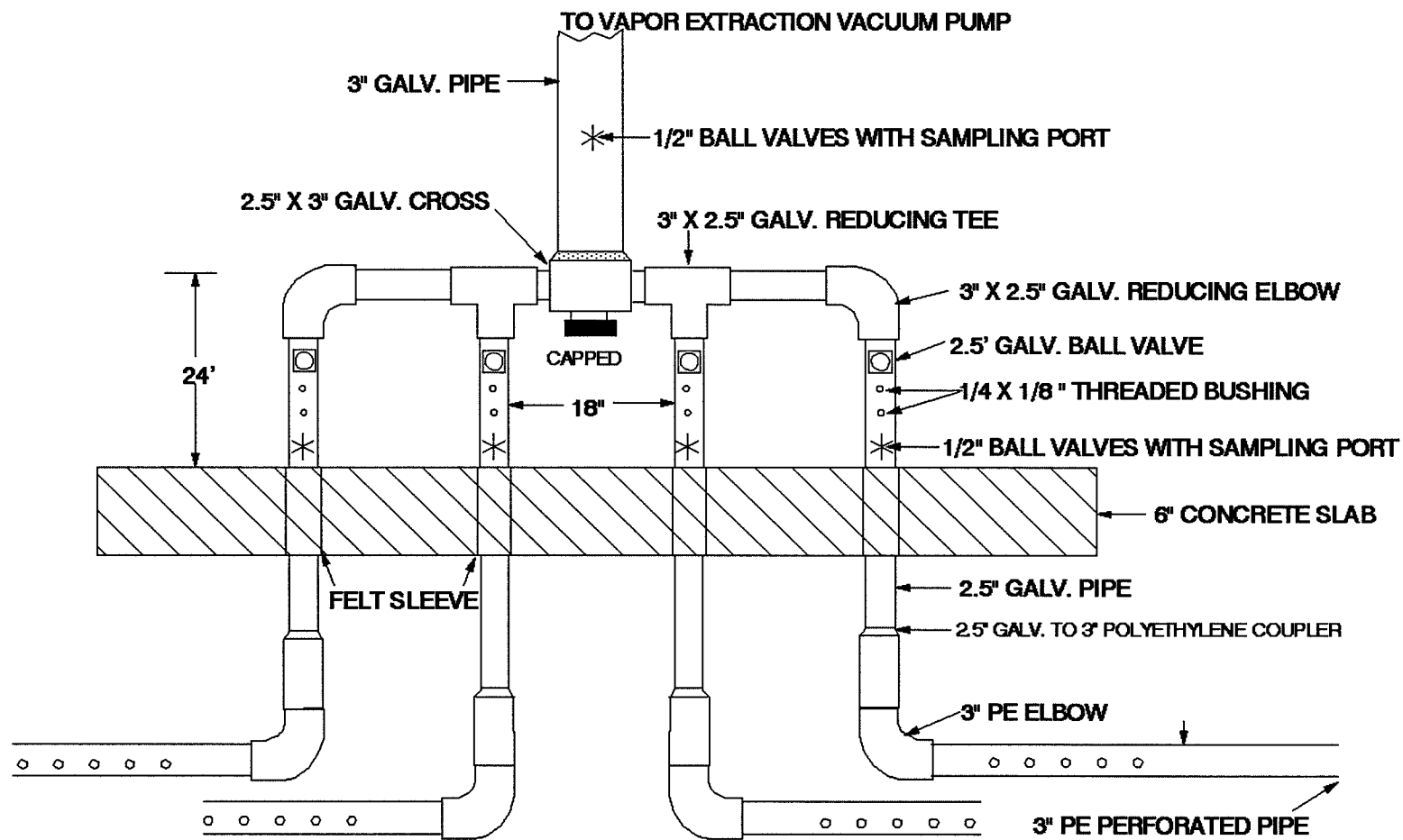
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MOOSE JUNCTION LOUNGE  
TRENCH DIAGRAM FOR VAPOR EXTRACTION

FIGURE 2-6

# EARTH BURNERS INC.



ALL EXPOSED GALVANIZED PIPE WILL BE HEAT TAPED AND COVERED WITH INSULATION

NOT TO SCALE

MOOSE JUNCTION LOUNGE REMEDIAL ACTION PLAN  
VAPOR EXTRACTION HEADER DESIGN

FIGURE 2-7

RWB: 1/96

## 2.5 Site Preparation/System Design

Site preparation will consist of the following:

- o Clear all obstructions from the proposed system area.
- o Arrange electrical power to the site.
- o Check all utility locations through Diggers Hotline.
- o Control all erosion through the use of staked bales and other industry standards where applicable.

The air sparging system is designed to run at a maximum of 4.2 PSI (115 inches water column) at 0.5 - 20 standard cubic feet per minute (scfm). The vapor extraction system has a maximum extraction of 280 scfm. It is expected to pump between 2 and 80 scfm, or at least four times the air sparging rate. The maximum psi the air sparging well can be operated is determined by the weight of the soil above the screen level of the shallowest sparge well. Using the following parameters, the maximum psi is calculated as 8.3 psi.

Weight of soil = (length of soil above the screen) \* (soil particle density) \* (1 - soil porosity) \* (water weight per ft<sup>3</sup>) then: = (9') \* (2.7) \* (1 - 0.3) \* (62.4 lbs/ft<sup>3</sup>) = 1061 lb/ft<sup>2</sup>

Weight of water = (length of water column) \* (water density) \* (saturated porosity) \* (water weight per ft<sup>3</sup>) then: = (7') \* (1) \* (0.3) \* (62.4 lbs/ft<sup>3</sup>) = 131 lb/ft<sup>2</sup>

Maximum psi = 1061 + 131 = 1192 lb/ft<sup>2</sup> divided by 144 in<sup>2</sup> per ft<sup>2</sup> = 8.3 psi.  
This pressure will not be approached as fracturing of the aquifer may result.

## 2.6 Schedule/Monitoring

The next groundwater sampling event will be scheduled approximately one week after the pilot system has been tested. Because the remedial system rate and the volume of contaminants are unknown, a remedial schedule cannot be predicted at this time. Table 8-1 shows an estimated schedule concerning groundwater sampling and remediation.

Because of the deep snow conditions and the depth of the frost, the project will be delayed until the spring of 1996. Heavy equipment such as the drill rig will be used prior to the anticipated date of road restrictions. The estimated schedule for soil/groundwater remediation activities at the Moose Junction Lounge LUST site is as follows:



**Table 2.1 - Remedial System Schedule**

## Work schedule

## Week #      Activity

# 1. After specification approval by the WDNR, EBI will arrange subcontractors and procure supplies, ensure site access permits are current, and complete another dissolved oxygen baseline.

# 3. Install air sparging/vapor extraction wells. Electrical power lines will be moved if necessary. Install system monitoring wells as needed.

# 4. Install regeneration pumps, electrical panel, connect electrical system to power source, build concrete pad and system control trailer, remove trees, and coordinate activities with the WDNR.

# 6. Pilot test system start-up, monitor system, set optimum rates.

# 7. Determine if system will remediate soils and groundwater, write treatability report.

# 8. First groundwater sampling after system start-up (all wells).

# 12. Install additional air sparging/vapor extraction components, if required.

# 14. Start remedial system.

# 16. Second groundwater sampling (MW-2 only).

# 18. Third groundwater sampling event (MW-2 only).

# 20. Fourth groundwater sampling, (all wells); examine groundwater data to determine remedial results.

# 24. If the groundwater analytics indicate remediation is complete, the system will be shutdown.

# 32. Fifth groundwater sampling; evaluate groundwater data, either restart system or plan system removal.

# 44. Sixth groundwater sampling event.

# 56. Seventh groundwater sampling event.

# 70. Eighth groundwater sampling. If analytical results are below WDNR enforcement standards for one year, site closure will be requested.

## **2.7 Permits/Access Agreements**

Access agreements will be needed to install the air sparging/vapor extraction on the Wisconsin Department of Transportation (WisDOT) property. An access agreement with the late Margaret Dickman Estate has been gained for remedial activities. An underground electrical power cable is near the proposed system. Caution will be exercised when installing the remedial system near the power line. Communication lines near the proposed remedial site may also be affected by the remedial system operation. EBI will confer with their personnel if the nearby lines will be affected by the remedial system. Because of the high concentration of petroleum contaminants in the proposed area, it is expected that an air quality control permit will be required. The permit will be applied for immediately after a successful 24 hour pilot test. Access agreements can be seen in Appendix A.

## **2.8 Site Closure**

Analytical results from MW-2 will determine the success of the system. If the system air monitoring shows a steady, but slow decline in VOC, the groundwater monitoring will continue quarterly. The contamination declination rate may help determine the length of time the system will need to operate.

If the soil boring is contaminated above 100 ppm GRO, an angled sparge well and two angled vapor extraction wells could be installed and outfitted to the proposed system.

After groundwater monitoring indicates air sparging/vapor extraction has reduced contaminant levels under the WDNR Enforcement Standards for four consecutive groundwater sampling events, site closure will be requested. If granted, the site will be properly abandoned by removing and/or sealing monitoring, air sparging, and vapor extraction wells. The wells will be sealed according to Chapter NR 141, the WDNR groundwater monitoring well requirements. The monitoring well casings will either be removed or cut two feet below grade and the boring sealed with neat cement grout. A report will be sent to the WDNR and, if all requirements are met, a site closure should be granted.

### 3.0 MATERIAL AND EQUIPMENT

**Table 3.1 - Remedial System equipment list.**

MOOSE JUNCTION EQUIPMENT LIST			
Soil Venting/Air Sparging Pilot Test			
System	Item	Estimated Costs	Source/Manufacturer
Sparge Well	2 Wells		
Components			
	Well Covers (4 ea)	280	Goodin, Company
	2" PVC Riser Piping (20')	40	"
	2" PVC Tee (2 ea)	10	"
	2" PVC Screen (2') (2 ea)	50	"
	2" PVC PCC Couplers (2 ea)	15	"
	Bentonite Seal (5 bags)	50	Standard Brick
	Bentonite Slurry ( 2 bags)	20	" "
	Portland Concrete (4 bags)	30	" "
	Check Valves (2 ea)	?	Goodin
Sparge Well			
Plumbing			
	2" Galvanize pipe (10 feet)	40	Goodin
	2" Galvanize Cross (1 ea)	21	"
	2" x 1" Reducing Tees (2 ea)	16	"
	1" Bronze Ball Valve (2 ea)	20	"
	Pressure Gauge (2 ea)	320	"
	1/4" x 1/8" Bushing (2 ea)	2	"
	Flow Gauge (2 ea)	140	ERDCO
	1 1/2" Galvanize Pipe (30 ft)	90	Goodin
	2" x 1 1/2" Bushing (1 ea)	3	"
	2" x 2" PE Coupler (2 ea)	25	"

Table 3.1 - Remedial System equipment list continued.

MOOSE JUNCTION EQUIPMENT LIST			
System	Item	Estimated Costs	Source/Manufacturer
Sparge Pump	Oil-less Regenerative Blower	2500	Gast Model R6PS3110M
			Midwest Machine Tool Sup.
Extraction Pump	Oil-less Regenerative Pump	1500	Gast Model R7100
			Midwest Machine Tool Sup.
Extraction System	Water Knock Out Tank		Gast RMS 200
Components	3" Galvanized (10 ft)	60	Goodin
	1/2" Ball Valve with 1/3" Port	5	"
	2 1/2" x 3" Reducing Cross (1 ea)	30	"
	3" x 2 1/2" Galv. Reducing Elbow (2 ea)	41	"
	2 1/2" Galv. Ball Valve ( 2 ea)	250	"
	1/4" x 1/8" Threaded Bushing (4 ea)	4	"
	1/2" Ball Valve Port (2 ea)	10	"
	2 1/2" Galv. Pipe (10 ft)	50	"
	3" PE to 2 1/2" Galv. Coupler (2 ea)	60	"
	3" Perforated Pipe (60 ft)	720	"
	Threaded Locking Cap (2 ea)	22	"
Other	Trench sand and backfill 65 cy	650	Duluth, Superior Blacktop
	Pea Rock 2' x 3' x 60' = 13 cy	260	Duluth, Superior Blacktop
	20 ml Reinforced Plastic (one roll)	640	C.H. Hanson
	Heat Tape	100	Menards
	10' X 18' X 6" Concrete Pad (1 ea)	800	Installed
	Fence ( 80 ft)	1,500	Dinehery
	Sparge/Extraction Pump Trailer (8' x 12')	3,500	Earth Burners, Inc
	Three phase electrical Hookup	4,000	Head of the Lakes, Electric
	Electrical Panel	3,300	Pnuemercator
	Electrical Contractor Wiring/Components	5,000	Determined by subcontract
	Electrical Wiring/Components	500	Lump sum/subcontract

#### **4.0 CONSTRUCTION FACILITIES**

In the Revised Remedial Action Plan for the Moose Junction Lounge (Oct. 30, 1995), EBI proposed two sheds to protect the air sparging and vapor extraction system. Because of the limited area at this site, a single mobile unit will be more efficient. The costs are expected to be near the same. Therefore, the facility to house the pump equipment and other pilferage items should be constructed on a small trailer. The trailer could be placed in a more suitable location if the pilot test and subsequent borings indicate system expansion is required. The trailer will need to be insulated to ensure freezing conditions do not ruin equipment. Because the length of time of remedial measures cannot be anticipated at this time, an electric heater with a variable thermostat will be necessary as the site area normally has seven to eight months of freezing temperatures.

The trailer will double as a site security and equipment storage. Figure 4-1 shows a plan view of the proposed trailer layout. The site trailer should be constructed on a tandem axle as the air sparging system (including electrical panel) is expected to weigh at least 3,500 pounds. The trailer is required to have all amenities to travel Wisconsin state highways. This includes brake, turn signal, and running lights. The trailer will be required to have electric brakes with breakaway switch. Dimensions for the trailer are 12 feet long by 7 feet wide by 6 feet high.

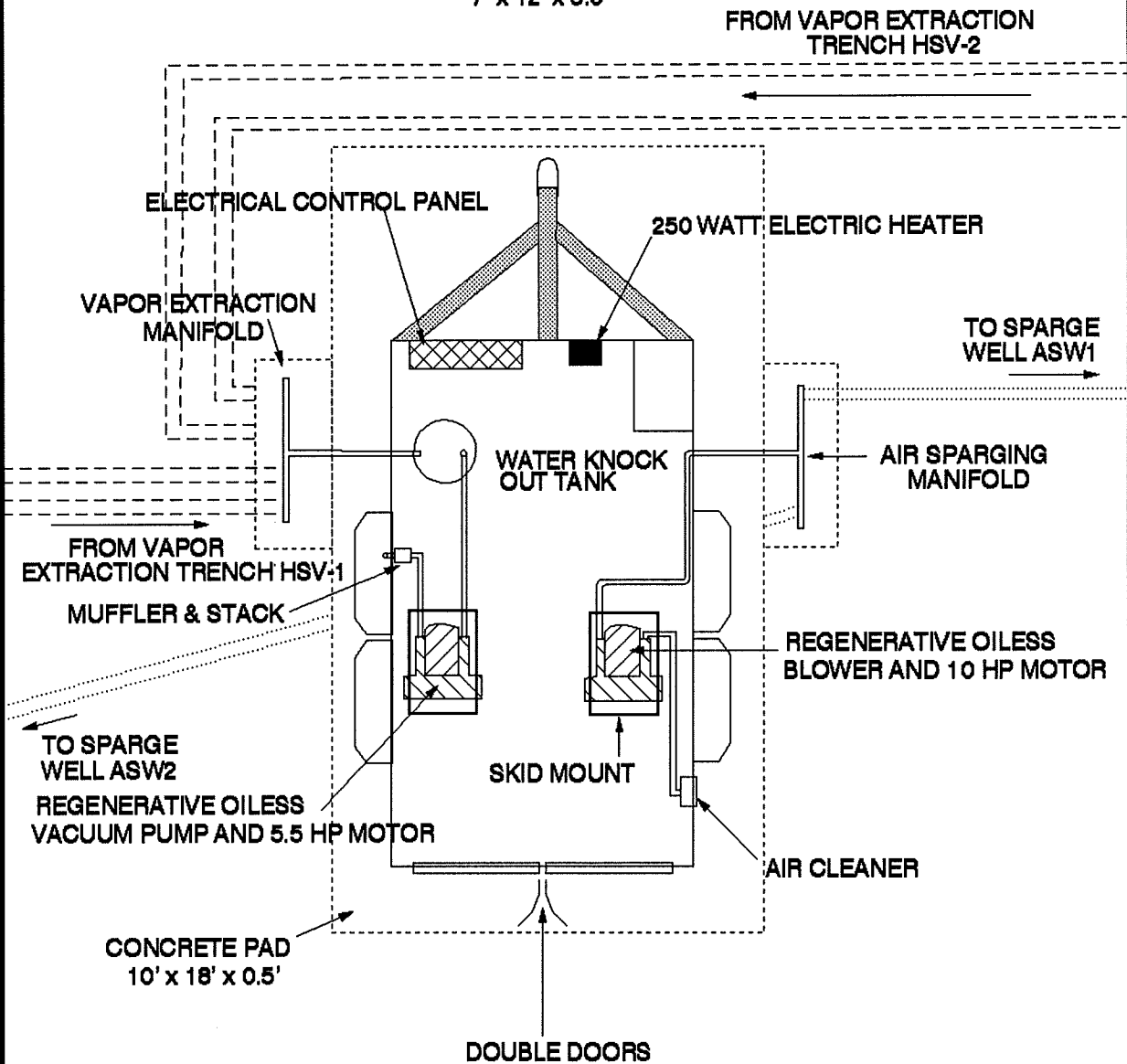
Wiring of the trailer (or the previously proposed storage sheds) was overlooked in the estimated Schedule of Costs. These costs are estimated to be \$700. Wiring of the trailer shall meet the requirements listed in Section 6.2 "Basic Electrical Requirements". Lights and the electric heater will be required to be explosion proof. The trailer shall have six weatherproof 110 volt outlets on the outside wall.

#### **5.0 CONTROL SYSTEMS**

All electrical panels, motors, thermostats, and other electrical devices utilized in the remedial system will be explosion proof. The electrical control panel design and construction will be the responsibility of the electrical subcontractor to be determined. Shop drawings of the electrical systems shall be provided to the contractor and ultimately the WDNR. Power distribution diagrams showing the thermal overload size, control voltage, short circuit protection, line connections, the motor thermal overload connections, the intrinsically safe relay wiring, and the water knock out tank overflow switch shall be provided to the prime contractor.

# EARTH BURNERS INC

## AIR SPARGING/VAPOR EXTRACTION SYSTEM CONTROL TRAILER 7' x 12' x 6.0'



0 2 4  
APPROXIMATE SCALE:  
ONE INCH = 4 FEET



MOOSE JUNCTION LOUNGE  
SYSTEM CONTROL TRAILER

FIGURE 4-1

## **6.0 ELECTRICAL SYSTEM**

### **6.1 Electric Power Requirements**

This cost is estimated by Head of The Lakes Electrical Co-op and could be substantially higher depending on the amount of power line which requires relocation. Additionally, the power company charges extra for a service entrance for three phase power. Head of the Lakes Electrical Company informed EBI an extra \$5,000 would be needed to bring three phase power to the site.

### **6.2 Basic Electrical Requirements**

The electrical subcontractor will be responsible for completing electrical requirements according to established procedures. All manufacturer specifications for electrical devices to be installed at the site will be provided for electrical determination of electrical requirements. Basic electrical requirements include the following:

- Compliance with NEMA requirements concerning electrical raceways .
- Electrical installation will conform to NFPA 70 - the National Electrical Code.
- Electrical components will comply with Underwriter Laboratories (UL) standards.
- Compliance with requirements set forth in the Wisconsin Administrative Code .
- Provide three sets of shop drawings to the general contractor.
- Schedule electrical system installation with the contractor engineer to allow an orderly procession of site activities.
- All electric motors, exposed switches, and lighting units will utilize non-sparking components.
- Install intrinsically safe wiring which will be enclosed in separate conduits from the power source.
- Provide the general contractor with any future service requirements to maintain the electrical system.
- Build the electrical control panel according to project specifications to efficiently control the remedial system.

### 6.3 Service Entrance

The electrical service entrance shall conform to all project requirements. The service entrance shall be outfitted with circuit breakers and meter sockets. Three copies of shop drawings and specifications of the service entrance shall be provided to the general contractor. Additionally, the aboveground service entrance shall be installed in accordance with ANSI C2, the National Electrical Safety Code.

### 6.4 Control Panel

The electrical control panel and its components shall conform to the requirements listed in the section "Basic Requirements". The Panel and subpanel circuit breaker shall be mounted in a tandem trailer provided by the general contractor, EBI. Panel location is shown in Figure 4-1 under the previous section "Construction Facilities". Other requirements for the control panel include:

- o 200 amp rating.
- o Three phase 240 volt.
- o Internal copper wiring shall be rated 600 volt/90 degrees Centigrade.
- o Solderless mechanical electrical connectors.
- o Circuit breaker switches, motor starter switches and thermal cutouts, reset buttons, and similar switches shall be mounted on a subpanel.
- o Panel shall be large enough to have at least 20% extra space for future use.
- o 120 volt control circuit and breakers.
- o Control Panel layout, to be determined by the electrical sub-contractor, shall be efficiently laid out to allow ease of field wiring.

The control panel shall have the following devices:

- Two system start switches with OFF, AUTO, and MANUAL modes for the air sparging system and the vapor extraction system.
- An automatic shutdown switch with corresponding red light indicators for OVER TEMPERATURE (air sparging system), OVER PRESSURE (air sparging system) and OVER WATER LIMIT (connected to the water knock-out tank) conditions to be activated in the AUTO mode.



- A latch circuit so the air sparging system and the vapor extraction system operate together except in the MANUAL position.
- Two green light indicators labelled AIR SPARGER and VAPOR EXTRACTOR activated when each system is operating normally.
- A RE-SET button with corresponding light for system shut-down caused by either temperature and/or pressure conditions greater than system design.
- A 24 hour timer which will allow programmable cycling of the sparging system.
- 10 % additional circuits for possible future connections.

The air pressure and temperature switches shall be adjustable between 1 - 20 PSI and 50 to 150 degrees Fahrenheit.

### **6.5 Grounding**

All grounding circuits and associated electrical components shall conform to the requirements listed in the section "Basic Requirements". The grounding system shall conform to all applicable local, state and federal codes. Its purpose is to protect human life and equipment from the detrimental effects of ungrounded electrical systems.

### **6.6 Motor Controllers**

Motor controllers and associated electrical components shall conform to the requirements listed in the section "Basic Requirements". The controllers shall provide a circuit for energizing the electric motors. The switches shall be grounded to protect personnel and shall have three switch positions: OFF, AUTO, and MANUAL.

### **6.7 Lighting**

Three explosion-proof lights will be installed: two in the interior of the trailer and one on the entrance side of the trailer as shown in the plan view of the trailer previously shown in Figure 4-1. An automatic street light at the service entrance power pole shall provide the general/security lighting for the project area.

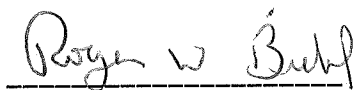
## **7.0 SITE SECURITY**

Site security involves the installation of a fence around the pilot system. An automatic street light will be installed to assist the security at the site.

## **8.0 STANDARD OF CARE**

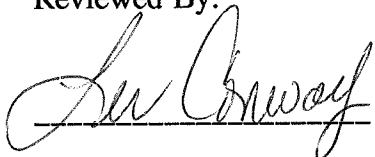
The conclusions contained in this report represent our professional opinion. These opinions were arrived at in accordance with currently accepted environmental practices. No warranty is implied or intended.

Prepared By:

Handwritten signature of Roger W. Biehl in cursive script, written over a horizontal line.

Roger W. Biehl  
Project Hydrogeologist

Reviewed By:

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Consulting Engineer  
Wisconsin PE License 29987

**APPENDIX A**  
**ACCESS AGREEMENTS**



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Fax: 218-628-0455

## ACCESS AGREEMENT FOR ENVIRONMENTAL INVESTIGATION/REMEDIATION

Earth Burners, Inc. (EBI) requests permission to access the property as located on Figure 1 to sample the subsurface via use of hollow stem auger borings and to install a remedial system near the Northeast corner of the property. Figure 2 shows the remedial system work zone which is the boundary of the proposed access. This request is required by the Wisconsin Department of Natural Resource (WDNR) as an on-going site investigation concerning a neighboring former motor vehicle gasoline retail outlet. EBI's sole intention is to clean-up the groundwater to Standards. EBI will be responsible for any damage your property sustains as a result of our environmental activities. If you approve this access agreement, please read, sign and date the agreement below.

I, Conrad E. Swenson, as executor of the late Margaret Dickman estate, approve access onto the work zone boundary of the property between June 1, 1995 and June 1, 1996 to Earth Burners, Inc. and their subcontractors to for the sole purpose of completing an environmental system to remediate subsurface soils and groundwater. I understand that environmental activities consisting of either an air sparging/soil vapor extraction or a groundwater pump and treatment system will be installed in accordance with WDNR and the Department of Labor and Human Resources (DILHR) standards. My property will be left, as feasibly possible, in its original condition.

### ACKNOWLEDGMENT OF APPROVAL

Conrad E. Swenson  
(Signature)

Date: June 12, 1995

5215 West Wellington Avenue  
Chicago, IL 60641  
Mailing Address

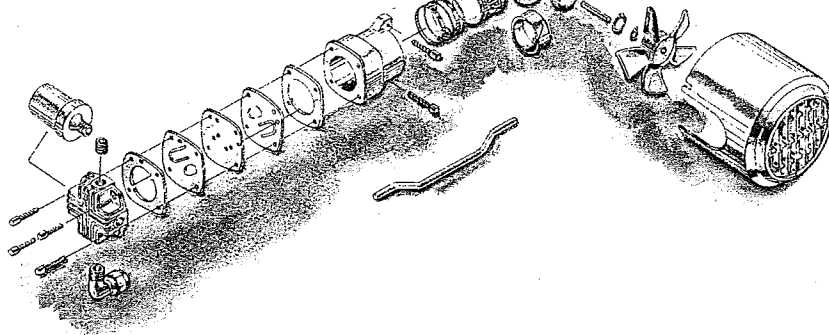
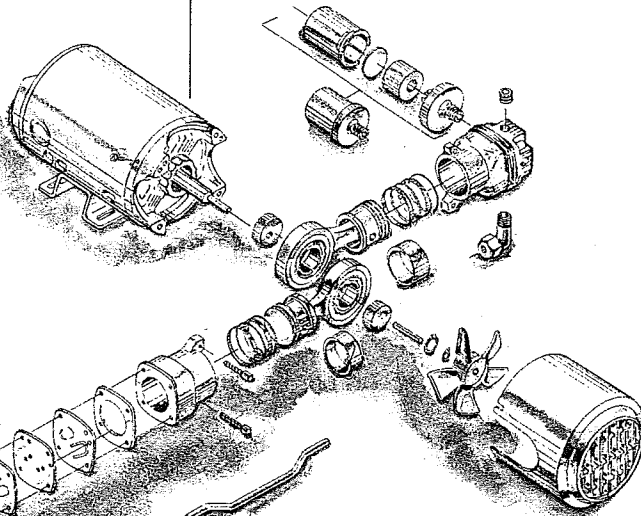
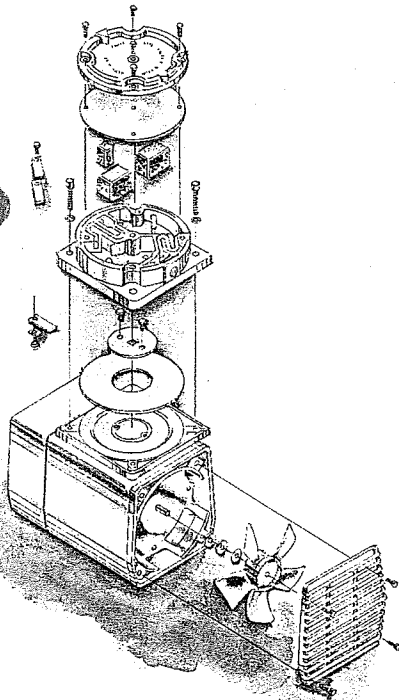
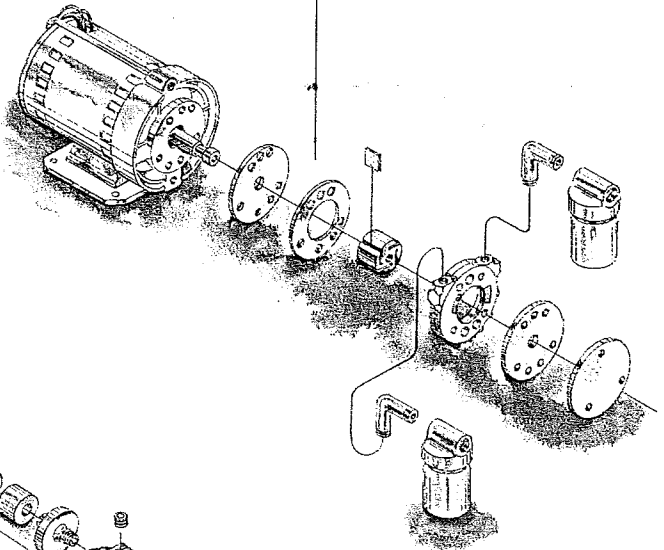
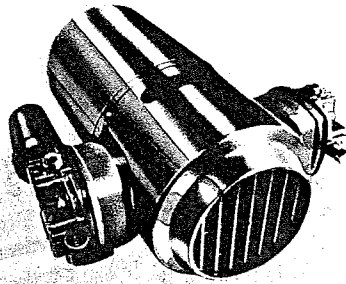
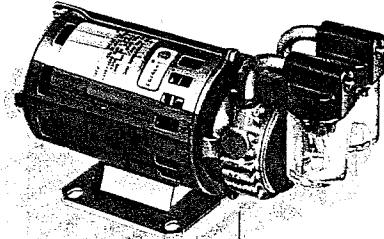
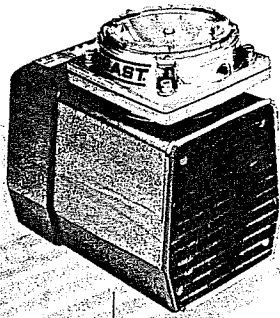
1-(312)-777-2926  
Telephone Number

**APPENDIX B**

**AIR SPARGING/VAPOR EXTRACTION PUMP SPECIFICATIONS**



# VACUUM PUMPS

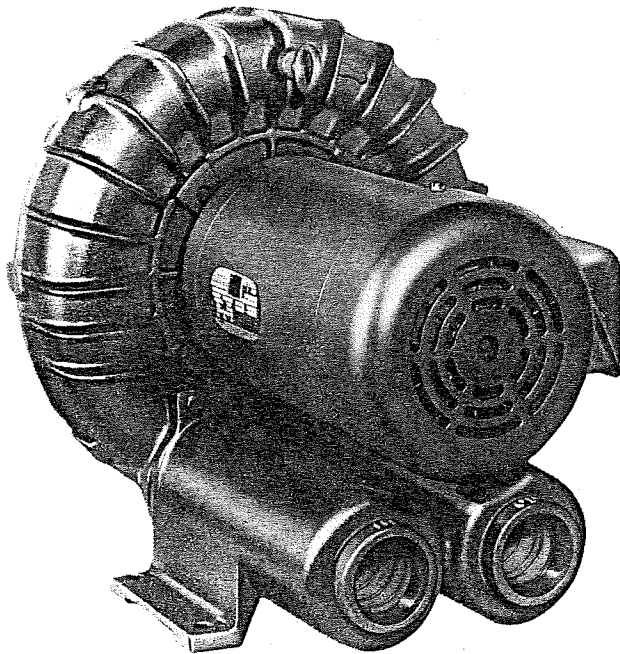


**MITS**  
MIDWEST MACHINE TOOL SUPPLY  
230 Commerce Circle South  
Minneapolis, MN 55432  
(612)  
571-3550  
800-327-9523

# Oilless Regenerative Blower, Motor Mounted to 270 cfm



## R6P Series



**MODEL R6P335A**  
35" H<sub>2</sub>O MAX. VAC., 270 CFM OPEN FLOW

**MODEL R6P350A**  
70" H<sub>2</sub>O MAX. VAC., 270 CFM OPEN FLOW

**MODEL R6P355A**  
90" H<sub>2</sub>O MAX. VAC., 260 CFM OPEN FLOW

### PRODUCT FEATURES

- Oilless operation
- TEFC motor mounted
- Can be mounted in any plane
- Rugged construction/low maintenance

### COMMON MOTOR OPTIONS

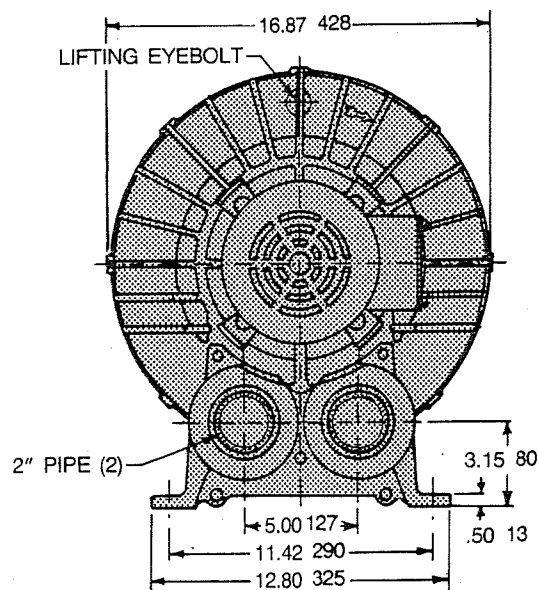
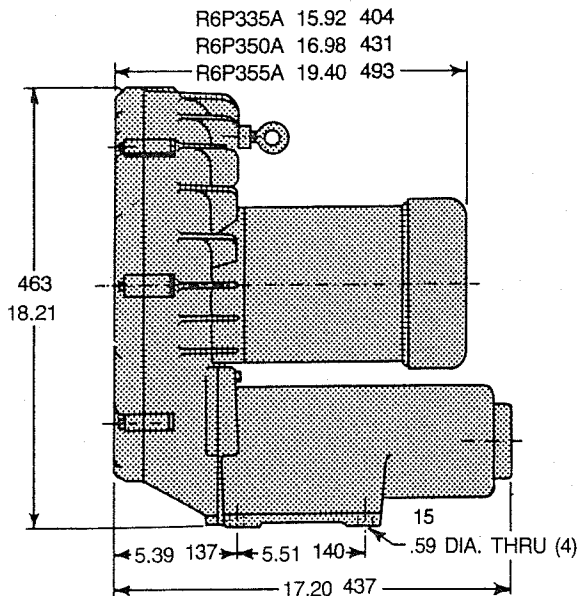
- 208-230/460V, 60 Hz; 190-220/380-415V, 50 Hz, three phase

### RECOMMENDED ACCESSORIES

- Vacuum gauge AE134
- In-line filter AJ151G
- Muffler AJ121F
- Relief valve AG258

Various brand name motors are used on any model at the discretion of Gast Mfg. Corp.

### Product Dimensions Metric (mm) U.S. Imperial (inches)



### Important Notice:

Pictorial and dimensional data is subject to change without notice.

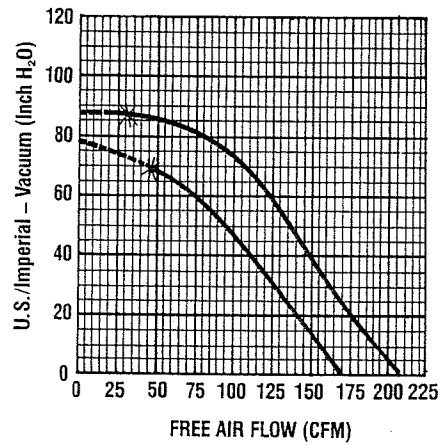
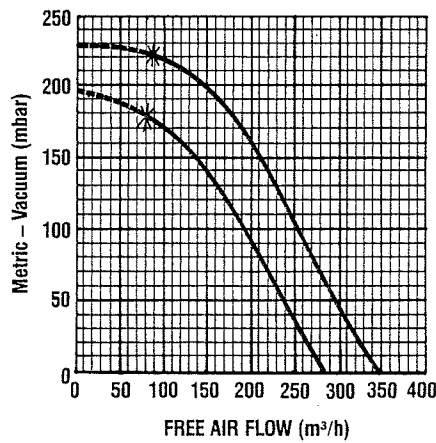
# Product Specifications

Model Number	Motor Specs	Full Load Amps	HP	RPM	Max Vac		Max Flow		Net Wt.	
					"H <sub>2</sub> O	mbar	cfm	m <sup>3</sup> /h	lbs.	kg
R6350A-2	190-220/380-415-50-3	14.4-13.4/7.2-6.8	4.80	2850	70	174	168	285	112	50,8
	208-230/460-60-3	13.0-12.0/6.0	5.00	3450	88	219	203	345		
R6335A-2	190-220/380-415-50-3	8-8/4-3.9	2.50	2850	65	162	168	285	82	37,2
	208-230/460-60-3	9.7-8.8/4.4	3.50	3450	80	199	203	345		
R6325A-2	190-220/380-415-50-3	6.6-6.7/3.3-3.5	1.85	2850	50	125	168	285	76	34,5
	208-230/460-60-3	6.9/3.45	2.50	3450	45	112	203	345		
R6125-2	115/208-230-60-1	22.4/12.4-11.2	2.50	3450	45	112	203	345	79	35,4

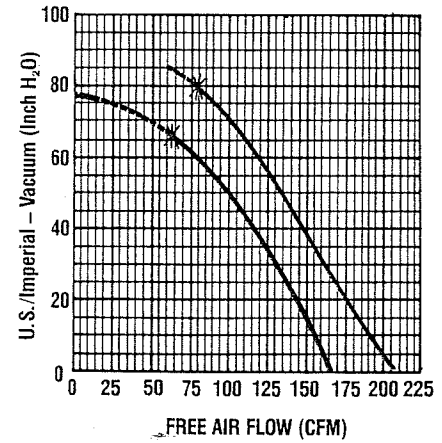
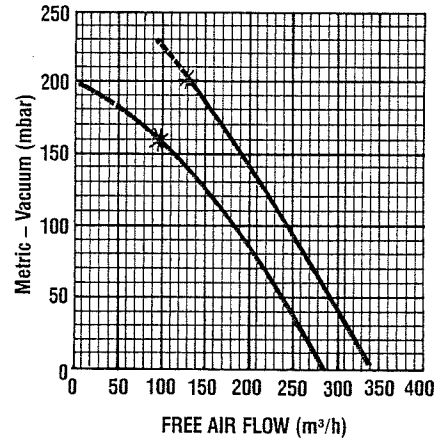
## Product Performance (Metric U.S. Imperial)

Black line on curve is for 60 cycle performance.  
Blue line on curve is for 50 cycle performance.

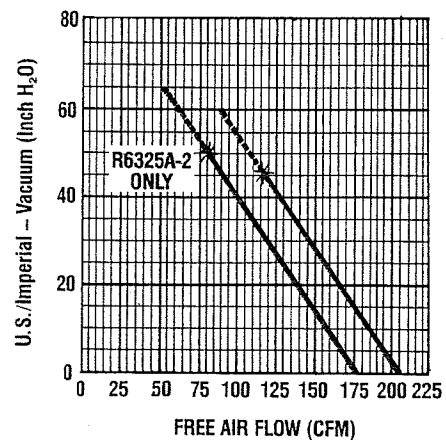
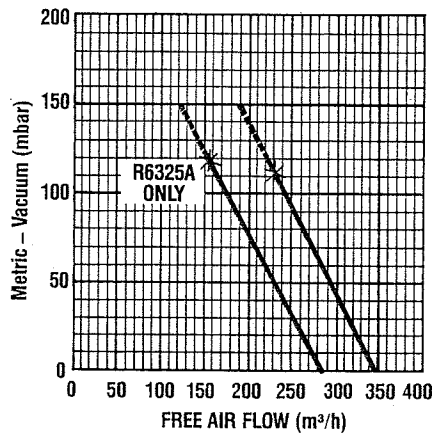
### R6350A-2



### R6335A-2



### R6325A-2 R6125-2





# Important Information on Gast Vacuum Pumps

## Installation

It is important to include a vacuum gauge at the vacuum pump inlet in the air line within a few inches of the unit. Diagnosis of system problems is easier and more accurate with a gauge at this location. In reciprocating units, a "snubber" should be installed in the gauge connection to reduce pulsations which can damage the gauge.

The installation of a relief valve is equally important. Unit life is directly related to duty levels and most systems require only a fraction of the pump's advertised capacity to operate efficiently. The Gast (optional) relief valve makes it simple to "fine tune" the pump to minimum system needs, reducing electrical consumption and maximizing pump life.

## Electric Motors

All electric motors supplied with Gast vacuum pumps are designed to operate at plus or minus 10% of nameplate voltage. Motors to meet special requirements are available upon request. Various brand-name motors are furnished on any model at the discretion of Gast.

## Lubrication

Unless otherwise specified, every lubricated Gast unit is equipped with a standard lubrication system that automatically delivers the correct amount of oil to the pump. To provide correct lubrication, it is important to keep the oil reservoir filled.

In general, a reservoir holds enough oil for 25-50 hours of operation. Variables, such as duty level and ambient temperature, can cause significant variation from this range. However, an oil reservoir that needs refilling outside this range may indicate a malfunction in the lubrication system. Too much oil usage seldom does as much harm as insufficient lubrication. The most serious consequences of too fast an oil feed rate are oil fog or heavy oil condensation at the exhaust. A likely consequence of too slow an oil feed rate is complete pump failure.

Consult the factory before attempting to alter the feed rates of properly operating lubrication systems.

## Unit Life Expectancy

Many variables determine the life expectancy of a unit. Among them are:

1. Ambient temperature
2. Duty level
3. Operating cycle
4. Operating speed
5. Condition of air handled
  - Cleanliness
  - Humidity
  - Heat
  - Chemical vapors present (corrosive, non-corrosive)
6. Unit maintenance
  - Lubrication
  - Filter maintenance
  - Muffler maintenance

As an example of the effect environment can have on pumps, consider this: Some Gast units are rated for 25,000 or more operating hours under controlled conditions, as in the Gast Engineering Department laboratory. The same model pumps, operating in the field under extremely adverse environmental conditions, have worn out in under 4,000 hours.

As a service to OEM customers, the Gast Engineering Department will predict the life expectancy of units used in OEM applications. Gast engineers will examine the units to predict life expectancy, after they have been used in the application for 4,000 hours.

Virtually all Gast units have lives much longer than 4,000 hours, a standard evaluation point for estimating total life expectancy. (DC Motor Brush life typically is less than 4,000 hours. It is best to consult the factory for further information.)

## Ambient Temperature

A not-to-be-forgotten condition in applying compressors and vacuum pumps is ambient temperature. To determine the ambient temperature reading of the air surrounding the unit, readings should be taken around the unit approximately 4 inches away. Gast's

guarantee applies only to units operating within a temperature range of 32°F (0°C) to 100°F (33°C). Low temperature affects the unit's ability to start and high temperatures affect its life. Contact the factory for authorization of unusual ambient conditions.

This range is to be used as a guide and in no way means that things can't be done to allow units to be applied outside this temperature range. For example, additional external cooling, change the duty cycle and duty, provide better lubrication, etc. The ambient temperature range is generally for continuous operation but should also be followed for intermittent applications if normal unit life is to be expected.

## Continuous vs. Intermittent Operation

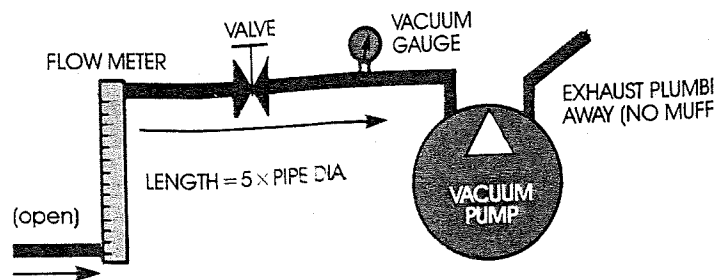
Continuous vs. intermittent duty usually must be considered. Our definition of intermittent duty is 10 minutes or less on and 10 minutes or more off. Here again we are dealing with a very general statement. A better method of determining if the unit is applied properly is to measure temperatures of the metal portion of the unit that surrounds the discharge port and top dead center of the electric motor. Please note that when you refer to performance curves in this catalog, the solid line indicates continuous operation, while the dashed line shows intermittent duty.

## Starting Under Load

- Rotary vane units will start under load. The vanes permit the internal chamber of the unit to bleed off during the cycle. At startup, the pump is not subjected to full load until enough centrifugal force has been attained to throw the vanes out against the body. By that time, the motor has gained enough momentum to continue its cycle without stress.

In systems where storage of built-up vacuum is important, check valves should be installed between the pump and the system.

- Blowers start up easily. Adequate internal clearances in Gast blowers make this possible.
- Oilless piston units will start under load as long as the top of the piston is not subjected to system vacuum. Under more complicated conditions, install a check valve next to the pump.
- Diaphragm units will not start under load because the surface area of the diaphragm is much larger than that of a piston pump. To start a diaphragm unit under load would require a motor too powerful to be cost effective. Instead, a specific volume of air at zero pressure differential must be provided to start the unit under load. (Specific volumes for different models are available from Gast.) Bleed orifices and dump valves are two common methods of supplying the correct zero-pressure-differential volume of air.
- ROC-R® rocking piston pumps use the same types of motors as diaphragm units and therefore the same conditions apply.

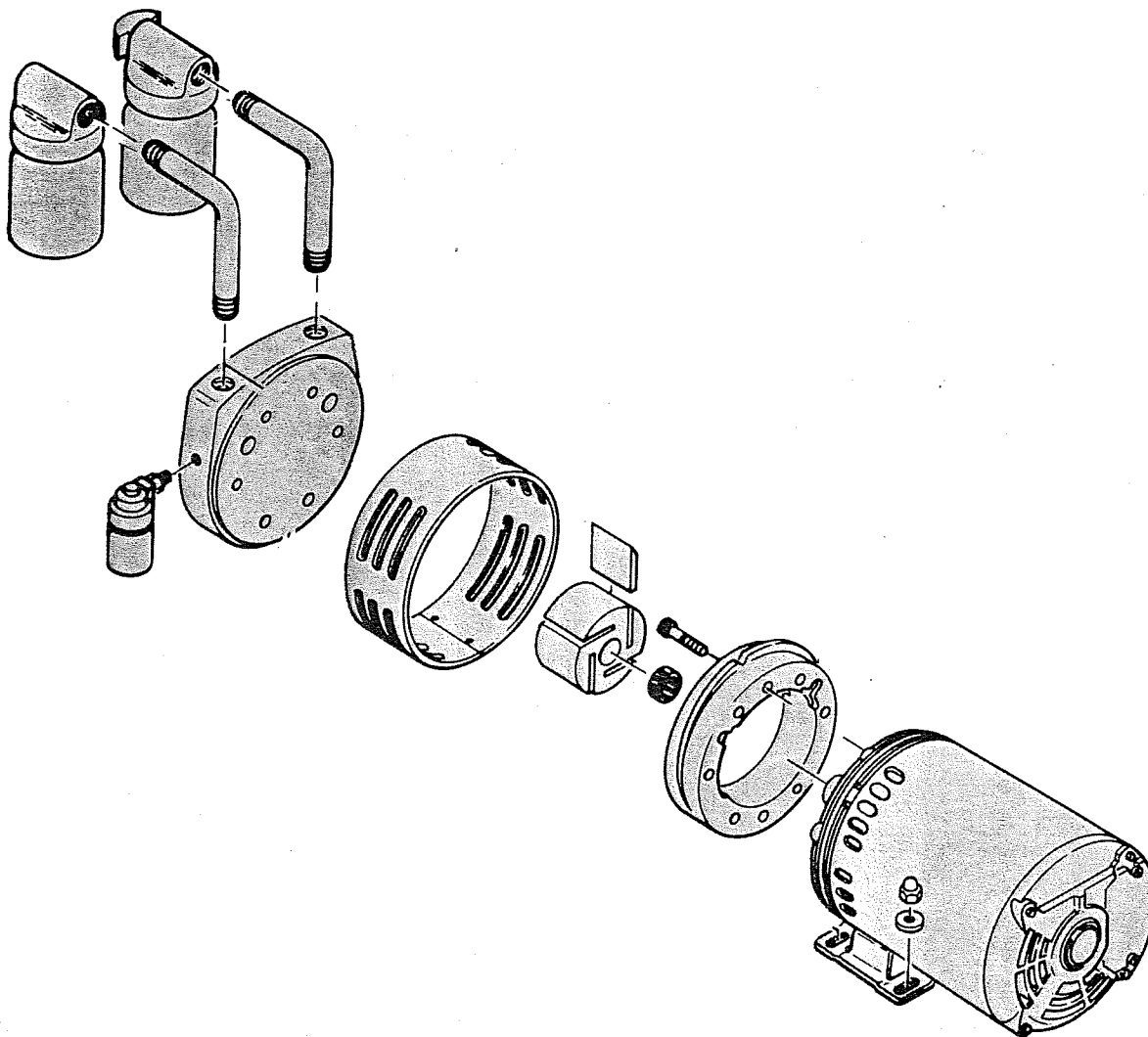


## Catalog Performance Specifications

When looking at a Gast catalog performance chart, please remember that the specifications listed are that of a unit at sea level with an ambient temperature of 70°F (21°C), operating with normal electrical current conditions.

Performance shown in this catalog is the nominal to be expected from these models without accessories. Intake filters and exhaust mufflers, and the accumulation of contaminants in them during operation, will decrease the flow of air as well as the achievable vacuum by the vacuum pump.

# Rotary Vane Vacuum Pumps



## **Oilless or lubricated.**

Oilless vacuum pumps produce completely oil-free air. They require no oiling and can be mounted in inaccessible places where regular maintenance might be difficult. The self-sealing, compound carbon vanes self-adjust as they wear so your pump will perform with like-new efficiency throughout its service life.

Lubricated pumps generally have higher vacuum ratings than oilless pumps. For example, our lubricated 2565 is guaranteed to operate reliably up to 28" Hg (65 mbar) while its oilless counterpart, the 2567 operates up to 27" Hg (99 mbar). The vanes inside are made of tough phenolic and random fibre, or of woven mat. They are particularly resistant to foreign matter.

Siphon and wick-type lubricators are used for lighter-duty applications. Heavy-duty lubricators are available for harsh conditions or when the pump operates under continuous duty, 24 hours a day, 7 days a week.

## **Motor-mounted or separate drive.**

Models are available with or without motors. That way, if you have access to a separate drive source, you can save the cost of the motor.

## **Easy to service.**

Oilless models have lubricated-for-life ball bearings. So internal workings require virtually no maintenance at all.

The only servicing needed is the occasional replacement of vanes when they become worn. On motor-mounted units, simply remove several bolts and the end plate to expose rotor and vanes for inspection.

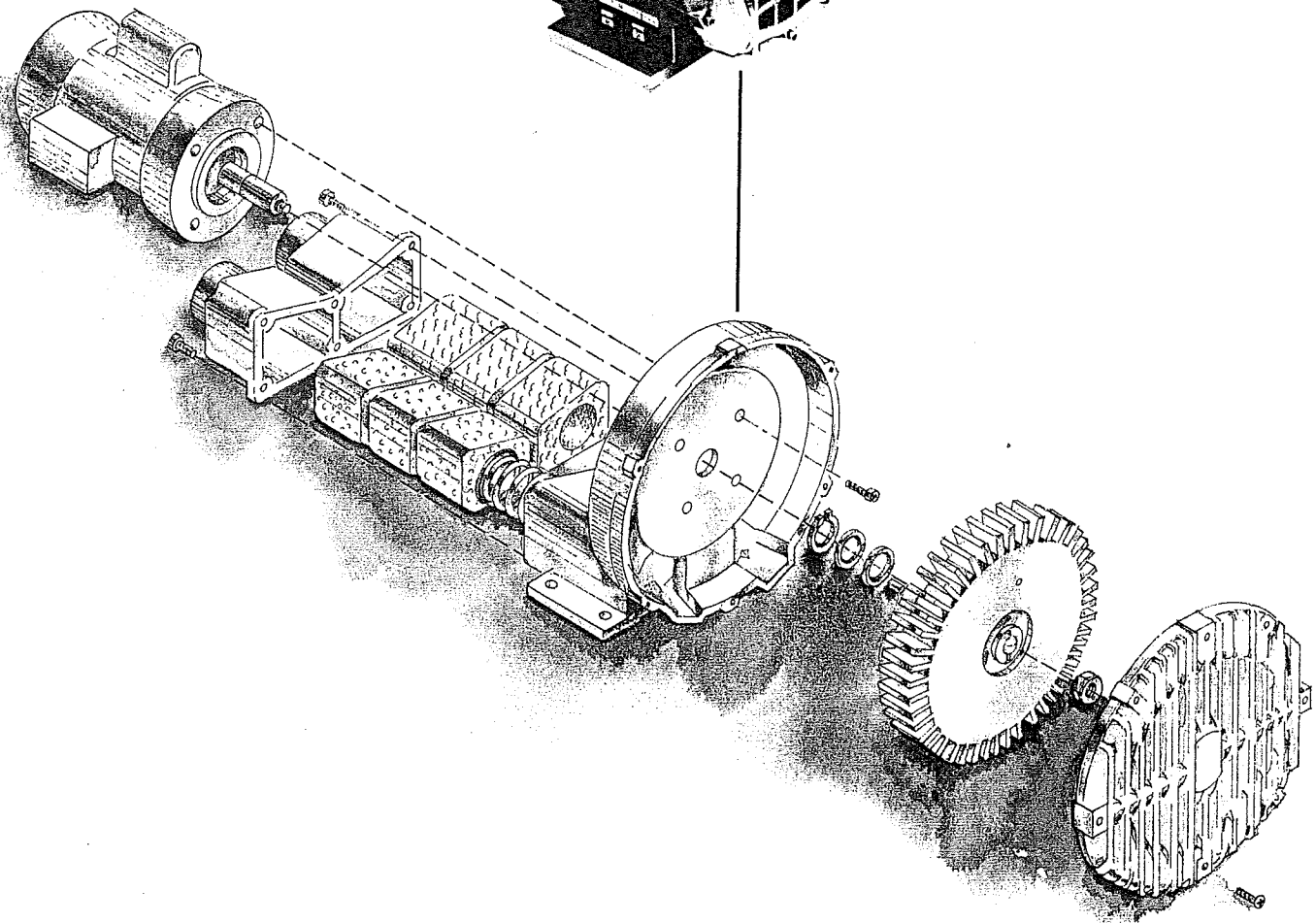
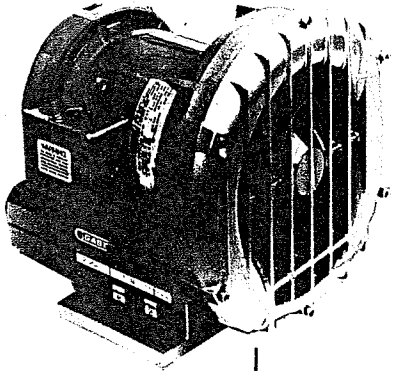
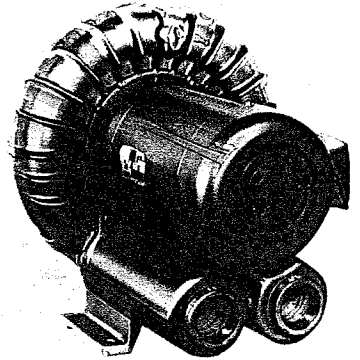
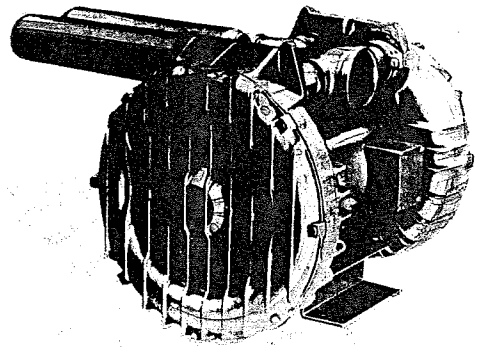
**WARNING: UNITS SHOULD NOT PUMP  
COMBUSTIBLE GASES OR BE USED IN  
COMBUSTIBLE AMBIENTS.**



# REGENAIR® REGENERATIVE BLOWERS

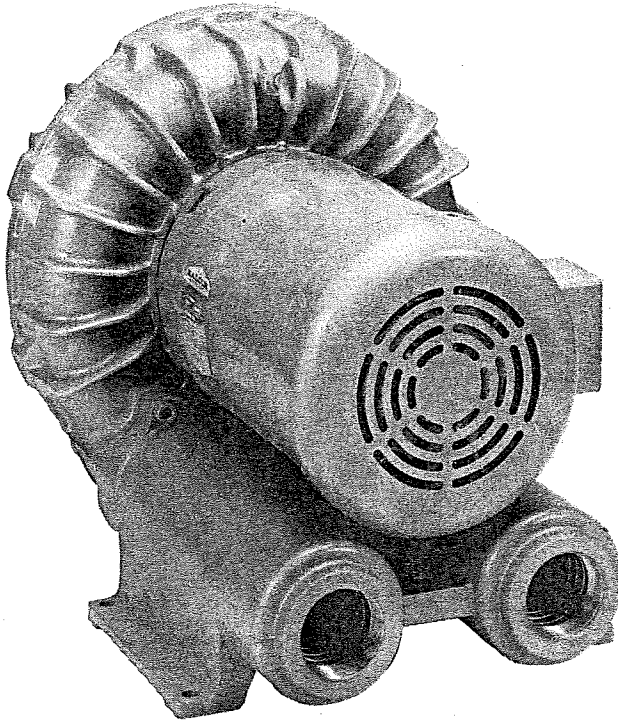
**mmts**  
MIDWEST MACHINE TOOL SUPPLY  
230 Commerce Circle South  
Minneapolis, MN 55432

(612)  
571-3550  
800-327-9523



VACUUM

## REGENAIR® R7 Series



**MODEL R7100A-2**  
95" H<sub>2</sub>O MAX. VAC., 410 CFM OPEN FLOW

### PRODUCT FEATURES

- Oilless operation
- TEFC motor mounted
- Can be mounted in any plane
- Rugged construction/low maintenance

### COMMON MOTOR OPTIONS

- 208-230/460V, 60 Hz; 190-220/380-415V, 50 Hz, three phase

### RECOMMENDED ACCESSORIES

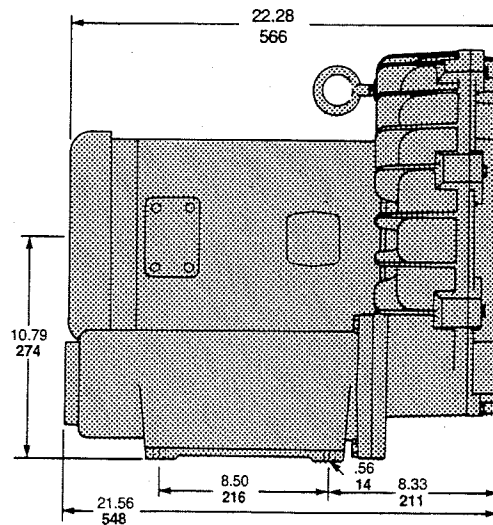
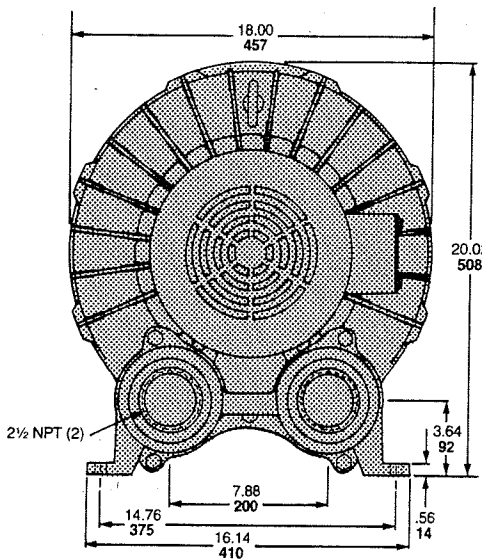
- Vacuum gauge AE134
- In-line filter AJ151H
- Muffler AJ121G
- Relief valve AG258

Various brand name motors are used on any model at the discretion of Gast Mfg. Corp.

### Important Notice:

Pictorial and dimensional data is subject to change without notice.

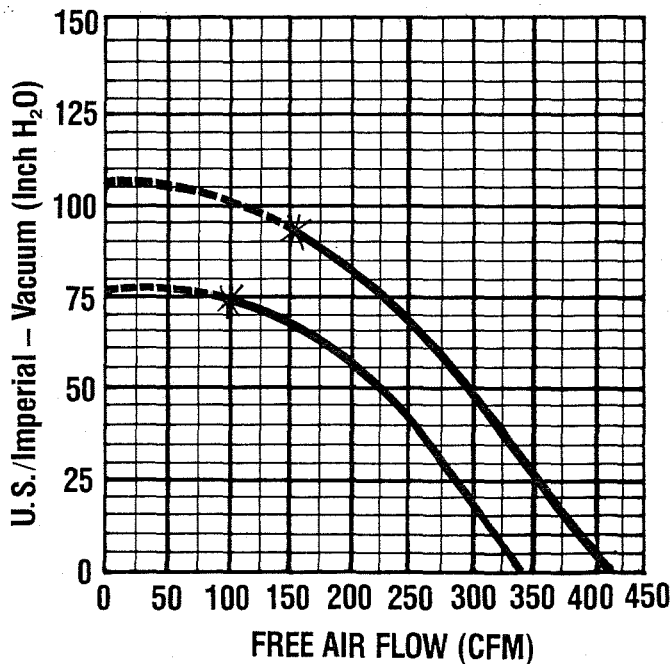
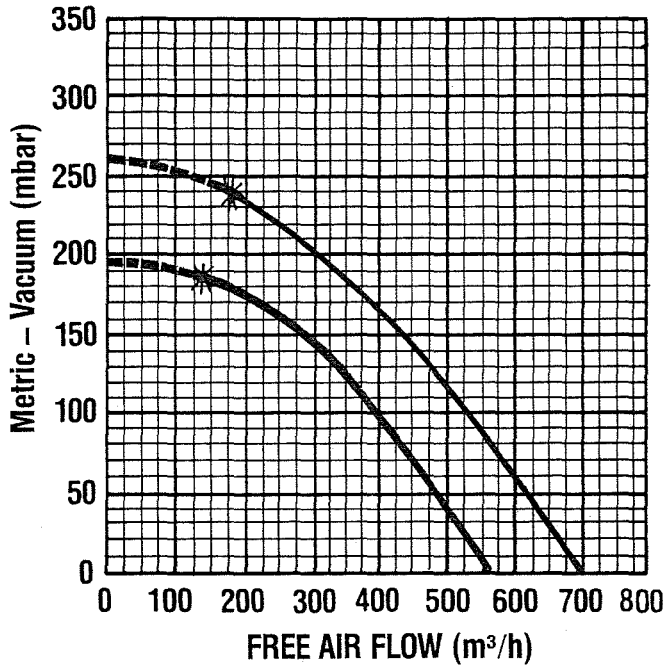
### Product Dimensions Metric (mm) U.S. Imperial (inches)



## Product Specifications

Model Number	Motor Specs	Full Load Amps	HP	RPM	Max Vac		Max Flow		Net Wt.	
					"H <sub>2</sub> O	mbar	cfm	m <sup>3</sup> h	lbs.	kg
R7100A-2	190-220/380-415-50-3	19.2-18.3/9.6-9.35	8	2850	74	184	332	564	297	134
	208-230/460-60-3	27.3-25/12.5	10	3450	95	237	410	697		

**Product Performance (Metric U.S. Imperial)**    Black line on curve is for 60 cycle performance.  
 Blue line on curve is for 50 cycle performance.



\*Recommended maximum duty.  
 ---- Intermittent duty only.

# Important Information on Gast **REGENAIR**<sup>®</sup> Regenerative Blowers

## Advantages

- Complete line of blowers to satisfy all single and three phase requirements
- UL recognized and CSA certified motors
- Energy efficient permanent split capacitor motors for 1 Hp and under are standard (fast start capacitor start motors available in quantities.)
- Low noise – well within OSHA regulations (shorter muffler boxes available for space conservation)
- Continuous, nonpulsating, oil-free air flow
- Compact size
- Lightweight
- All motors designed to run within class B limits
- Mount in any position
- Performance modifications and/or special requirements can be accommodated
- 12 month Regardless of the Reason for Failure Guarantee

## Performance Data

The performance data shown in this catalog was determined under the following conditions:

- Line voltage @ 60 Hz. 230V or 460V for three phase units. 115V or 230V for single phase units.
- Line voltage @ 50 Hz. 220V for three phase or single phase units.
- Units in a temperature stable condition.
- Delivery measurements made with output port throttled.
- Suction measurements made with input port throttled.
- Test conditions: Inlet air density at 0.075 lbs. per cu. ft. [20°C (68°F), 29.92" Hg (14.7 PSIA)].
- Normal performance variations on the resistance curve within  $\pm 10\%$  of supplied data can be expected.

## Blower System Design Tips

In order to utilize your regenerative blower most efficiently, proper system design is essential. The most important thing to recognize is that by utilizing large diameter plumbing, friction losses in plumbing can be greatly reduced. Here are some guidelines to use when setting up your blower system:

1. The plumbing should at least be the same size as the blower port or ideally one size larger (example – blower has ports that are 1½" NPT, plumbing should be 2" NPT). The plumbing should remain this size until it has reached the location of the work area.
2. Plumbing for Separate Drive Blowers operating above 3500 RPM should be at least one pipe size larger than the blower ports.
3. Elbows create additional friction which causes pressure loss and back pressure. Plumbing at least one pipe size larger than the blower pipe ports minimizes the friction loss they create.
4. The pressure/vacuum relief valve should be installed in a "T" which is at least one pipe size larger than that of the exhaust of the blower. To properly protect a large horsepower blower, set the relief valve to limit the blowers duty to 5" below its continuous duty rating.
5. Operating the blowers at high altitude decreases their maximum pressure or vacuum duty rating. If this is a consideration, request bulletin F2-70 for this application of the Fan Laws.
6. The exhaust air of the blowers increases with increasing duty. At duties over 70" of water it is too hot for most plastic pipe. Metal pipe must be considered. To prevent danger of burns, access to these pipes should be limited, guarded or marked, "Danger Hot."

### DISCLAIMER

The information presented in this catalog is based on technical data and test results of nominal units. It is believed to be accurate and is offered as an aid in the selection of Gast products. It is the user's responsibility to determine suitability of the product for his intended use and the user assumes all risk and liability whatsoever in connection therewith.

## VACUUM-PRESSURE EQUIVALENCE TABLE

in Water	in Mercury	PSI	mbar
200	14.71	7.2	498.2
190	14	7	
180	13	6	450
170	12	6	400
160	11	5	
150	10	5	350
140	9	4	
130	8	4	300
120	7	3	
110	6	3	250
100	5	2	
90	4	2	200
80	3	1	
70	2	1	150
60	1	1	100
50	0	0	50
40	0	0	0
30			
20			
10			
0			

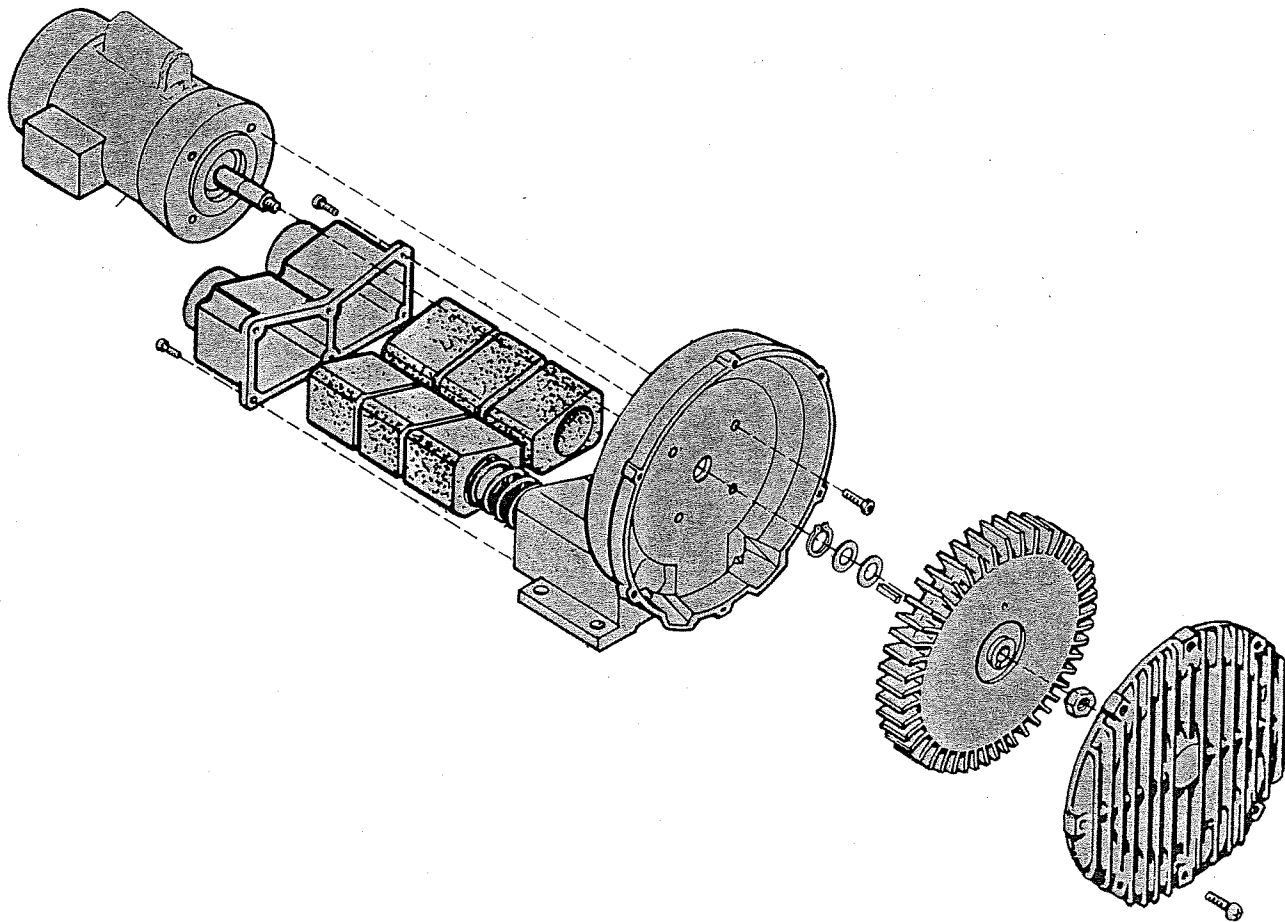
### Other Conversions

cfm × 1.6992 = m <sup>3</sup> h
m <sup>3</sup> h × .5886 = cfm
In. H <sub>2</sub> O × .036 = Psi
In. H <sub>2</sub> O × .074 = 1 in. Hg
In. H <sub>2</sub> O × 1.868 = mm Hg
In. H <sub>2</sub> O × 2.491 = mbar
mbar × .402 = " H <sub>2</sub> O
Psi × 27.68 = " H <sub>2</sub> O
In. Hg × 13.594 = " H <sub>2</sub> O

# Regenerative Blowers

REGENAIR®

up to 485 cfm



### **Long life and safety are built-in.**

Our REGENAIR design incorporates cast iron or aluminum housings and fan cooling to rapidly dissipate heat around the bearings, to help prolong bearing life. Fan cooling also helps reduce the temperature of the impeller housing and dissipates heat for cooler air delivery.

Integral muffler intake and exhaust muffler assemblies are standard on all single ended units. They minimize blower operating noise and eliminate the hazard of an exposed impeller.

**Warning: Units Should Not Pump Combustible Gases or Be Used in Combustible Ambients**

### **Little maintenance.**

Double-sealed, lubricated-for-life bearings minimize maintenance while maximizing performance (models over 5 HP utilize regreasable bearings for extended bearing life).

### **Mounting versatility.**

Blowers can be mounted horizontally and vertically, onto a wall or inside machinery. Cost of installation and plumbing fittings can be reduced because blower units can be adapted to almost any system or mounting configuration. Twin ended units need to be mounted horizontally.



70-6100  
F2-205/8/92  
Rev. E

Post Office Box 97  
Benton Harbor, MI. 49023-0097  
Ph: 616/926-6171  
Fax: 616/925-8288

**MMTS**  
MIDWEST MACHINE TOOL SUPPLY  
230 COMMERCE CIRCLE SO.  
MINNEAPOLIS, MN 55432  
(612) 571-3550

# INSTALLATION AND OPERATING INSTRUCTIONS FOR GAST HAZARDOUS DUTY REGENAIR BLOWERS

This instruction applies to the following models ONLY: R3105N-50, R4110N-50, R4310P-50, R4P115N-50, R5125Q-50, R5325R-50, R6130Q-50, R6P155Q-50, R6350R-50, R6P355R-50 and R7100R-50.

*Gast Authorized Service Facilities are Located in the locations listed below*

Gast Manufacturing Corporation  
505 Washington Avenue  
Carlstadt, N. J. 07072  
Ph: 201/933-8484  
Fax: 201/933-5545

Gast Manufacturing Corporation  
2550 Meadowbrook Road  
Benton Harbor, MI. 49022  
Ph: 616/926-6171  
Fax: 616/925-8288

Brenner Fiedler & Associates  
13824 Bentley Place  
Cerritos, CA. 90701  
Ph: 310/404-2721  
Ph: 800/843-5558  
Fax: 310/404-7975

Wainbee Limited  
215 Brunswick Blvd.  
Pointe Claire, Quebec  
Canada H9R 4R7  
Ph: 514/697-8810  
Fax: 514/-697-3070

Wainbee Limited  
5789 Coopers Ave.  
Mississauga, Ontario  
Canada L4Z 3S6  
Ph: 416/243-1900  
Fax: 416/243-2336

Japan Machinery  
Central PO Box 1451  
Toyko 100-91, Japan  
Ph: 813 3573-5421  
Fax: 813 3571-7896

Gast Manufacturing Co. Ltd.  
Halifax Road, Cressex Estate  
High Wycombe, Bucks HP12 3SN  
England  
Ph: 44 494 523571  
Fax: 44 494 436588



# OPERATING AND MAINTENANCE INSTRUCTIONS

## SAFETY

This is the safety alert symbol. When you see this symbol personal injury is possible. The degree of injury is shown by the following signal words:

- ⚠ **DANGER** Severe injury or death will occur if hazard is ignored.
- ⚠ **WARNING** Severe injury or death can occur if hazard is ignored.
- ⚠ **CAUTION** Minor injury or property damage can occur if hazard is ignored.

Review the following information carefully before operating.

## GENERAL INFORMATION

*This instruction applies to the following models ONLY: R3105N-50, R4110N-50, R4310P-50, R4P115N-50, R5125Q-50, R5325R-50, R6130Q-50, R6P155Q-50, R6350R-50, R6P355R-50 and R7100R-50.* These blowers are intended for use in Soil Vapor Extraction Systems. The blowers are sealed at the factory for very low leakage. They are powered with a U.L. listed electric motor Class 1 Div. 1 Group D motors for Hazardous Duty locations. Ambient temperature for normal full load operation should not exceed 40° C (105° F). For higher ambient operation, contact the factory.

Gast Manufacturing Corporation may offer general application guidance: however, suitability of the particular blower and/or accessories is ultimately the responsibility of the user, not the manufacturer of the blower.

## INSTALLATION

- ⚠ **DANGER** Models R5325R-50, R6130Q-50, R6350R-50, R5125Q-50, R6P155Q-50, R6P355R-50 AND R7100R-50 use Pilot Duty Thermal Overload Protection. Connecting this protection to the proper control circuitry is mandated by UL674 and NEC501. Failure to do so could/ may result in a EXPLOSION. See pages 3 and 4 for recommended wiring schematic for these models.

- ⚠ **WARNING** Electric shock can result from bad wiring. A qualified person must install all wiring, conforming to all required safety codes. Grounding is necessary.

- ⚠ **WARNING** This blower is intended for use on soil vapor extraction equipment. Any other use must be approved in writing by Gast Manufacturing Corp. Install this blower in any mounting position. Do not block the flow of cooling air over the blower and motor.

**PLUMBING** - Use the threaded pipe ports for connection only. They will not support the plumbing. Be sure to use the same or larger size pipe to prevent air flow restriction and overheating of the blower. When installing fittings, be sure to use pipe thread sealant. This protects the threads in the blower housing and prevents leakage. Dirt and chips are often found in new plumbing. Do not allow them to enter the blower.

**NOISE** - Mount the unit on a solid surface that will not increase the sound. This will reduce noise and vibration. We suggest the use of shock mounts or vibration isolation material for mounting.

**ROTATION** - The Gast Regenair Blower should only rotate clockwise as viewed from the electric motor side. The casting has an arrow showing the correct direction. Confirm the proper rotation by checking air flow at the IN and OUT ports. If needed reverse rotation of three phase motors by changing the position of any two of the power line wires.

## OPERATION

- ⚠ **WARNING** Solid or liquid material exiting the blower or piping can cause eye damage or skin cuts. Keep away from air stream.

- ⚠ **WARNING** - Gast Manufacturing Corporation will not knowingly specify, design or build any blower for installation in a hazardous, combustible or explosive location without a motor conforming to the proper NEMA or U. L. standards. Blowers with standard TEFC motors should never be utilized for soil vapor extraction applications or where local state and/or Federal codes specify the use of explosion-proof motors (as defined by the National Electric Code, Articles 100,500 c1990).

- ⚠ **CAUTION** Attach blower to solid surface before starting to prevent injury or damage from unit movement. Air containing solid particles or liquid must pass through a filter before entering the blower. Blowers must have filters, other accessories and all piping attached before starting. Any foreign material passing through the blower may cause internal damage to the blower.

- ⚠ **CAUTION** Outlet piping can burn skin. Guard or limit access. Mark "CAUTION Hot Surface. Can Cause Burns". Air temperature increases when passing through the blower. When run at duties above 50 in. H<sub>2</sub>O, metal pipe may be required for hot exhaust air. The blower must not be operated above the limits for continuous duty. Only models R3105N-50, R4110N-50 and R4310P-50 can be operated continuously with no air flowing through the blower. Other units can only be run at the rating shown on the model number label. Do not Close off inlet (for vacuum) to reduce extra air flow. This will cause added heat and motor load. Blower exhaust air in excess of 230°F indicates operation in excess of rating which can cause the blower to fail.

**ACCESSORIES** ...Gast pressure gauge AJ496 and vacuum gauges AJ497 or AE134 show blower duty. The Gas pressure/vacuum relief valve, AG258, will limit the operating duty by admitting or relieving air. It also allows full flow through the blower when the relief valve closes.

### SERVICING

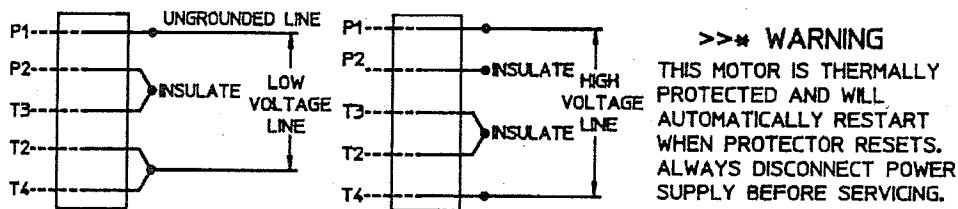
**⚠ WARNING** To retain their sealed construction they should be serviced by Gast authorized service centers ONLY. These models are sealed at the factory for very low leakage.

**⚠ WARNING** Turn off electric power before removing blower from service. Be sure rotating parts have stopped. Electric shock or severe cuts can result. Inlet and exhaust filters attached to the blower may need cleaning or replacement of the elements. Failure to do so will result in more pressure drop, reduced air flow and hotter opera-

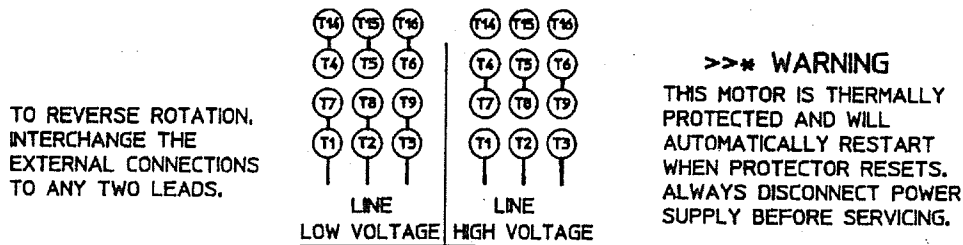
tion of the blower. The outside of the unit requires cleaning of dust and dirt. The inside of the blower also may need cleaning to remove foreign material coating the impeller and housing. This should be done at a Gast Authorized Service Center. This buildup can cause vibration, failure of the motor to operate or reduced flow.

**KEEP THIS INFORMATION WITH THIS BLOWER.  
REFER TO IT FOR SAFE INSTALLATION,  
OPERATION OR SERVICE.**

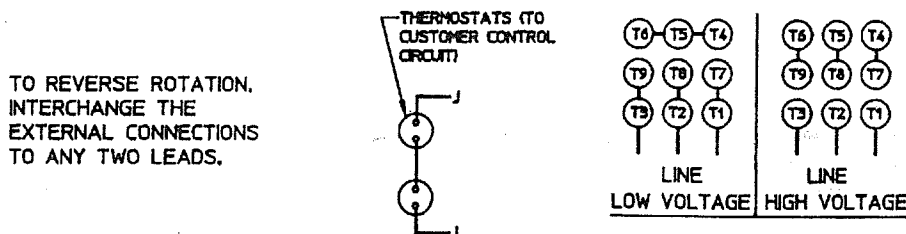
### MOTOR WIRING DIAGRAM FOR R4110N-50 & R3105N-50



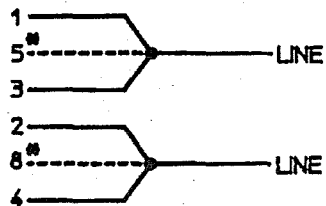
### MOTORS WIRING DIAGRAM FOR R4310P-50



### MOTORS WIRING DIAGRAM FOR R5325R-50, R6350R-50, R6P355R-50, & R7100R-50



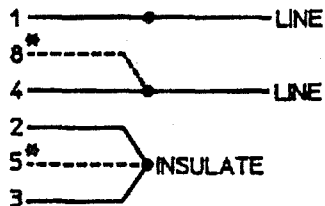
## MOTOR WIRING DIAGRAM FOR R5125Q-50 & R4P115N-50



— THERMOSTAT

— THERMOSTAT

LOW VOLTAGE



— THERMOSTAT

— THERMOSTAT

HIGH VOLTAGE

• R5125Q-50 BLOWERS PRODUCED AFTER SEPTEMBER 1992 (SER. NO. 0992)  
DO NOT HAVE MOTOR LEADS 5 & 8.

## MOTOR WIRING DIAGRAM FOR R6130Q-50 & R6P155Q-50

CONNECT THERMOSTAT  
TO MOTOR PROTECTION  
CIRCUIT

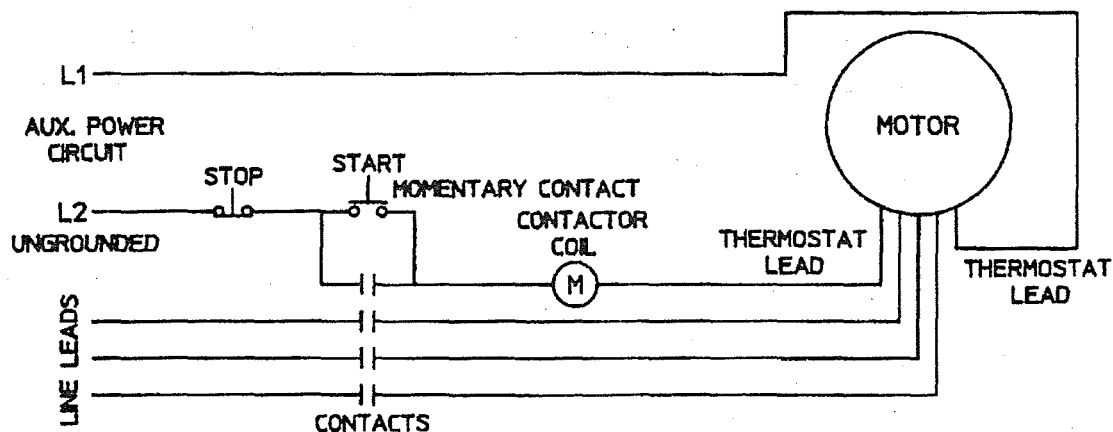
T1 — LINE

T4 — LINE

— THERMOSTAT

— THERMOSTAT

## CONNECTION FOR THERMOSTAT MOTOR PROTECTION



TERMOSTATS TO BE CONNECTED IN SERIES WITH  
CONTROL AS SHOWN. MOTOR FURNISHED WITH  
AUTOMATIC THERMOSTATS RATED A.C. 115-600V. 720VA

## MAINTENANCE:

1. Maintain a clean air filter cartridge to insure optimum flow and performance. The location and the quality of air being ingested dictates the frequency for inspection and replacement. A dirty filter restricts air flow, causes the pump to run hotter and results in longer operating cycles.
2. Drain air receiver regularly. The amount of moisture and how quickly it accumulates inside the air receiver is proportional to the amount of humidity in the air and how long the pump is in operation. If not drained, the air receiver will fill with water.

3. Clean the pump/motor regularly. A film (oil,dirt,etc.) build up on the outer shell of the pump or motor will reduce the unit's ability to dissipate heat. This unit has been designed to operate between 32° to 100° F.

## TROUBLESHOOTING: Pressure and Vacuum Systems

### Pump Stalls After Vacuum or Pressure Starts Building Up in Receiver:

Shut unit off, disconnect power. Motor incorrectly wired for high voltage instead of low voltage. Check motor nameplate for voltage compatibility and/or correct wiring configuration. Single voltage motors will only operate on the designated voltage specified on the motor nameplate.

### Motor Won't Start:

Nothing happens after power is turned on. [Gauge reads 0 psi (atmospheric pressure)]:

1. Shut unit off, disconnect power. Check that supply voltage is the same as motor nameplate voltage. If the motor has multiple voltage capability, confirm that the motor is properly wired for the supply voltage.
2. Motor has power. Check that power is on and that electrical cord is not heating up because of being undersized. If electrical cord is longer than approximately 15 feet, contact your local electrician; let him know motor nameplate data; hp, voltage, phase and motor amps.
3. If there is power and it is the correct voltage and phase, contact your local Gast Distributor or the Gast Rebuilding Center for further instruction.

### Motor Starts When Gauge Reads 0 Psi. But, Won't Restart When Under Pressure:

This symptom results from a bad check valve, allowing the pressure in the receiver to leak back to the pump, forcing the pump to start under load. When the motor can't start, a high amperage condition will:

1. Trip the thermal overload in the motor (which shuts the motor off).
2. Damage a non-thermally protected motor.

### Starts Intermittently:

Disconnect power source to unit. Inspect points in pressure or vacuum switch which may be worn or dirty. Visually inspect for build up or uneven wear. If necessary, contact your local distributor for replacement parts.

### Pump Cycles On - Off More Often Than When First Installed:

1. Air receiver probably filled with water. Drain receiver. The receiver is being used to store condensed water instead of allowing it to fill with compressed air.

### Pump/Motor is On (Running) More Often Than When Originally Installed:

1. The air requirement has increased through the use of new or different pneumatic equipment or the system has developed air leaks.
2. Filters are dirty - restricted air flow to pump results in decreased discharge.
3. Inspect head valves and rings. Under normal operating conditions (clean, dry air at recommended ambient and operating pressures), installation of a service kit should be considered at approximately 5,000 hours to maintain peak performance..

### Air Receiver Loses Pressure:

1. Check for system (pipe, fitting and seal) leaks.
2. The leak is at the pump. Probable cause, the check valve is allowing the air pressure to leak back from the receiver to the pump.
  - a. On pressure pumps it is common to see bubbles around the head assembly when the pump is in operation. Check for air leaks at the pump after it has been shut off for a few minutes. This will allow the initial pressure between the pump and check valve to bleed off to atmosphere.
  - b. On vacuum systems, the check valve is even more likely to hang up than on pressure systems. Unfortunately, the bubble test cannot be used to test for leak locations. This being the case, remove and perform a visual inspection of the check valve. If necessary, use the AV460 filter prior to the tank to eliminate contaminants.

**Warning: Protect the motor from getting wet; water could cause internal damage to some motors.**

### A Leak is Determined at the Pump:

Relieve all pressure inside of air receiver (until gauge reads 0 psi). Inspect check valve. It must be free from foreign matter, wear and operates freely. Replace if necessary (not serviceable).



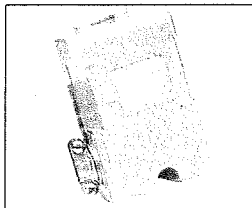


Manufacturing Corporation

## COMPRESSED AIR & VACUUM SYSTEM INSTRUCTIONS

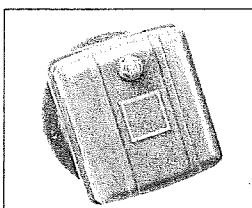
### Component Description and Function

**PRESSURE SWITCH:** (Standard on pressure units.) This pressure actuated switch senses the pressure inside the air receiver and sends a signal (start or stop) to the motor/pump. The operating pressure is pre-set at the factory and does not require readjustment. Do not exceed recommended maximum operating pressure. On standard units, the motor will automatically start at pressures between 0 to 70 psi gauge and shuts off when the tank pressure reaches 90 psi gauge.



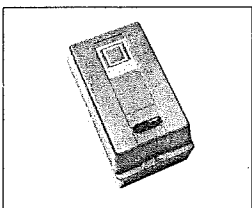
**WARNING:** Motor/pump starts automatically, shut off power at electric source and/or unplug before servicing. Personal injury and/or property damage could result.

**VACUUM SWITCH:** (Standard on vacuum units.) This vacuum actuated switch senses the vacuum level inside the air receiver and sends a signal (start or stop) to the motor/pump. The operating level is preset at the factory and does not require readjustment. The vacuum switch has been set for operating at the optimum vacuum level.



**WARNING:** Motor/pump starts automatically, shut off power at electric source and/or unplug before servicing. Personal injury and/or property damage could result.

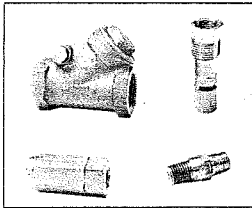
**THE MAGNETIC STARTER (MOTOR CONTROL):** (Used with 3 phase motors, 1.0 HP and larger single phase motors and duplex units.) Controls the motor/pump starting and stopping. The magnetic starter consists of a control circuit (magnetic field), a heavy duty set of contacts (switch) and thermal overloads (monitors amperage). The magnetic field pulls in a contact bar which completes the circuit for the motor to start. The thermal overload senses the amperage draw going to the motor. If a high amperage draw condition exists, the overload will shut the motor off before the motor can be damaged. The overload monitors amperage for each leg of the motor and has to be selected and sized for each specific voltage. Amperage is inversely proportional to voltage, i.e. If the voltage for the same size motor is changed from 460 volt to 230 volt (1/2 voltage) the amperage doubles.



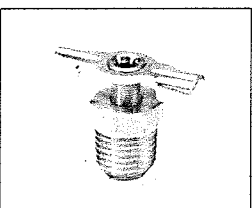
**CAUTION:** Do not adjust overload. Premature tripping or motor damage would result.

**WARNING:** Before connecting to power source, confirm that voltage on factory wired units and line voltage at the job site are the same. If not, personal injury and/or property damage could result.

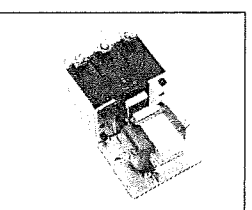
**CHECK VALVE:** (Standard on all models.) The check valve allows the air to flow only in one direction (arrow on side of part designates direction). This valve is typically located between the pump and the air receiver to prevent the pressure or vacuum stored in the tank from leaking back to the pump. After the pump shuts off there should not be any pressure at the pump. In other words, the pump will be able to start unloaded.



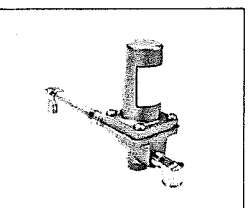
**MANUAL DRAIN:** (Standard on all pressure units.) Located on the bottom of the air receiver. This valve must be opened periodically to drain the condensation that settles inside of the receiver. Otherwise, it is possible the receiver can and will fill with water.



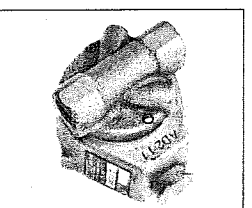
**ALTERNATOR:** (Standard on duplex models.) Automatically selects the first pump to start each cycle by alternating between two pumps. This heavy duty alternator has been wired to allow the second (off) unit to start automatically if/when the first pump selected cannot satisfy the system demand. When both units are operating, they will shut off at the operating setting of the first (lead) sensing switch.



**AUTOMATIC TANK DRAIN:** (Optional for all pressure units.) The auto tank drain is actuated by a pressure differential (10 psi) inside the air receiver. The pressure change actuates a valve which opens momentarily to release moisture that may have settled inside the receiver. To prevent moisture from accumulating on floor, connect pipe to drain and direct to a container or floor drain, etc.



**MOTORIZED LUBRICATOR:** (Standard on 5565 vacuum pumps.) The motorized lubricator has to be operating when the pump is in operation. The lubricator has been designed to introduce a predetermined amount of oil to satisfy this pump's characteristics. The oil being introduced develops only an oil film on all internal moving parts providing a seal to improve pump performance, cooling efficiency and operating life.



**WARNING:** Check voltage on lubricator motor. Factory packaged duplex units are equipped with a 115 volt control circuit transformer and will be prewired for unit operation. Otherwise check voltage on lubricator motor prior to connecting power.

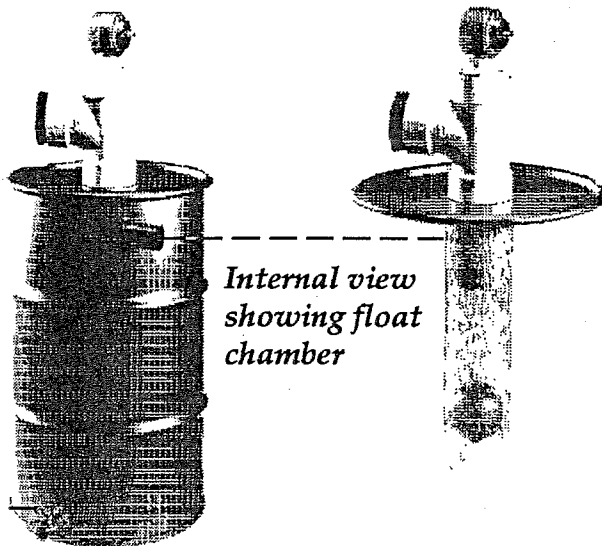


Post Office Box 97  
 Benton Harbor, Michigan 49023-0097  
 Ph: 616/926-6171  
 Fax: 616/925-8288

F2-11G 11/92

# MOISTURE SEPARATOR

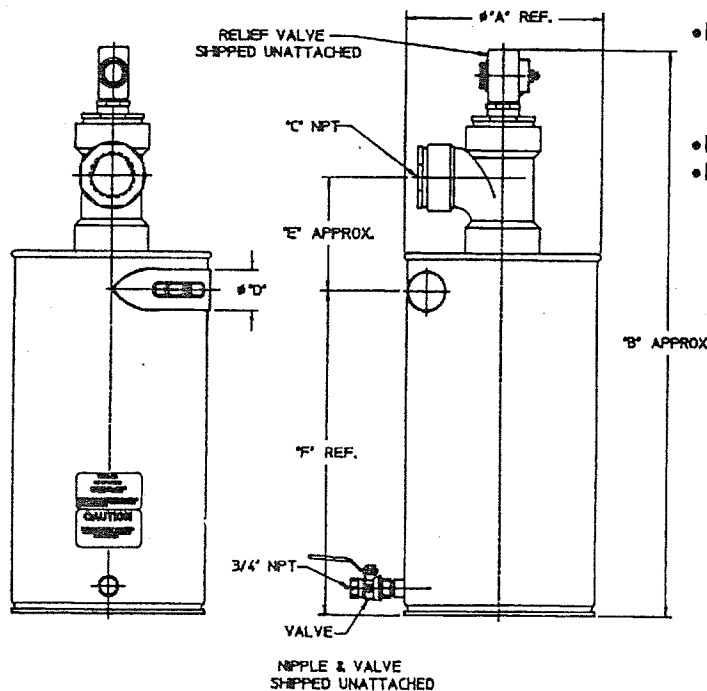
to be used with  
 blowers for soil  
 vapor extraction



Internal view  
 showing float  
 chamber

The purpose of the moisture separator is to remove liquids from the gas stream in a soil vapor extraction process. This helps protect the blower from corrosion and a build up of mineral deposits.

The moisture separator is located between the extraction wells and the blower. The in-line filter would locate between the separator and the blower.



MODEL	A DIA.	B	C NPT	D DIA	E	F
RMS160	14.8	41.5	2"	2"	7.5"	26.6"
RMS200	19.7"	39"	2"	2"	7.5"	26.6"
RMS300	19.7"	39"	2 1/2"	2 1/2"	7.5"	26.6"
RMS400	24"	48"	3"	3"	9.7"	29"

**Models**  
**RMS160**  
**RMS200**  
**RMS300**  
**RMS400**

## Features

- Large capacity from 10 to 40 gallons of liquid.
- A float valve automatically seats when the separator is full of liquid and prevents the blower from flooding.
- The vacuum relief valve protects the blower from overheating when the float valve is closed or if the line is blocked.
- High efficiency cyclonic action separates and removes most solids from the gas stream. The removal of much of the solids prolongs in-line filter life.
- Brass drain valve for easy draining of fluid.
- Epoxy coat interiors.

MODEL	LIQUID CAPACITY GALLONS	USED ON
RMS160	10	R4, R4P, R5
RMS200	19	R4, R4P, R5, R6
RMS300	19	R5, R6, R6P
RMS400	40	R6P, R7

Customer Sales & Service  
 2550 Meadowbrook Road  
 Benton Harbor, MI. 49022  
 Ph: 616/926-6171  
 Fax: 616/925-8288

Corporate Headquarters  
 Post Office Box 97  
 Benton Harbor, MI. 49023  
 Ph: 616/926-6171  
 Fax: 616/927-0808

Eastern Sales Office  
 515 Washington Avenue  
 Carlstadt, NJ 07072  
 Ph: 201/933-8484  
 Fax: 201/933-5545

Midwestern Sales Offices  
 755 North Edgewood  
 Wood Dale, IL 60191  
 Ph: 708/860-7477  
 800/800-8715  
 Fax: 708/860-1748

European Sales Office  
 Halifax Road, Cressex Estate  
 High Wycombe, Bucks HP 12 3SN  
 Ph: 44 494 523571  
 Fax: 44 494 436588  
 Telex 83488



Post Office Box 97  
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Fax: 616/925-8288

F2-220  
(11-92)

# INSTALLATION AND OPERATING INSTRUCTIONS FOR GAST ® REGENAIR BLOWER MOISTURE SEPARATORS

## SAFETY

⚠ **CAUTION:** Minor Injury or property damage can occur if hazard is ignored. Review the following information carefully before operating.

## GENERAL INFORMATION

This instruction applies to the following models only: RMS200, RMS300 and RMS400. These separators were engineered for use on soil vapor extraction systems.

Gast Manufacturing Corporation may offer general application guidance; however, suitability of the particular blower and /or accessories is the ultimate responsibility of the user, not the manufacturer of the blower.

These moisture separators are not substitutes for in-line air filters.

## INSTALLATION

Before use, cut and remove the plastic cable ties from the screen assembly inside the separator. These ties prevent shipping damage to the hollow stainless steel ball by restraining it. They should be replaced before shipping the separator. Attach the inlet to system plumbing with a flexible coupling. Use a pipe union on the discharge for easy removal of the cover for cleaning of the interior of the separator. The separator works in an upright position only. See Figure #1.

The separator must be protected from freezing with water in it. Measures taken may include insulation and or the use of water pipe heater tape to prevent freezing. The vacuum relief valve may have to be adjusted to limit the vacuum to the blower. The adjustment of the relief valve is accomplished by loosening the lock nut on the adjusting screw and turning the adjusting screw with the blade of a screwdriver. This is a sensitive adjustment. Turning the adjusting screw clockwise will increase relief valve setting and counter clockwise will decrease the setting. The use of the Gast vacuum gauge AJ497 or AE134 will provide an accurate setting.

We recommend it be adjusted to limit the vacuum to 5" of water, 12 mbar, less than the maximum continuous rated operating vacuum of the blower. For operation at altitudes exceeding 2,000 feet, ask Gast for "How Altitude Affects Blower Performance" (F2-70).

⚠ **CAUTION:** These separators are engineered to withstand the vacuum indicated on the label on the separator. Exceeding this vacuum level may crush the moisture separator.

## OPERATION

Cyclonic action separates moisture and most solid particulate from the incoming air stream. Air is discharged from the top of the separator. When the separator is full of liquid, the stainless steel ball float shuts off the air flow. The vacuum relief valve opens and limits the vacuum to the blower.

To drain liquid from the moisture separator: turn off the blower and open the ball valve at the bottom of the separator.

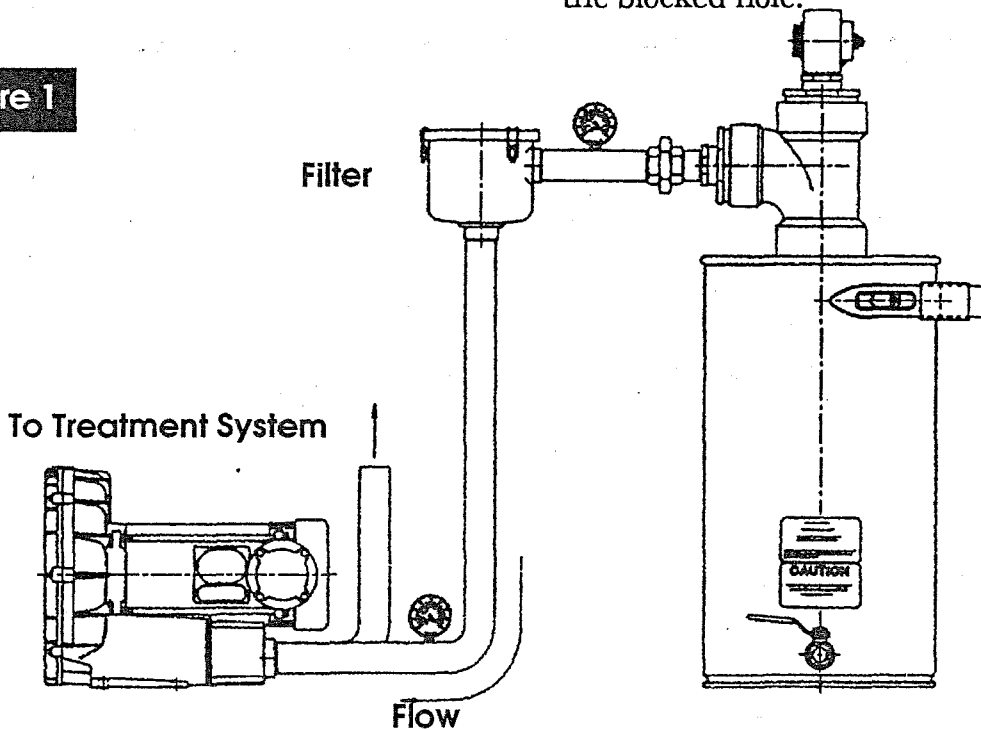
**⚠ CAUTION:** The liquid or solids contained in the separator should be analyzed before it is disposed of. It may be considered hazardous waste and require special treatment for proper disposal.

## MAINTENANCE

As needed, the inside of the separator should be cleaned with detergent to insure free movement of the stainless steel ball valve. In normal operation a layer of sludge may settle to the bottom of the separator. The lid of the moisture separator is removable to allow removal of this sludge.

Components of the vacuum relief valve are corrosion resistant. In normal operation the only maintenance needed is cleaning the valve with Gast Flushing Solvent (AH255A). Often the valve need not be disassembled to clean. Particular attention should be given to cleaning the small hole through the center of the piston. If this becomes clogged the valve will not function properly. A pin or small wire may be used to clean the blocked hole.

**Figure 1**



*Gast Authorized Service Facilities are Located in the locations listed below*

Gast Manufacturing Corporation  
2550 Meadowbrook Road  
Benton Harbor, MI. 49022  
Ph: 616/926-6171  
Fax: 616/925-8288

Gast Manufacturing Corporation  
505 Washington Avenue  
Carlstadt, N. J. 07072  
Ph: 201/933-8484  
Fax: 201/933-5545

Gast Manufacturing Co. Ltd.  
Halifax Road, Cressex Estate  
High Wycombe, Bucks HP12 3SN

Brenner Fiedler & Associates  
13824 Bentley Place  
Cerritos, CA. 90701  
Ph: 213/404-2721  
Ph: 800/843-5558  
Fax: 213/404-7975

Wainbee Limited  
5789 Coopers Ave.  
Mississauga, Ontario  
Canada L4Z 3S6  
Ph: 416/243-1900  
Fax: 416/243-2336

Wainbee Limited  
215 Brunswick Blvd.  
Pointe Claire, Quebec  
Canada H9R 4R7  
Ph: 514/697-8810  
Fax: 514/-697-3070

**MMS**  
MIDWEST MACHINE TOOL SUPPLY  
230 Commerce Circle South  
Minneapolis, MN 55432  
(612)  
571-3550  
800-327-9523



# ADJUSTABLE RELIEF VALVES

For pressure and vacuum applications. Durable, accurate and quiet.

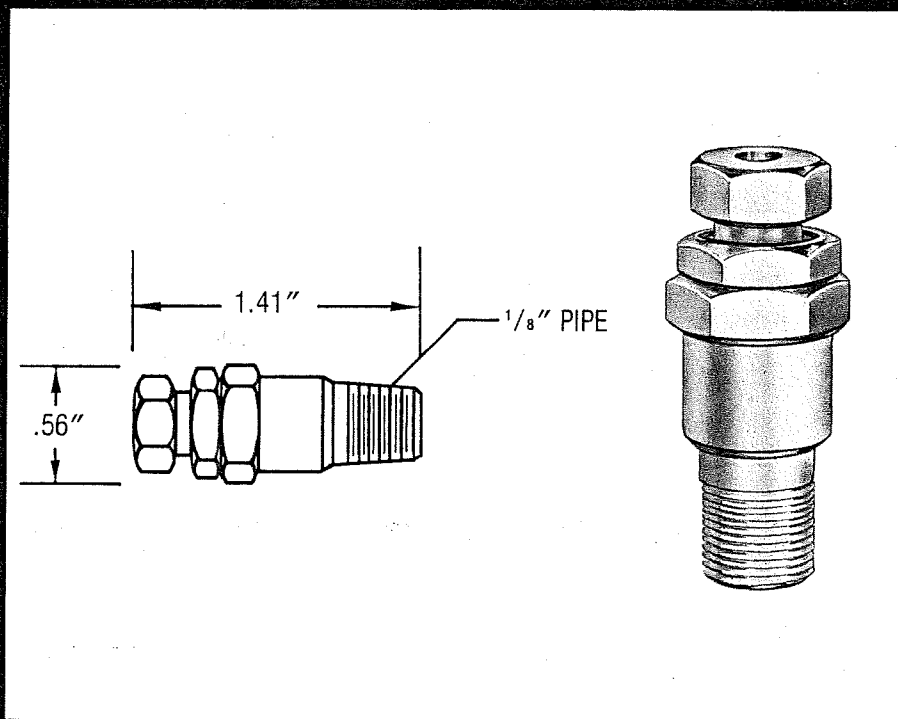
## Pressure Relief Valve #AA203

• • •

## Vacuum Relief Valve #AA204

Tough, corrosion-resistant aluminum body with 1/8" pipe thread.

- Model #AA203 adjusts to relieve **pressure** from 2 to 25 psig. Maximum flow capacity 2 scfm.
- Model #AA204 relieves **vacuum** from 5" to 27" Hg. Handles maximum flow of 2 scfm.



Relief valves #AA203 and #AA204

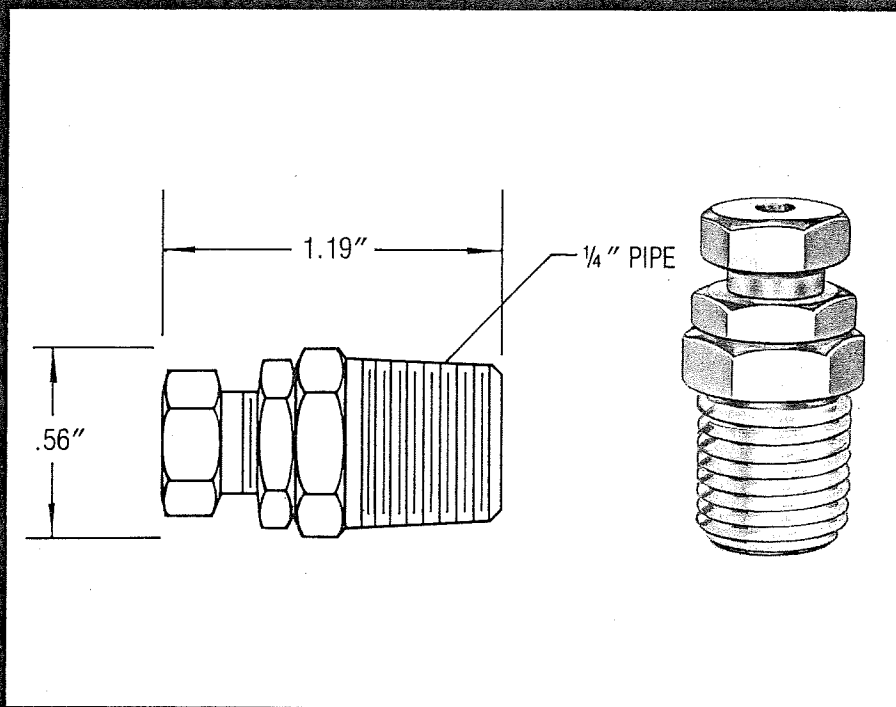
## Pressure Relief Valve #AA205

• • •

## Vacuum Relief Valve #AA207

Aluminum body has 1/4" pipe thread.

- Model #AA205 relieves **pressure** from 2 to 25 psig. Maximum flow is 2 scfm.
- Model #AA207 adjustable for **vacuums** from 5" to 27" Hg. Flow to 2 scfm.



Relief valves #AA205 and #AA207

See back page for comparative flows and pressure/vacuum adjustment ranges.