1304-1007280002

OU-1 PUMP AND TREATMENT
OPERATION AND MAINTENANCE PLAN

OPERATION AND MAINTENANCE PLAN

1. INTRODUCTION

This Operation and Maintenance (O&M) Plan has been prepared consistent with the requirements of the CERCLA Record of Decision (ROD) for Operable Unit One (). The O&M Plan describes the general guidelines for effective operation and maintenance of the pump-and-treat system. Mound Plant personnel will operate the plant, conduct sampling, and prepare reports. The Mound Plant may elect to subcontract some or all of the O&M tasks to others.

The O&M Plan presents the purpose of the pump-and-treat system, general safety guidelines, general procedures for operation, and routine maintenance procedures for various equipment. Closely related to the operation of the system are certain measurements of groundwater, which are used to verify the satisfactory functioning of the pump-and-treat system. The groundwater measurements are briefly described in the O&M Plan, but a complete discussion is reserved for the Sampling and Analysis Plan (SAP), presented as Appendix C.

2. PURPOSE OF THE PUMP-AND-TREAT SYSTEM

A groundwater contaminant plume emanates southward from the landfill and travels toward the Mound Plant water production wells. The primary contaminants of concern are cis-1,2-dichloroethene; trans-1,2-dichloroethene; tetrachloroethene; tetrachloromethane; 1,1,1-trichloroethane; trichloroethene; trichlorofluoromethane; chloroform, and vinyl chloride. The main purpose of the pump-and-treat system is to prevent further migration of affected groundwater, and to treat extracted water to acceptable levels for disposal.

3. PROCESS SUMMARY

The proposed system will extract the affected groundwater, treat the affected groundwater in a low-profile air stripper, and discharge the treated effluent to a new storm drain that passes along the west side of . The pump-and-treat system consists of a system of pumps, valves, trays, instruments and electrical controls.

The three extraction wells will pump at a combined rate of approximately 100 gallons per minute (g.p.m.). The estimated average initial VOC concentrations in the extracted groundwater before treatment are 274 μg/L cis-1,2-dichrloroethene; 3.2 μg/L trans-1,2-dichloroethene; 125 μg/L tetrachloroethene; 3.4 μg/L tetrachloromethane; 0.7 μg/L 1,1,1-trichloroethane; 86 μg/L trichloroethene; 5.4 μg/L trichlorofluoromethane; 43 μg/L chloroform, and 3.6 μg/L vinyl chloride. (Note: These concentrations represent the untreated water concentrations below ground. The aforementioned concentrations are taken from the Operable Unit 1 Contract Documents for Remedial Action Pump and Treatment System Construction, June 1996 (Appendix E). The air stripper will reduce the concentrations before discharge. See Section 7 "Effluent Monitoring" for a discussion of tested water quality.)

Three submersible pumps, one in each extraction well, pump groundwater to the treatment system building. The pipelines conveying the water are constructed of Schedule 80 PVC plastic. Most of the pipe run is below ground, but a small portion of the pipe run where the pipe enters the side of the building is aboveground. The aboveground portion is heated and insulated. The pipes join together at a manifold system.

After the manifold, the water flows to a low-profile air stripper. In the air stripper, the contaminants of concern are each reduced to less than the MCL (generally <5 μg/L, typically not detectable). The contaminants are transferred from the water to the air medium and exhausted outdoors through the air vent. The contaminants dissipate and decompose rapidly in the atmosphere.

After passing through the stripper, the water enters a gravity-flow effluent pipe. The effluent pipe is constructed of Schedule 80 PVC plastic. The effluent pipe flows to a below-grade storm drain that runs along the West Side of .

4. SAFETY GUIDELINES

Safety procedures and lists of any hazardous materials must be made and kept with responsible personnel for reference during operation and maintenance. Periodic review of safety procedures is recommended. All procedures must be in compliance with OSHA regulations. The equipment manufacturers provide specific safety requirements associated with the operation and maintenance of specific equipment. Similarly, the chemical vendors provide specific safety requirements of water treatment chemicals. Safety guidelines for the treatment system are contained in the Site Specific Health and Safety Plan (HASP), Appendix D, and are generally summarized below.

Environmental

Volatile organic compounds contaminate the water being treated by this plant. These contaminants are not present in high concentrations, but have been shown to in some cases to be carcinogenic (cancer causing) or in other ways harmful to human health. The following general safety guidelines must be employed:

1. Prevent skin contact with the influent water being treated.

2. Repair all water leaks immediately. Water that has spilled or leaked should be routed to the floor sump, where it should be pumped to the air stripper for treatment.

3. Repair all air leaks immediately. The vent pipe contains contaminants liberated from the water, so the air should be considered hazardous like the water. Although Ohio EPA considers the air emissions from the unit to be "de minimis," it is still prudent to minimize occupational exposure to the air. If air is leaking, stop the system, ventilate the building's interior, and repair the leak.

4. Ventilate the building's interior if water leaks are large or have rested on the floor for a long time. The contaminants tend to evaporate quickly from water, thereby entering the air.

Chemicals

Depending on manufacturer's instructions, industrial chemicals may be used for cleaning, and those chemicals may be hazardous. The chemicals in question often pose hazards from splashing or spraying. Suitable protective clothing, eye protection, and gloves are recommended. A portable eyewash/safety shower should be kept in the building as a backup protection if protective equipment somehow fails.

5. PUMP-AND-TREAT SYSTEM OPERATION

This subsection describes the operation of the pump-and-treat system. The narrative description is intended to assist in the operation and adjustment of the plant.

Well Pumps

Three well pumps are located underground, one within each extraction well. Each well's water travels through a dedicated influent pipe to the treatment system building. A check valve assures that water cannot flow backward toward a well. A valve to achieve the desired flow rate can individually throttle each influent pipe.

Water Level Control

Each well contains a level control switch that prevents the well pump from running without adequate water level. The pump would become damaged if it ran without proper water flow. When the water level drops below the low-level switch, the individual pump stops. The well automatically restarts when water level rises above the operating-level switch, after a brief (programmable) reset period elapses. The reset period is controlled by a timer, which eliminates the possibility of the well pump cycling too rapidly.

Pressure Indicators

An inline pressure gauge, located on the composite header, displays the head produced by the pumps and the force of air in the stripper. Exact pressure readings (analyzed together with flow readings) can be compared to pump curves to indicate the condition of each pump. If unusual pressure is indicated relative to the amount of water that is flowing, the pump must be turned off until the source of blockage is found.

Flow Meter

Three individual flow meters indicate the water flow from each well and a non-resettable totalizer integrates individual flow to record total flow to date. If a well's flow rate drops without explanation, test the transmission pipe for leakage.

Sampling Ports

Sampling ports allow monitoring of influent and effluent quality. Ports are located at each individual well influent, at the composite manifold influent, and at the effluent.

Floor Sump

A floor sump collects spilled water. Spilled water can be manually returned to the stripper by a sump pump. An alarm is sounded if a high-level indicator is triggered in the floor sump. Simultaneously, the well pumps and stripper are all shut down.

Low-Profile Air Stripper

The air stripper uses a series of trays for the distribution of water, which is met with a crosscurrent of forced air. Water enters at the top of the stripper, and air enters at the bottom. The air and volatilized contaminants are vented to vapor phase treatment while the treated water falls into the sump tank. The air stripper sump has a high-level switch that can deactivate the three well pumps and the air stripper blower.

Air Stripper Blower

The air stripper blower introduces air at the bottom of the stripper. The blower is equipped with pressure switches and a pressure indicator (magnehelic®). The pressure switches shut off the pumps and blower if minimal or excessive pressure develops at the blower discharge. The system shutdown caused by an unacceptable pressure condition activates the associated alarm, shuts down the blower and shuts down the three well pumps simultaneously. A typical cause of excessive pressure is fouling of the stripper trays, indicating a need to clean the trays. Typical causes of minimal pressure is fouling of the air intake filter(s), loss of large port cover, or closing of the air intake gate.

5.1 Building Power

WARNING

Building power must be maintained in winter to prevent freezing of water. If power must be disconnected, precautions MUST be taken to prevent freezing.

5.1.1 Switch PP-1-A disconnect to ON position.

5.1.2 Switch PP-1-B Breaker 2 and 7 to ON position.

5.1.3 Switch PP-1-D disconnect to ON position.

5.1.4 Ensure heater on/off switch is in on position with thermostat set to maintain temperature above 50 degrees Fahrenheit.

NOTE

LP-1-B Main Breaker and Breaker 6 must stay ON during freezing conditions. See above warning.

5.1.5 Switch LP-1-B Master Breaker and Breakers 1 through 6 to ON position.

5.2 System Startup

NOTE

If system has been drained,
the system MUST be primed with clean water
prior to continuing. See Appendix A for LP-1-A Layout.

5.2.1 If needed, prime the system via the three inch port on top of the Stripper with clean water until the Stripper sump has approximately one foot of water in it (approximately 125 gallons of water). Ensure Valve 12, for the signt tube is open.

5.2.2 Ensure LP-1-A switches for Panel Main, Well 412, Well 413, Well 414, and Blower are in the OFF position.

5.2.3 Turn LP-1-A Panel Main switch to the ON position.

5.2.4 Push LP-1-A RESET Button and wait for Low Air Pressure alarm indication.

5.2.5 Switch PP-1-C disconnect to ON position.

5.2.6 Switch PP-1-B Breakers 1, 8, 13, and 14 to ON position.

NOTE

See Appendix B for Valve Layout.

5.2.7 Ensure Valves 7, 9, 11, and SP-1 through SP-5 are in the CLOSED position.

5.2.8 Ensure Valves 1 through 6, 8, 10, 12, 13, and 14 are in the OPEN position.

5.2.9 Ensure Blower air intake gate valve is in the fully open position.

5.2.10 Turn LP-1-B Blower switch to "Automatic" position and push "RESET" button.

5.2.11 Allow Blower to come up to speed and turn LP-1-A switches for Well 412, Well 413, and Well 414 to the "Automatic" position.

5.2.12 Observe that all four green "ON" lamps are illuminated.

5.2.13 Observe that all three red "ALARM" lamps are not illuminated.

5.2.14 Observe Magnehelic® gauge reads approximately 15 inches of water column.

5.2.15 Observe that the pressure gauge above Valve 14 reads approximately 10 psi.

5.3 System Shutdown

NOTE

See Appendix A for LP-1-A Layout.
Turn OFF LP-1-A Well switches first!
Blower will continue to run for time preset
on internal timer (TD-5) to ensue all water is treated.

5.3.1 Turn LP-1-A switches for Well 412, Well 413, Well 414, and Blower to the OFF position.

5.3.2 Wait until Blower stops running and Turn LP-1-A Panel Main switch to the OFF position.

5.3.3 Switch PP-1-C disconnect to OFF position.

5.3.4 Switch PP-1-B Breakers 1, 8, 13, and 14 to OFF position.

NOTE

See Appendix B for Valve Layout.
If below freezing temperatures are expected and
power to building disconnected, the system
must be drained to prevent freezing.

5.3.5 Ensure ALL Valves (1 through 14) and Sample Ports (SP-1 through SP-5) are in the CLOSED position.

5.3.6 Close Blower air intake gate valve.

5.4 System Draining

NOTE

See Appendix A for LP-1-A Layout.
Turn OFF LP-1-A Well switches first!
Blower will continue to run for time preset
on internal timer (TD-5) to ensue all water is treated.

5.4.1 Turn LP-1-A switches for Well 412, Well 413, Well 414, and Blower to the OFF position.

5.4.2 Wait until Blower stops running and Turn LP-1-A Panel Main switch to the OFF position.

5.4.3 Switch PP-1-C disconnects to OFF position.

5.4.4 Switch PP-1-B Breakers 1, 8, 13, and 14 to OFF position.

NOTE

See Appendix B for Valve Layout.
If below freezing temperatures are expected and
power to building disconnected, the system
must be drained to prevent freezing.

5.4.5 Ensure Valves 1 through 6, 8, 12, and 14 are in the OPEN position.

5.4.6 Ensure Valves 7, 9, 10, 11, 13 and Sample Ports (SP-1 through SP-5) are in the CLOSED position.

5.4.7 Close Blower air intake gate valve.

NOTE

All untreated water must be containerized, sampled,
and disposed of through the SD treatment facility.

5.4.8 Obtain appropriate containers to capture contaminated water.

5.4.9 Consult Health and Safety Plan and Industrial Hygiene for proper Personal Protective Equipment and monitoring requirements.

5.4.10 Place a container under Valve 7 quick disconnect cap and remove cap.

5.4.11 Operate Valve 7 to drain manifold piping to container(s).

5.4.12 Open Sample Ports 1 through 4 to drain and use container to capture water.

5.4.13 Obtain the Pitless Adapter tool from the southwest corner of the Building.

5.4.14 Proceed to each well, remove cap, and carefully loosen Pitless Adapter to drain unprocessed water back into the well. Be certain not to change the orientation of the Pitless Adapter to the opening in the well casing.

5.4.15 After unprocessed water flow back into the wells stops, tighten the Pitless Adapter and secure the well cap. Return the Pitless Adapter tool to storage location.

5.4.16 Close all Valves on the incoming piping to the Stripper and secure the Valve 7 quick disconnect cap.

5.4.17 Drain the processed water from the Stripper utilizing Valve 11 and hose. This water only needs to be containerized when loss of power occurs or system is turned off in any manner other than that described in System Shutdown Section.

5.4.18 Drain the water from SP-5 and Valve 9.

5.4.19 Close all Valves from the Stripper to effluent discharge (All Valves in the Building in the CLOSED position).

5.4.20 Containerize any water found in the Building sump.

5.4.21 Dispose of all containerized water through SD treatment facility.

6. REGULAR INSPECTION AND MAINTENANCE GUIDELINES

Regular inspection and maintenance of the pump-and-treat system is required for continued effective operation. Regular activities, which shall be documented in the system logbook, include the following:

- Note pressure readings on all pressure indicators.
- Note flow rate indicated on all flow meters.
- Note any alarms. Determine underlying the cause of the alarm. Perform necessary maintenance or adjustment to resolve the underlying cause. Reset the alarm.
- Check lubrication on electric blower motor on the air stripper.
- Periodically disassemble gauges and meters and clean according to manufacturer directions.
- Periodically check trays for fouling and clean openings to permit uniform flow of air through stripper trays, or change trays.
- Determine the underlying cause of any new noises or vibrations then correct the underlying cause.
- Well pumps require no regularly scheduled maintenance. If an influent line does not produce sufficient flow, check its throttle valve and electrical connection. If flow remains insufficient, replace the entire well pump assembly. If well continues to fail to produce water, contact a hydro geologist to diagnose the problem and determine a solution.

NOTE

Magnehelic® readings lower than 10 inches water closet can be caused by air intake restriction.

6.1 Check Building air intake filter on a weekly basis.

6.1.1 Clean and/or replace filter media. Clean media by removing it and spraying it with clean water.

6.1.2 Replacement media should be permanent washable natural hairs that are cured, treated and permanently coated with a plastic and neoprene compound (or equivalent). The media is approximately 2" thick and comes on a roll.

6.2 Perform System Shutdown and check Stripper air intake filter monthly.

6.2.1 Clean pre-filter media by removing it and spraying it with clean water.

6.2.2 Replace pre-filter and filter approximately every 60 days. New filters are ordered from Solberg Manufacturing, Inc. and are part number 377P. See filter housing for address and telephone number.

NOTE

Magnehelic® readings greater than 20 inches water closet can be caused by Stripper fouling/restriction.

6.3 If system fouling is suspected, perform a System Shutdown.

6.3.1 Consult Health and Safety Plan and Industrial Hygiene for proper Personal Protective Equipment and monitoring requirements.

6.3.2 Remove inspection/clean out ports on the West end of the stripper and inspect for fouling with a flashlight.

6.3.3 If system is fouled perform System Draining omitting Steps 5.4.5 through 5.4.15.

6.3.4 Obtain fresh water supply, "Steam Genie/Pressure Washer", and any other needed supplies.

6.3.5 Obtain the cleaning wand from the southwest corner of the Building.

6.3.6 Open effluent drain Valve 10.

6.3.7 Starting at the bottom and working to the top, use the wand to clean the stripper at a rate no faster than one inch per second.

6.3.8 If necessary, remove top of Stripper to thoroughly clean air de-mister screen.

6.3.9 Drain the Stripper sump utilizing Valve 11 and remove solid residue with a wet/dry shop vacuum.

6.3.10 Restore Stripper to a ready to run condition.

6.4 If system automatic shutdown occurs due to all three wells recharging at the same time, reset TD-5 to a longer timeout value. The TD-5 timer value must take TD-1 through TD-3 values into consideration. The time delay on TD-5 shall never be less than 5 minutes (300 seconds). See Appendix C for timer locations.

7. EFFLUENT MONITORING

The effluent, which is also known as Outfall 003, must be monitored. The automatic sampler located within Building 300 is to be operated solely by the Environmental Monitoring and Compliance organization, unless extenuating circumstances prevail (i.e., the sampling system container is overflowing). In the event that the sampling system is paused/turned off (given an extenuating circumstance) or needs attention, contact the appropriate Environmental Monitoring and Compliance representative. Should the building loose power for any reason, contact the appropriate Environmental Monitoring and Compliance representative to check the sampler for proper operation.

Monitoring is most intense during initial startup, both when the system is new and after any major overhaul of the air stripper. Refer to the Sampling and Analysis Plan (Appendix C) for detailed instructions on how to monitor the effluent. The results of the water treatment system measurements have a direct bearing on the operation of the system. Separate rules govern initial startup and routine operation.

Initial Startup

Before its first use and after any major overhaul, the air stripper must be subjected to initial startup testing. Ohio EPA must be notified before start-up. Containerize all treated effluent during the two-hour initial startup. Collect and analyze samples as described in the SAP Section 3.3 of Appendix C. If at least four of five effluent samples show all contaminants of potential concern (COPCs) less than 5 μg/L, the initial startup is successful, and routine operation may begin, and the containerized water may be released to the effluent pipe. All management of water shall comply with ER SOP 1.15 and Ohio EPA Policy DSW-DERR 100.027. If the initial startup is not successful, dispose of containerized effluent into the Mound sewage system, and troubleshoot the air stripper, and repeat the initial testing when the stripper is properly prepared.

Routine Operation

Collect and analyze sample as described in the SAP. Compare effluent samples against the criteria for acceptable treatment.
The criteria for acceptable treatment are as follows:

Daily Maximum: 10 μg/L for each of the COPCs.
Thirty-day Average: 5 μg/L for each of the COPCs.
(Reference: Ohio EPA Policy DSW-DERR 100.027.)

If one or both of the criteria are exceeded, repeat the sampling and then stop operation. After the repeated sample is analyzed, operation may resume only if the repeated sample discloses that neither criterion is exceeded when the second sample is included in calculations. If the repeated sample confirms exceedance, do not resume operation. Troubleshoot the treatment system, perform the indicated maintenance, and return to the "Initial Startup" procedure described above.

8. GROUNDWATER MONITORING

The pump-and-treat system is designed to gain control of groundwater flow and contaminant transport within the groundwater beneath OU1. Accordingly, certain measurements must be taken of the groundwater elevations and groundwater chemistry. These measurements are made in certain nearby groundwater monitoring wells. Refer to the Sampling and Analysis Plan, Sections 3.1 and 3.2 of Appendix C, for detailed instructions on how to monitor the groundwater.

The results of groundwater monitoring influence the operation of the system. Head measurements and concentration measurements each play a role.

Head Measurements

On a quarterly frequency, using methods consistent with the Mound Plant Groundwater Protection Management Program Plan (GWPMPP), conduct head measurements as described in the SAP. Notify Ohio EPA before taking measurements. Contour the head data. If a 0.002-foot/foot (or greater) inward gradient is created across the boundary, consider the hydraulic control of the landfill a success. If the inward gradient greatly exceeds 0.002-foot/foot across the entire boundary, consider throttling back the flow rate to avoid wasting groundwater. If the inward gradient does not meet the 0.002-foot/foot criterion, throttle up the system to a higher flow rate. Continue provisionally operating at the higher flow rate and reassess at the next round of head measurements. Submit results to the Mound Plant Environmental Group, Ohio EPA, and U.S. EPA.

Groundwater Chemical Measurements

On a quarterly frequency using methods consistent with the GWPMPP, conduct VOA analyses of select groundwater monitoring wells as defined in the SAP. Notify Ohio EPA before taking samples. Develop concentration-versus-time plots for each well. Over a number of sampling rounds, trends will develop for each well. A sustained downward slope will be interpreted as proof of successful capture of the plume. A steady or upward slope will be interpreted as failure to capture the plume. In the case of success, continue operation. In the case of failure, throttle up the pumping rate on nearby extraction wells, even if hydraulic head calculations suggest that the higher flow is unnecessary. Submit results to the Mound Plant Environmental Group, Ohio EPA, and U.S. EPA.

REMOTE ALARMS AND CONTROLS

RACO Manufacturing and Engineering Co., 1400 62nd St., Emeryville, CA 94608 (510) 658-6713 800-722-6999 FAX (510) 658-3153

Calling a Pager with Chatterbox

Introduction

It has become fairly common to have the Chatterbox call a pager system with an alarm call. The dialer is able to handle many of the current pagers, and an overall understanding of the sequence of events will make the required programming go smoother.
A note of caution to begin: The growth in pager system popularity as been accompanied by some industry growing pains as well. Some pager companies have been known to switch their protocols (pager call timing, use of "#" teminator codes, etc.) suddenly, often without informing their customers. This can cause problems for a preprogrammed calling device, as you may well imagine. More importantly, it can also prevent the system operator from getting an alarm call via the pager. As a result, RACO strongly recommends that you program other personnel phone numbers at the appropriate place in the dialing list. This is to insure that if for some reason the pager system cannot be activated, you will get a timely warning from your autodialer.

General Programming Considerations

In some cases, the entire pager calling sequence can be handled within the dialing string of the Chatterbox. That is, it is all part of the phone number. The unit will handle up to 16 digits, including any timing delays you insert. Delays are added by pressing the MINUS key on the front panel. Each delay is about 1.5 second The dialer calls out with a "blind" call, meaning that it does not attempt to find out what's happening on the other end. Delays are used to allow the dialer to enter numbers into the pager without detecting what is going on. One of the main tasks in programming for pager operation is to time the necessary delays. Finally, the dialer must be programmed for touch tone dialing , as a pager will not recognize pulse dialing.
To program touch-tone dialing, press PROGRAM, then POINT. The POINT key toggles dialing between pulse dial and touch tone when you are at the first phone number.

Case 1: Simplest Case Pager

The simplest case is when you only have to call the pager and can hang up as soon as it answers, with no information being passed to the pager except that someone called. If you have only one dialer (and no one else uses the number!) you assume that any call from the pager is a Chatterbox alarm call, and proceed from there. Of course, if you had two possible callers, you wouldn't know which one had called. A wrong number would also trigger the pager.

example 1: Set the first phone number to call the pager, the second phone number to call the plant foreman. Using coded programming (1 then PROGRAM), program 71 9 MINUS 1 713 235 3456 ENTER. (here, 71 signifies the first phone number, 9 to get an outside line, MINUS to wait 1.5 seconds to get an outside line dial tone, 1 713 235 3456 our mythical long distance call to a pager, and ENTER to complete the phone number). Program 72 9 MINUS 548 7632 ENTER (this is the second phone number, to call the foreman in case the pager call doesn't get through).

Case 2: Passing a Phone Number to a Pager

Some pager systems will allow the caller to enter a phone number (or other ID number), which is then relayed on to the beeper. When the person with the beeper gets the call, he will know immediately from the number which dialer has called. This is a good system if you are using multiple dialers, or have other pager calls in addition to autodialers.

Typically, a call to the pager is placed. You wait a short period (usually 5-12 seconds), the pager answers then gives a beep or a short burst of beeps. This is the signal to begin entering the number you want to be received by the beeper. When you are finished, hang up. A variation of this is when a # terminator is asked for (see case 3). The critical task here is to time the delay from the last digit dialed until the pager beeps. Use a stopwatch or a clock with a second hand. You want to time this delay to the nearest second, then add 1 second to be sure. Consult the diagram to see the time line of events, then program the dialer:

- Call pager by hand and time the delay between the phone number and the beep. Add 1 second.
- Program the pager number in the dialer, adding delays, followed by the Chatterbox number.

Remember that the dialing string is only 16 digits.

example 2: Our pager phone number is 235-2456. The dialer is at 548-1234. On calling the pager, the time between the number 6 and the pager beep was 4 seconds. Add 1 second. We need about 4 delays. Use 1234 to identify the Chatterbox. This gives us a total of 15 digits- just under the wire!
1st phone number: 235 2456 MINUS MINUS MINUS MINUS 1234 ENTER .
2nd phone number: 548 7632 (our foreman).

Case 3: Using the Station ID to send Pager Messages

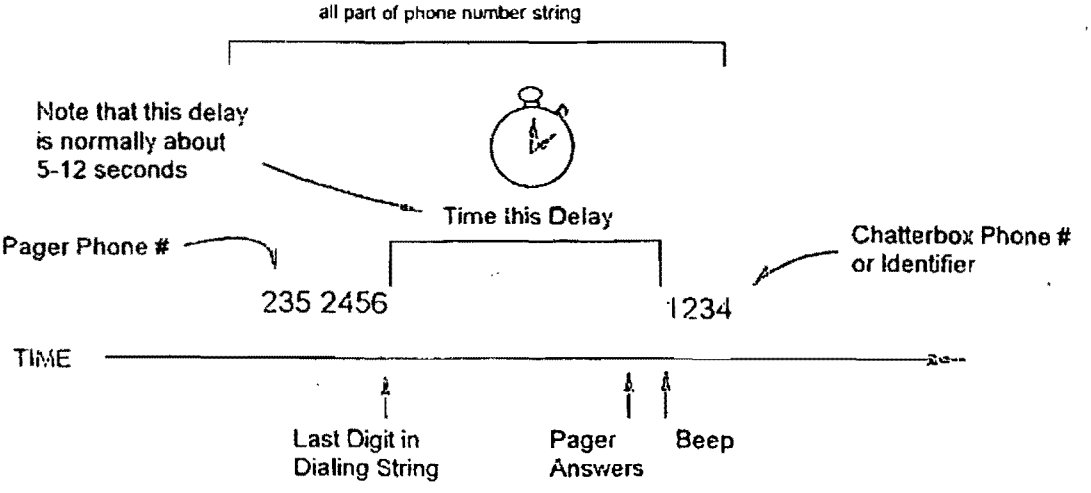
In most instances it will be necessary to use the station ID as a means to get information into the pager once it has been dialed. As you can see from the above example, you could soon run out of room in the dialing string if you wanted to include a complete phone number to be sent to the pager or if the delay time was say 8 or 9 seconds. Instead of trying to cram everything into the phone number string, it is possible to put the numbers you want to appear on the pager into the station ID string.

1) Time the delay from the last digit in the pager phone number until the beep from the pager.

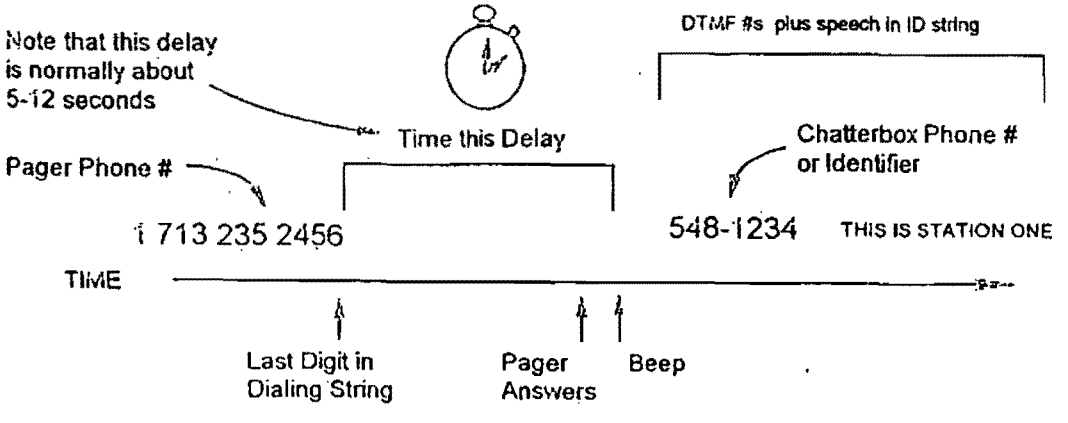
2) Calculate the delay you will need to put in the dialing string. Note that there is a 6 second delay built into the Chatterbox until it begins speaking.

3) Enter the pager phone number plus the calculated delay. Remember to have the Chatterbox set for tone-dialing.

Case 2 Pager Calling Sequence (ex. 2)



Case 2 Pager Calling Sequence (ex. 3)



4) Enter the Chatterbox ID into the station ID speech using DTMF code numbers (these are touch tones equivalent to pressing the numbers on a touch telephone). To do this, check the table of user programmable speech. The DTMF numbers are 059 to 068. From NORMAL, press PROGRAM and advance to Station ID. Press POINT, then enter your speech codes.
Note that you can add regular speech after the touch tones. Press normal when done.

example 3: Our pager phone number is 1-714-235-2456. The dialer is at 548-1234. On calling the pager, the time between the number 6 and the pager beep was 9 seconds. Add 1 second. This gives us a total of 10 seconds delay. Subtract 6 seconds for the natural delay of the Chatterbox. We need 4 seconds of delay in the dialing string. use 3 delays. This gives us a total of 14 digits- just under the wire! Use 548-1234 to identify the Chatterbox.
1st phone number: 1 714 235 2456 MINUS MINUS MINUS ENTER .
2nd phone number: 548 7632 (our foreman).
Station ID: 064 063 067 060 061 062 063 202 106 191 001 (using speech codes)
(meaning) 5 4 8 1 2 3 4 this is station one

WARRANTY REGISTRATION

If you complete and mail in this warranty registration form within 30 days of purchase we will send you a *FREE GIFT* in appreciation of your prompt response. Postage is paid if mailed in the U.S. otherwise, please return to the address shown on the back of this card.

Model: CB-4 _____ Address: _____

Serial Number: 4-7523 _____ City: _____

Name: _____ State: _____ Zip: _____

Title: _____ Country: _____

Company: _____ Phone: _____

Department: _____ Fax: _____

E-Mail address: _____

All warranty information can be found in your owners manual. If you would like information on any of our autodialer systems, i.e., product brochure, specifications, options, drawings or tehnical support we have a fully automated Fax-On-Demand System. Simply call (510) 658-6716, either from your touch tone telephone or your fax machine, and follow the voice instructions. Request our *Catalogue of Documents - Document No. 100* and receive a complete catalog of all available documents.

The following information will assist us in our continuing efforts to provide you with products that meet your specific requirements.

1. The autodialer is used for:
   - ☐ Waste Water
   - ☐ Gas Pipeline
   - ☐ Remote Equipment
   - ☐ Cold Storage
   - ☐ Chemical Manufacture
   - ☐ Energy Generation
   - ☐ Agriculture
   - ☐ Other_____

2. Types of transducer used:
   - ☐ Pressure
   - ☐ Temperature
   - ☐ Flow
   - ☐ Electrical Detection
   - ☐ Gas (All Types)
   - ☐ Intrusion
   - ☐ Float Level
   - ☐ Other_____

3. I became aware of your products from:
   - ☐ Dealer Showroom
   - ☐ Trade Show
   - ☐ Colleague
   - ☐ Professional Association
   - ☐ Magazine
   - ☐ Mailer
   - ☐ Other_____

4. I read the following publication(s):
   - ☐ *Water & Wastes Digest*
   - ☐ *Waterworld News*
   - ☐ *Pollution & Equipment News*
   - ☐ *Pollution Engineering*
   - ☐ *W.E.F. Journal*
   - ☐ *AWWA Journal*
   - ☐ Other(s)_____

5. *FREE GIFT* (Choose one item only): ☐ Flashlight ☐ Engraved Pen ☐ Multi-function Knife

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CODED PROGRAMMING SUMMARY

(Refer to Owners Manual for details)

FOR ACCESS TO CODED PROGRAMMING:

At panel, press "1" then press PROGRAM.
Over phone, press "1" at sound of beep.

FUNCTION	FUNCTION CODE
Single Analog Chan.	00
Channel 1	01
Channel 2	02
Channel 3	03
Channel 4	04
↓	↓
Channel 32	32

COMMENTS FOR FUNCTION CODES 00 TO 32:
For Function Code (Channel #) entries 00 to 32, the following subcodes are to be entered after the channel #, to select the desired operation for the selected channel.

SUBCODE	OPERATION
(none)	Reads status for this channel
1	Read/set criteria & meters
2	Read/set RSP (analog)
3	Read/set FSP (analog)

FOR SUBCODE 1 (read/set criteria & Run Time Meters), the following parameters may be optionally entered after SUBCODE 1 to alter (rather than just read) the programmed setting.

1	set Open Circuit is Alarm
2	set Closed Circuit is Alarm
3	set No Alarm
4	set Run Time Meter On, Reset Mode 1
5	set Run Time Meter On, Reset Mode 2
9	set (clear) Run Time Meter to 0 reading

SEE ADDITIONAL CODES ON RESERVE SIDE.

CODED PROGRAMMING SUMMARY

(Continued)

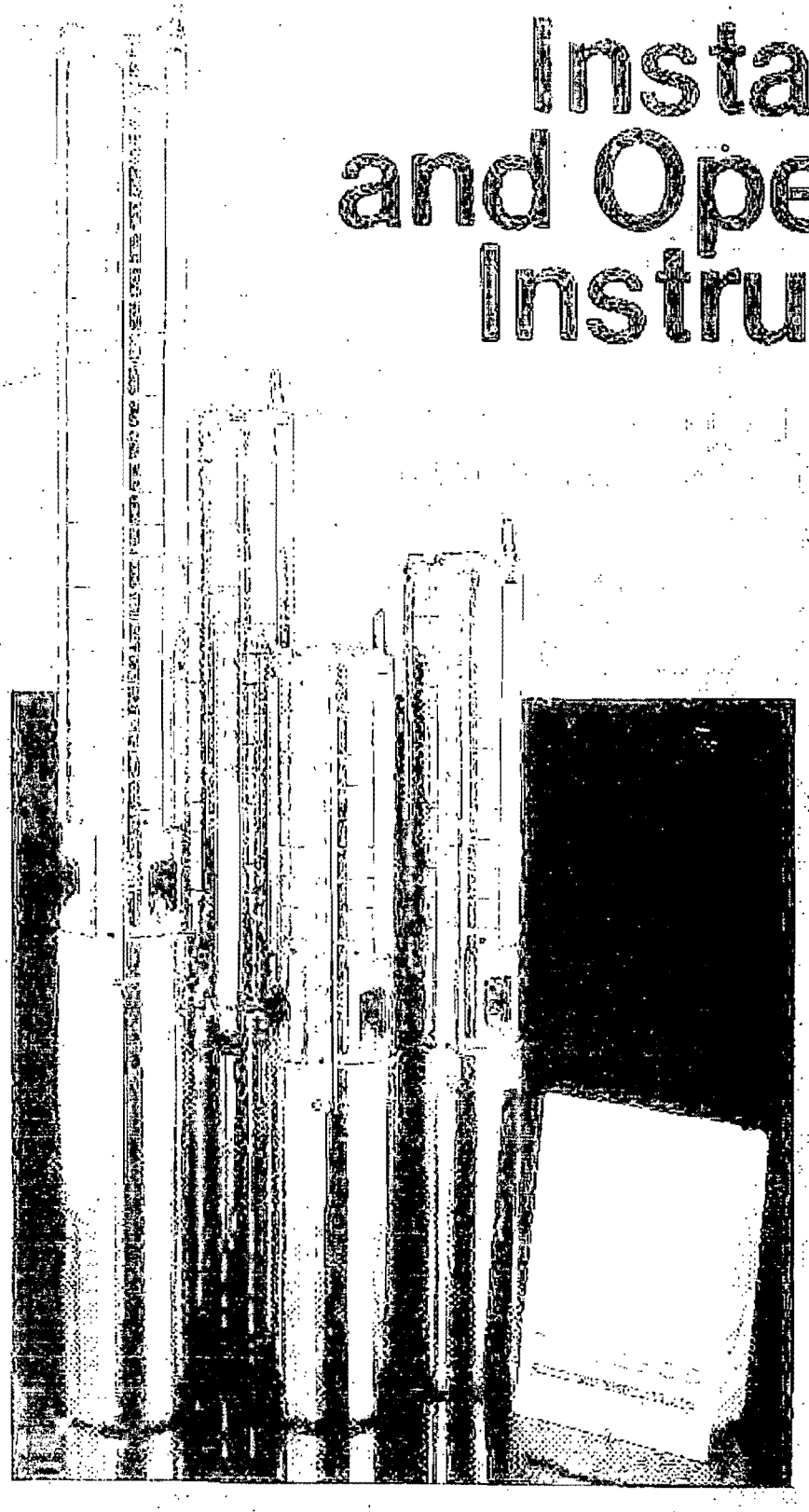
FUNCTION	FUNCTION CODE
First Phone #	71
Second Phone #	72
Third Phone #	73
↓	↓
Eighth Phone #	78
Ninth (Callback) Phone #	79
Callback Execute	80
Tone vs Pulse Dialing	81
Station ID #	82
Alarm Trip Delay	83
Time Between Calls	84
Alarm Reset On/Off 1=ON 0=OFF	85
Alarm Reset time	86
Autocall On/Off 1=ON 0=OFF	87
Autocall time	88
Ring Delay	89
# of Alarm Readings	90
Callin Count	91
Dialout Count	92
Ack Alarm Count	93
Pwr off Count	94
Comm Mode	95
Time	96
Date	97
Access Code	98

Over The Phone:

= ENTRY COMPLETE

** = CANCEL ENTRY

Installation and Operating Instructions



Please leave these instructions with the pump

Installation and Operating Instructions

TABLE OF CONTENTS

Installation and Operating Instructions

GRUNDFOS

Redi-Flo4

Your Grundfos Redi-Flo4 Environmental Pump is of the utmost quality. Combined with proper installation, your Grundfos pump will give you many years of reliable service.

To ensure the proper installation of the pump, carefully read the complete manual before attempting to install the pump.

SECTION 1.

Shipment Inspection

Examine the components carefully to make sure no damage has occurred to the pump-end, motor, cable or control box during shipment.

This Grundfos Redi-Flo4 Environmental Pump should remain in its shipping carton until it is ready to be installed. The carton is specially designed to protect it from damage. During unpacking and prior to installation, **make sure that the pump is not contaminated, dropped or mishandled.**

The motor is equipped with an electrical cable. **Under no circumstance should the cable be used to support the weight of the pump.**

You will find a loose data plate wired to the pump. It should be securely mounted at the well or attached to the control box.

SECTION 2.

Pre-Installation Checklist

Before beginning installation, the following checks should be made. They are all critical for the proper installation of this submersible pump.

☑ **A. CONDITION OF THE WELL**

If the pump is to be installed in a new well, the well should be fully developed and bailed or blown free of cuttings and sand. Dispose of discharged materials in accordance with the specific job site requirements. The stainless steel construction of the Redi-Flo4 Environmental Pump makes it resistant to abrasion; however, no pump, made of any material, can forever withstand the destructive wear that occurs when constantly pumping sandy groundwater.

Determine the maximum depth of the well, and the drawdown level at the pump's maximum capacity. Pump selection and setting depth should be based on this data.

The inside diameter of the well casing should be checked to ensure that it is not smaller than the size of the pump and motor.

☑ **B. CONDITION OF THE WATER**

Redi-Flo4 pumps are designed for pumping cold groundwater that is free of air or gases. Decreased pump performance and life expectancy can occur if the groundwater is not cold or contains air or gases.

☑ **C. INSTALLATION DEPTH**

Pumping sand or well sediment can occur when the pump motor is installed lower than the top of the well screen or within five feet of the well bottom. This can reduce the performance and life expectancy of the pump and should be avoided.

If the pump is to be installed in a lake, containment pond, tank or larger diameter well, the water velocity passing over the motor must be sufficient to ensure proper motor cooling. The minimum recommended water flow rates which ensure proper cooling are listed in Table A.

☑ **D. ELECTRICAL SUPPLY**

The motor voltage, phase and frequency indicated on the motor nameplate should be checked against the actual electrical supply.

SECTION 3.

Wire Cable Type

The type of wire used between the pump and control box should be approved for submersible pump applications. The conductor insulation should have a continuous Teflon® jacket with no splices and must be suitable for use with submersible pumps.

SECTION 4.

Installation

The riser pipe or hose should be properly sized and selected based on estimated flow rates and friction-loss factors.

A back-up wrench should be used when attaching a riser pipe or metallic nipple to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. **The body of the pump, cable guard or motor should not be gripped under any circumstance.**

If steel riser pipe is used:

An approved pipe thread compound should be used on all joints. Make sure the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

When tightened, the first section of the riser pipe must not come in contact with the check valve retainer in the discharge chamber of the pump.

After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. **Do not clamp the pump.** When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only.

Make sure that the electrical cables are not cut or damaged in any way when the pump is being lowered in the well.

The drop cable should be secured to the riser pipe at frequent intervals using an approved clip or tape to prevent sagging, looping and possible cable damage.

If plastic or flexible riser pipe is used:

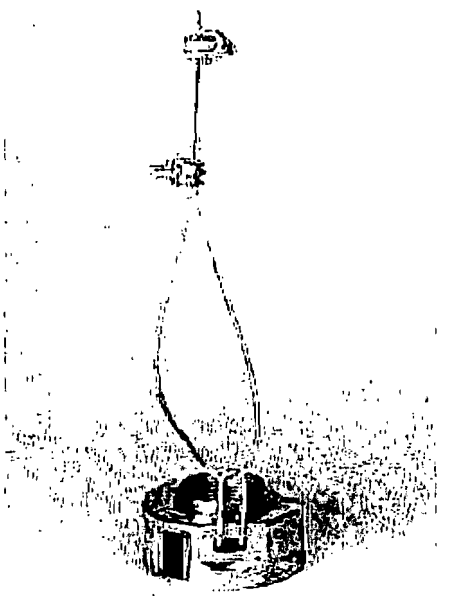
Use the correct compound recommended by the pipe manufacturer or specific job specifications. Besides making sure that joints are securely fastened, the use of a torque arrester is recommended when using these types of pipe.

Do not connect the first plastic or flexible riser section directly to the pump. Always attach a metallic nipple or adapter into the discharge chamber of the pump. When tightened, the threaded end of the nipple or adapter must not come in contact with the check valve retainer in the discharge chamber of the pump.

The drop cable should be secured to the riser pipe at frequent intervals using an approved clip or tape to prevent sagging, looping and possible cable damage.

IMPORTANT- Plastic and flexible pipe tend to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe. Leave enough slack between clips or taped points to allow for this stretching. This tendency for plastic and flexible pipe to stretch will also affect the calculation of the pump setting depth. If the depth setting is critical, check with the manufacturer of the pipe to determine how to compensate for pipe stretch.

When these types of pipe are used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge piece of Redi-Flo4 submersibles is designed to accommodate this cable. (Figure 4)



Protect the well from contamination:

While installing the pump, proper care should be used not to introduce foreign objects or contaminants into the well. The well should be finished off above grade to protect against surface water from entering the well, causing contamination.

NOTE: Teflon® is a registered trademark of DuPont.

SECTION 5.

Electrical

WARNING: To reduce the risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor, at least the size of the circuit supplying the pump, to the grounding screw provided within the wiring compartment.

All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

Verification of the electrical supply should be made to ensure the voltage, phase and frequency match that of the motor. Motor voltage, phase, frequency and full-load current information can be found on the nameplate attached to the motor. Motor electrical data can be found in Table C.
If voltage variations are larger than ± 10%, do not operate the pump.
Direct on-line starting is used due to the extremely fast run-up time of the motor (0.1 second maximum), and the low moment of inertia of the pump and motor. Direct on-line starting current (locked rotor amp) is between 4 and 6.5 times the full-load current.

Engine-Driven Generators

If the Redi-Flo4 pump is going to be operated using an engine driven generator, we suggest the manufacturer of the generator be contacted to ensure the proper generator is selected and used. See Table B for generator sizing guide.

Control Box, Single-Phase Motors

Single-phase motors must be connected as indicated in the motor control box. A typical single-phase wiring diagram using a Grundfos control box is shown. (Figure 5-A)

High Voltage Surge Arresters

A high voltage surge arrester should be used to protect the motor against lightning and switching surges. The correct voltage-rated surge arrester should be installed on the supply(line) side of the control box.(Figure 5-B) The arrester **must be grounded in accordance with the National Electric Code, local codes and regulations.**

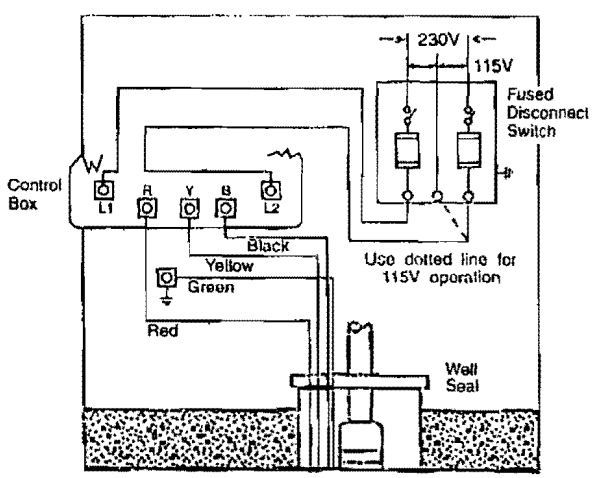
Control Box and Surge Arrester Grounding

The control box shall be permanently grounded in accordance with the National Electrical Code and local codes or regulations. The ground wire should be a bare copper conductor at least the same size as the drop cable wire size. The ground wire should be run as short a distance as possible and be securely fastened to a true grounding point.

True grounding points are considered to be: a grounding rod driven into the water strata, steel well casing submerged into the water lower than the pump setting level, and steel discharge pipes without insulating couplings. If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel. Do not ground to a gas supply line. Connect the grounding wire to the ground point first and then to the terminal in the control box.

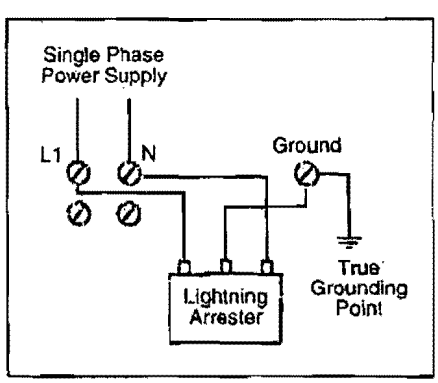
Wiring Checks

Before making the final wiring connections of the drop cable to the control box terminal, it is a good practice to check the insulation resistance to ensure that the cable is good. Measurements for a new installation must be at least 1,000,000 ohm. Do not start the pump if the measurement is less than this. If it is higher, finish wiring and verify that all electrical connections are made in accordance with the wiring diagram. Check to ensure the control box and high voltage surge arrester have been grounded.



Single Phase Wiring Diagram for Grundfos Control Boxes

(Figure 5-A)



Single Phase Hookup

(Figure 5-B)

SECTION 6.

Start-Up

After the pump has been set into the well and the wiring connections have been made, the following procedures should be performed.

A. Attach a temporary horizontal length of pipe with installed gate valve to the riser pipe.

B. If required, make provisions to capture discharged fluids for disposal.

C. Adjust the gate valve one-third open.

D. Start the pump and let it operate until the water runs clear of sand and silt.

E. As the water clears, slowly open the gate valve in small increments until the desired flow rate of clear water is reached. The pump should not be operated beyond its maximum flow rating and should not be stopped until the groundwater runs clear.

F. If the groundwater is clean and clear when the pump is first started, the valve should still be opened until the desired flow rate is reached.

G. Disconnect the temporary piping arrangements and complete the final piping connections.

H. **Under no circumstances should the pump be operated for any prolonged period of time with the discharge valve closed.** This can result in motor damage due to overheating. A properly sized relief valve should be installed at the well head to prevent the pump from running against a closed valve.

I. Start the pump and test the system. Check and record the voltage and current draw on each motor lead.

Operation

A. The pump and system should be periodically checked for water quantity, pressure, drawdown, periods of cycling, and operation of controls. **Under no circumstances should the pump be operated for any prolonged periods of time with the discharge valve closed.** This can result in motor and pump damage due to overheating. A properly sized relief valve should be installed at the well head to prevent the pump from running against a closed valve.

B. If the pump fails to operate, or there is a loss of performance, refer to Troubleshooting, Section 7.

SECTION 7.

Troubleshooting

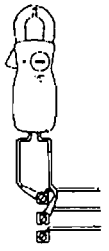
The majority of problems that develop with submersible pumps are electrical, and most of these problems can be corrected without pulling the pump from the well. The following charts cover most of the submersible service work. As with any troubleshooting procedure, start with the simplest solution first; always make all the above-ground checks before pulling the pump from the well.

Usually only two instruments are needed – a combination voltmeter/ammeter, and an ohmmeter. These are relatively inexpensive and can be obtained from most water systems suppliers.

WHEN WORKING WITH ELECTRICAL CIRCUITS, USE CAUTION TO AVOID ELECTRICAL SHOCK. It is recommended that rubber gloves and boots be worn and that care is taken to have metal control boxes and motors grounded to power supply ground or steel drop pipe or casing extending into the well. WARNING: Submersible motors are intended for operation in a well. When not operated in a well, failure to connect motor frame to power supply ground may result in serious electrical shock.

Preliminary Tests

SUPPLY VOLTAGE



How to Measure

By means of a voltmeter, which has been set to the proper scale, measure the voltage at the control box. On single-phase units, measure between line and neutral.

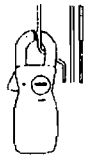
What it Means

When the motor is under load, the voltage should be within ± 10% of the nameplate voltage. Larger voltage variation may cause winding damage.

Large variations in the voltage indicate a poor electrical supply and the pump should not be operated until these variations have been corrected.

If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage.

CURRENT MEASUREMENT



How to Measure

By use of an ammeter, set on the proper scale, measure the current on each power lead at the control box. See the Electrical Data, Table C, for motor amp draw information.

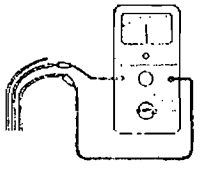
Current should be measured when the pump is operating at a constant discharge pressure with the motor fully loaded.

What it Means

If the amp draw exceeds the listed service factor amps (SFA), check for the following:

1. Loose terminals in control box or possible cable defect. Check winding and insulation resistances.
2. Too high or low supply voltage.
3. Motor windings are shorted.
4. Pump is damaged causing a motor overload.

WINDING RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohmmeter, set the scale selectors to Rx1 for values under 10 ohms and and Rx10 for values over 10 ohms.

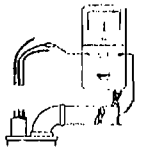
Zero-adjust the meter and measure the resistance between leads. Record the values.

Motor resistance values can be found in the Electrical Data, Table C. Cable resistance values are in Table D.

What it Means

If all the ohm values are normal, and the cable colors correct, the windings are not damaged. If any one ohm value is less than normal, the motor may be shorted. If any one ohm value is greater than normal, there is a poor cable connection or joint. The windings or cable may also be open. If some of the ohm values are greater than normal and some less, the drop cable leads are mixed. To verify lead colors, see resistance values in Electrical Data, Table C.

INSULATION RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohm or mega ohmmeter, set the scale selector to Rx100K and zero-adjust the meter.

Measure the resistance between the lead and ground (discharge pipe or well casing, if steel).

What it Means

For ohm values, refer to table below. Motors of all Hp, voltage, phase and cycle duties have the same value of insulation resistance.

OHM VALUE	MEGAOHM VALUE	CONDITION OF MOTOR AND LEADS
		Motor not yet installed:
2,000,000 (or more)	2.0	New Motor
1,000,000 (or more)	1.0	Used motor which can be reinstalled in the well.
		Motor in well (Ohm readings are for drop cable plus motor):
500,000 - 1,000,000	0.5 - 1.0	A motor in reasonably good condition.
20,000 - 50,000	0.02 - 0.5	A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.
10,000 - 20,000	0.01 - 0.02	A motor which definitely has been damaged or with damaged cable. The pump should be pulled and repairs made to the cable or the motor replaced. The motor will still operate, but probably not for long.
less than 10,000	0 - 0.01	A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will not run in this condition.

Troubleshooting Chart

FAULT	POSSIBLE CAUSES	HOW TO CHECK	HOW TO CORRECT
A. Pump Does Not Run	1. No power at pump panel.	Check for voltage at panel.	If no voltage at panel, check feeder panel for tripped circuits.
	2. Fuses are blown or circuit breakers are tripped.	Remove fuses and check for continuity with ohmmeter.	Replace blown fuses or reset circuit breaker. If new fuses blow or circuit breaker trips, the electrical installation and motor must be checked.
	3. Defective controls.	Check all safety and pressure switches for operation. Inspect contact in control devices.	Replace worn or defective parts.
	4. Motor and/or cable are defective.	Turn off power. Disconnect motor leads from control box. Measure the lead to lead resistances with the ohmmeter (Rx1). Measure lead to ground values with ohmmeter (Rx100K). Record measured values.	If open motor winding or ground is found, remove pump and recheck values at the surface. Repair or replace motor or cable.
	5. Defective capacitor.	Turn off the power, then discharge capacitor. Disconnect leads and check with an ohm-meter (Rx100K). When meter is connected, the needle should jump forward and slowly drift back.	If there is no needle movement, replace the capacitor.
B. Pump Runs But Does Not Deliver Water	1. Groundwater level in well is too low or well is collapsed.	Check well drawdown.	Lower pump if possible. If not, throttle discharge valve and install water level control.
	2. Integral pump check valve is blocked.	Install pressure gauge, start pump, gradually close the discharge valve and read pressure at shut-off. After taking reading, open valve to its previous position. Convert PSI to feet (For water: PSI x 2.31 ft/PSI = _____ ft.), and add to this the total vertical distance from the pressure gauge to the water level in the well while the pump is running. Refer to the specific pump curve for the shut-off head for that pump model. If the measured head is close to the curve, pump is probably OK.	If not close to the pump curve, remove pump and inspect discharge section. Remove blockage, repair valve and valve seat if necessary. Check for other damage. Rinse out pump and reinstall.
	3. Inlet strainer is clogged.	Same as B.2 above.	If not close to the pump curve, remove pump and inspect. Clean strainer, inspect integral check valve for blockage, rinse out pump and reinstall.
	4. Pump is damaged.	Same as B.2 above.	If damaged, repair as necessary. Rinse out pump and reinstall.
C. Pump Runs But at Reduced Capacity	1. Drawdown is larger than anticipated.	Check drawdown during pump operation.	Lower pump if possible. If not, throttle discharge valve and install water level control.
	2. Discharge piping or valve leaking.	Examine system for leaks.	Repair leaks.
	3. Pump strainer or check valve are clogged.	Remove pump and inspect.	Clean, repair, rinse out pump and reinstall.
	4. Pump worn.	Same as B.2 above.	If not close to pump curve, remove pump and inspect.

Troubleshooting (continued)

FAULT	POSSIBLE CAUSES	HOW TO CHECK	HOW TO CORRECT
D. Pump Cycles Too Much	1. Pressure switch is not properly adjusted or is defective.	Check pressure setting on switch and operation. Check voltage across closed contacts.	Re-adjust switch or replace if defective.
	2. Level control is not properly set or is defective.	Check setting and operation.	Re-adjust setting (refer to manufacturer data). Replace if defective.
	3. Plugged snifter valve or bleed orifice.	Examine valve and orifice for dirt or corrosion.	Clean and/or replace if defective.
E. Fuses Blow or Circuit Breakers Trip	1. High or low voltage.	Check voltage at pump panel. If not within ± 10%, check wire size and length of run to pump panel.	If wire size is correct, contact power company. If not, correct and/or replace as necessary.
	2. Control box wiring and components.	Check that control box parts match the parts list. Check to see that wiring matches wiring diagram. Check for loose or broken wires or terminals.	Correct as required.
	3. Defective capacitor.	Turn off power and discharge capacitor. Check using an ohmmeter (Rx100K). When the meter is connected, the needle should jump forward and slowly drift back.	If no meter movement, replace the capacitor.
	4. Starting relay (Franklin single phase motors only).	Check resistance of relay coil with an ohmmeter (Rx1000). Check contacts for wear.	Replace defective relay.

Table A

Minimum Water Flow Requirements for Submersible Pump Motors

MOTOR DIAMETER	CASING OR SLEEVE I.D. IN INCHES	MIN. FLOW PAST THE MOTOR (GPM)
4"	4	1.2
	5	7
	6	13
	7	21
	8	30

NOTES: 1. A flow inducer or sleeve must be used if the water enters the well above the motor or if there is insufficient water flow past the motor.

2. The minimum recommended water velocity over 4" motors is 0.25 feet per second.

Table B

Guide for Engine-Driven Generators in Submersible Pump Applications

	MINIMUM KILOWATT RATING OF GENERATOR FOR THREE-WIRE SUBMERSIBLE PUMP MOTORS	
MOTOR HP	EXTERNALLY REGULATED GENERATOR	INTERNALLY REGULATED GENERATOR
0.33 HP	1.5 KW	1.2 KW
0.50	2.0	1.5
0.75	3.0	2.0
1.0	4.0	2.5
1.5	5.0	3.0

NOTES:

1. Table is based on typical 80°C rise continuous duty generators with 35% maximum voltage dip during start-up of single phase motors.
2. Contact the manufacturer of the generator to assure the unit has adequate capacity to run the submersible motor.
3. If the generator rating is in KVA instead of kilowatts, multiply the above ratings by 1.25 to obtain KVA.

Table C

Electrical Data - 60 Hz Submersible Pump Motors

GRUNDFOS MOTORS

4 Inch (Two Wire) Motors - Control Box Not Required — 60 Hz

HP	Ph	VOLT	Ser. Fact.	Circ. Brk. or Stnd. Fuse	Dual Element Fuse	AMPERAGE Full Load	AMPERAGE Lock Rotor	AMPERAGE S.F. Amps	FULL LOAD Eff.	FULL LOAD Power Factor	Line-to-Line Resistance(Ohms) Blk-Yel Delta	Line-to-Line Resistance(Ohms) Red-Yel Delta	KVA Code **	Maximum Thrust (lbs)	GRUNDFOS PART NO.
SINGLE PHASE															
1/3	1	230	1.75	15	5	3.0	25.5	4.4	47.3	63.0	6.8-8.2		S	750	79.952301
1/2	1	230	1.60	15	7	4.3	34.5	5.9	50.6	64.7	5.2-6.3		H	750	79.952302
3/4	1	230	1.50	20	9	6.6	40.5	8.0	57.0	70.0	3.2-3.8		N	750	79.952303
1	1	230	1.40	25	12	8.0	47.4	9.6	59.8	74.3	2.5-3.1		M	750	79.952304
1 1/2	1	230	1.30	35	15	10.6	60.8	13.1	64.3	77.2	1.9-2.3		L	750	79.952305

4 Inch (Three Wire) Motors

SINGLE PHASE

1/3	1	230	1.75	15	5	3.0	14.0	4.4	47.0	63.0	6.8-8.3	17.3-21.1	L	750	79.453301
1/2	1	230	1.60	15	7	4.3	20.0	5.9	50.7	64.6	4.7-5.7	15.8-19.6	L	750	79.453302
3/4	1	230	1.50	20	9	6.6	30.8	8.0	57.3	70.0	3.2-3.9	14-17.2	L	750	79.453303
1	1	230	1.40	25	12	8.0	36.3	9.6	59.8	74.5	2.6-3.1	10.3-12.5	K	750	79.453304
1 1/2	1	230	1.30	30	15	9.7	44.0	11.5	67.5	84.1	1.9-2.3	7.8-9.6	H	750	79.453305

Franklin Motors

(refer to the Franklin Submersible Motors Application Maintenance Manual)

Table D
Total Resistance of Drop Cable (OHMS)

The values shown in this table are for copper conductors. Values are for the total resistance of drop cable from the **control box to the motor and back.**

To determine the resistance:

1. Disconnect the drop cable leads from the control box.
2. Record the size and length of drop cable.
3. Determine the cable resistance from the table.
4. Add drop cable resistance to motor resistance. Motor resistances can be found in the Electrical Data Chart, Table C.
5. Measure the resistance between each drop cable lead using an ohmmeter. Meter should be set on Rx1 and zero-balanced for this measurement.
6. The measured values should be approximately equal to the calculated values.

Wire Resistances

Distance From Control Box to Pump Motor (FT.)	12 AWG Wire Resistance (OHMS)	14 AWG Wire Resistance (OHMS)
10	0.03	0.05
20	0.06	0.10
30	0.10	0.15
40	0.13	0.21
50	0.16	0.26
60	0.19	0.31
70	0.23	0.36
80	0.26	0.41
90	0.29	0.46
100	0.32	0.51
110	0.36	0.57
120	0.39	0.62
130	0.42	0.67
140	0.45	0.72
150	0.49	0.77
160	0.52	0.82
170	0.55	0.87
180	0.58	0.93
190	0.62	0.98
200	0.65	1.03

Redi-Flo4

LIMITED WARRANTY

Redi-Flo4 Environmental Pumps manufactured by GRUNDFOS Pumps Corporation (GRUNDFOS) are warranted to the original user only to be free of defects in material and workmanship for a period of 18 months from date of installation, but not more than 24 months from date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS' factory or authorized service station, any product of GRUNDFOS manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of GRUNDFOS products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact GRUNDFOS or an authorized service station for instructions. Any defective product to be returned to GRUNDFOS or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

GRUNDFOS

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Sales Support Centers: Allentown, PA • Atlanta, GA • Chicago, IL

SERIES 5100

TASKMASTER

Installation Instructions

COMBINATION WALL/CEILING SWIVEL BRACKET
FOR HORIZONTAL AIR DELIVERY • TASKMASTER SERIES

MODEL A5105 USE WITH 5102-5105 UNITS
MODEL A5120 USE WITH 5107-5120 UNITS
MODEL A5150 USE WITH 5125-5150 UNITS

MINIMUM MOUNTING DISTANCES
12" FROM CEILING AND ADJACENT SURFACES
7' FROM FLOOR TO BOTTOM OF HEATER

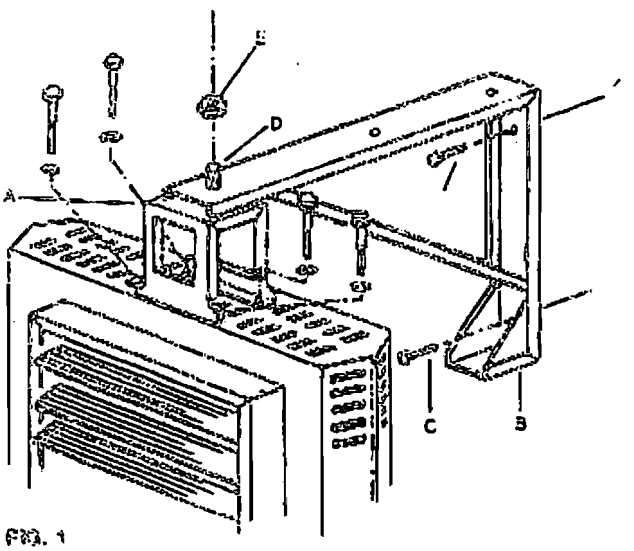

FIG. 1

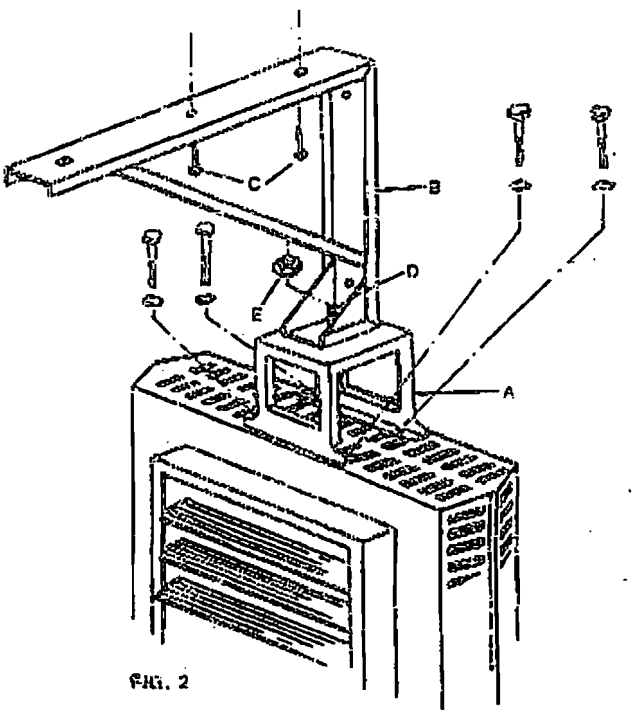

FIG. 2

1) Swivel hanger brackets can be used to suspend unit heaters from either the wall (Fig. 1) or the ceiling (Fig. 2).

2) Attach hanger base "A" to top of heater with the four 5/16 x 18 cap screws and lockwashers (provided in envelope).

3) Attach main hanger frame "B" to wall or ceiling in desired location using lag screws "C" or other suitable attachments (supplied by others).

4) Lift heater into position inserting stud "D" through hole in main hanger frame and attach lock nut (provided in envelope) "E" tightening to within two turns of being tight.

5) Swivel heater to desired position, tighten lock nut.

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Photo/Design 815/764-3048

Form 9121
Revised 3/9

Instructions d'installation

SUPPORT DE SUSPENSION A PIVOT FIXÉ AU MUR OU AU PLAFOND
POUR PROPULSION D'AIR HORIZONTALE • SERIES TASKMASTER

MODELE A5105 A UTILISER AVEC LES APPAREILS 5102-5105
MODELE A5120 A UTILISER AVEC LES APPAREILS 5107-5120
MODELE A5150 A UTILISER AVEC LES APPAREILS 5125-5150

DISTANCES DE MONTAGE MINIMUM
A 12" (305) DU PALFOND ET DES SURFACES ADJACENTES
A 7' (2m 134) DU PLANCHER AU DESSOUS DU RADIATEUR

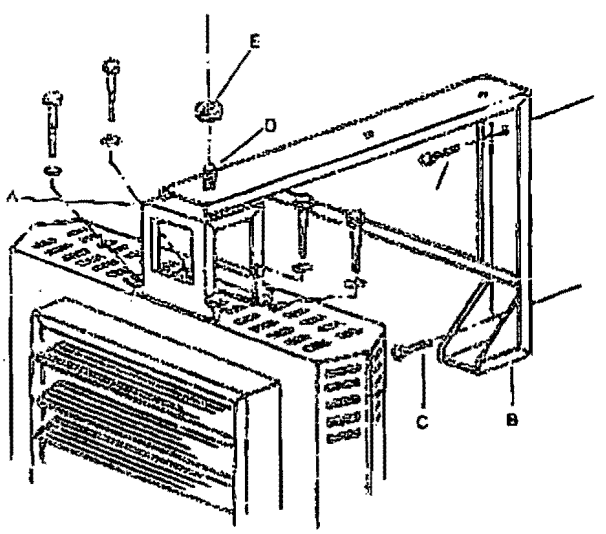


Fig. 1

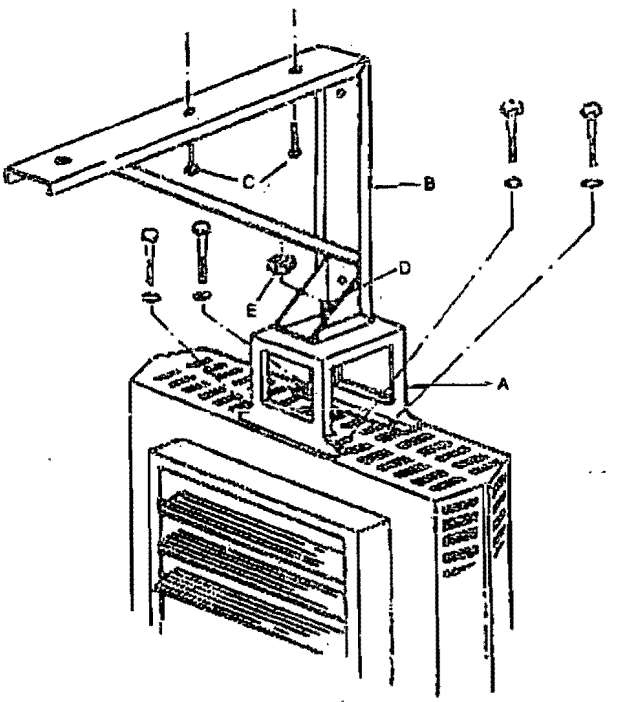


Fig. 2

1) Les supports de suspension à pivot peuvent être utilisés afin de suspendre les radiateurs au mur (Fig. 1) ou au plafond (Fig. 2).

2) Montez la base de soutien "A" au dessus du radiateur avec les quatres vis de 5/16" x 18 et les rondelles d'arrêt (dans l'enveloppe).

3) Fixez le support de suspension principal "B" au mur ou au plafond à l'emplacement désiré en utilisant les tire-fonds "C" ou des pièces de fixation adéquates (fournies par d'autres).

4) Soulevez le radiateur, faites rentrer la tige "D" dans le trou du support de suspension principal et vissez l'écrou à créneaux "E" (dans l'enveloppe) jusqu'à ce qu'il soit à deux tours d'être serré.

5) Faites pivoter le radiateur à la position désirée, serrez l'écrou à créneaux et insérez la goupille fendue "F" à travers le trou percé dans la tige.

IN USA:
Markel Products Company
P.O. Box 4973, CRS
Johnson City, Tennessee 37602-4973

SERIES 5100

TASKMASTER

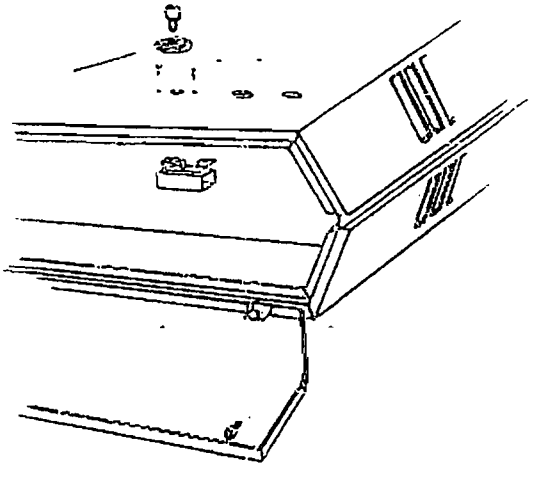
Installation Instructions

DCS252 POWER DISCONNECT SWITCH • TASKMASTER SERIES
RATING - 2 POLE 25 AMP 277 VAC RESISTIVE

READ THESE INSTRUCTIONS THOROUGHLY BEFORE INSTALLING SWITCH. BE SURE TO DEENERGIZE POWER SOURCE TO UNIT BEFORE INSTALLING SWITCH. CHECK HEATER DATA TAPE TO INSURE THAT HEATER ELECTRICAL RATING DOES NOT EXCEED THE POWER DISCONNECT ELECTRICAL RATING.

SUPPLY WIRES MUST BE COPPER CONDUCTORS ONLY.

ALL WIRING TO BE IN ACCORDANCE WITH CSA, NEC AND LOCAL CODES. DO NOT REMOVE SWITCH OR FISHPAPER BARRIER FROM SWITCH MOUNTING BRACKET. DO NOT INTERRUPT POWER TO HEATER WHILE THE UNIT IS OPERATING IN ORDER TO PERFORM NORMAL MAINTENANCE SERVICE. ANY POWER INTERRUPTION DURING NORMAL OPERATION WILL PREVENT THE FAN FROM PURGING THE UNIT OF RESIDUAL HEAT.



1) Remove ½" (13mm) dia. knockout and two adjacent small knockouts from heater back.

   NOTE: ½" (13mm) dia. knockout is located on the heater back center approximately 3½" (89mm) from the bottom of heater with the two small knockouts on either side.

2) Remove paper backing from "ON-OFF" decal, align with the ½" (13mm) dia. knockout hole and affix to heater back with "ON" toward top of heater.

3) Rotate switch shaft clockwise to the ON position.

4) With flat portion of switch shaft toward top of heater, attach switch bracket to heater back by means of the two No. 8 sheet metal screws supplied.

5) Push knob on switch shaft and check alignment of knob pointer with "ON-OFF" decal.

6) Wire switch according to wiring diagram located on inside of bottom panel. Attach switch leads T1 and T2 to L1 and L2 of heater terminal block.

   Attach switch leads L1 and L2 to incoming supply conductors L1 and L2 by suitable means.

7) Restore power to unit and check for proper operation.

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Photo/Design 615/764-3346

Form 56628-002
REV 05/96

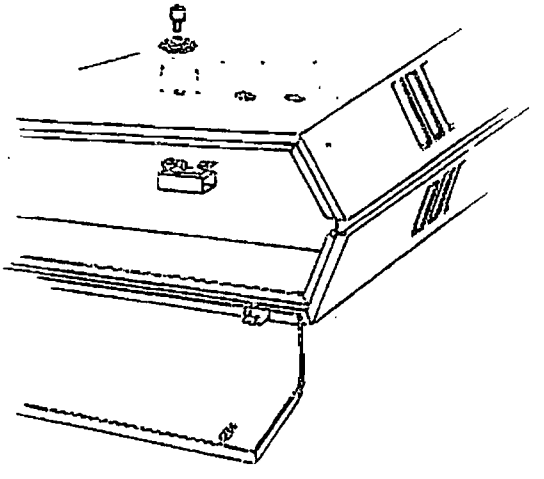
Instructions d'Installation

SÉRIES TASKMASTER — INTERRUPTEUR DE COURANT DCS252
BIPOLAIRE 25 AMP. 277 VOLTS C.A. RÉSISTANT

LISEZ CES INSTRUCTIONS SOIGNEUSEMENT AVANT D'INSTALLER L'INTERRUPTEUR. S'ASSURER DE DÉBRANCHER L'APPAREIL DE L'ALIMENTATION DE COURANT AVANT D'INSTALLER L'INTERRUPTEUR. VÉRIFIEZ LA PLAQUE DE CARACTÉRISTIQUES DU RADIATEUR AFIN DE VOUS ASSURER QUE LES DONNEES ÉLECTRIQUES DU RADIATEUR N'EXCÈDENT PAS CELLES DE L'INTERRUPTEUR DE COURANT.

LES FILS CONDUCTEURS DE L'ALIMENTATION DOIVENT ÉTRE EN CUIVRE SEULEMENT.

TOUTE LA FILERIE DOIT ÉTRE CONFORME AVEC L'ACNOR, NEC ET LES CODES LOCAUX EN VIGUEUR. NE PAS ENLEVER L'INTERRUPTEUR OU LE PAPIER ISOLANT DU SUPPORT DE L'INTERRUPTEUR. NE PAS COUPER LE COURANT DU RADIATEUR PENDANT QUE CELUI-CI FONCTIONNE POUR FAIRE UN SERVICE D'ENTRETIEN REGULIER. TOUTE INTERRUPTION DU COURANT DURANT LE FONCTIONNEMENT NORMAL DU RADIATEUR, EMPÊCHERA LE VENTILATEUR D'ENLEVER LA CHALEUR AINSI EMMAGASINÉE POUVANT CAUSER DE CE FAIT L'OUVERTURE DU RÉENCLENCHEMENT.



1) Enlevez la rondelle défonçable de ½" (13mm) ainsi que les deux petites situées à côté, de l'arrière du radiateur.
   NOTE: La rondelle de ½" (13mm) est située à l'arrière et au centre du radiateur à approximativement à 3½" (89mm) du bas de celui-ci avec deux autres rondelles de chaque côté.
2) Enlevez le papier du dos de l'étiquette "MARCHE-ARRÉT", alignez-là avec le trou ainsi fait de ½" (13mm) puis collez-là au dos du radiateur "MARCHE" étant vers le haut de celui-ci.
3) Tournez l'arbre du radiateur dans le sens des aiguilles d'une montre à la positon "MARCHE".
4) La partie plate de l'arbre de l'interrupteur étant vers le haut du radiateur, fixez le support de l'interrupteur à l'arrière du radiateur à l'aide des deux vis en acier fournies.
5) Poussez le bouton sur l'arbre de l'interrupteur et vérifiez l'alignement de la pointe du bouton par rapport à L'ÉTIQUETTE "MARCHE-ARRET".
6) Connectez l'interrupteur conformément au shéma de filerie situé à l'intérieur du panneau inférieur. Les fils T1 et T2 de l'interrupteur aux bornes L1 et L2 du radiateur.
   Connectez les conducteurs de l'interrupteur L1 et L2 aux conducteurs de l'alimentation L1 et L2 par des moyens appropriés.
7) Remettez le courant à l'appareil et vérifiez à ce qu'il fonctionne bien.

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Markel Products Company
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Johnson City, Tennessee 37602-4973

SERIES 5100

TASKMASTER

Installation Instructions

DCS253 POWER DISCONNECT SWITCH • TASKMASTER SERIES
RATING — 3 POLE 25 AMP 600 VAC RESISTIVE

READ THESE INSTRUCTIONS THOROUGHLY BEFORE INSTALLING SWITCH. BE SURE TO DEENERGIZE POWER SOURCE TO UNIT BEFORE INSTALLING SWITCH. CHECK HEATER DATA TAPE TO INSURE THAT HEATER ELECTRICAL RATING DOES NOT EXCEED THE POWER DISCONNECT SWITCH'S ELECTRICAL RATING.

SUPPLY WIRES MUST BE COPPER CONDUCTORS ONLY.

ALL WIRING MUST BE IN ACCORDANCE WITH NEC AND LOCAL CODES. KIT CONSISTS OF: THE DISCONNECT SWITCH ASSEMBLY WITH KNOB AND LEADWIRES, TWO #8 MOUNTING SCREWS, "ON-OFF" DECAL, INSTALLATION INSTRUCTIONS.

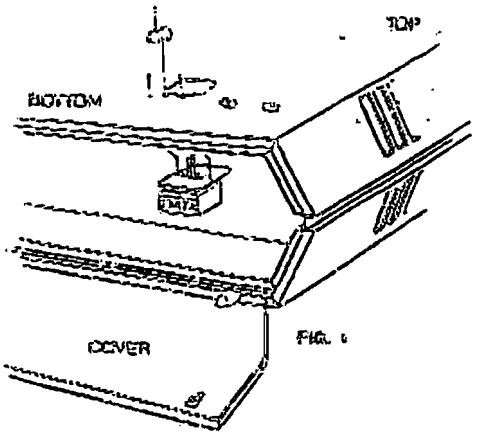

FIG. 1

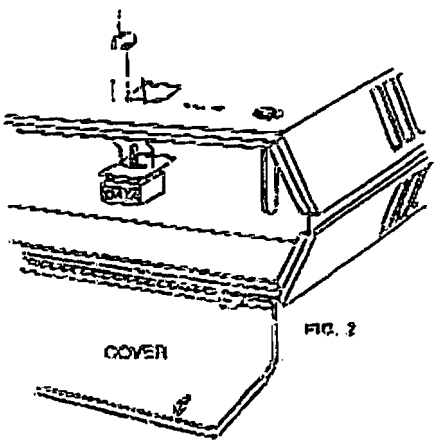

FIG. 2

1) Locate and remove knockouts where switch is to be mounted.
   a. For heater Model No's 5103 thru 5105 (Fig. 1)
   Remove ½" dia. knockout and two adjacent small knockouts from heater back.
   NOTE: ½" dia. knockout is located on the back center approximately 3½" from the bottom of heater with a small knockout on either side.
   b. For heater Model No's 5107 thru 5115 (Fig. 2)
   Remove ⅝" wide knockout slot and two adjacent small knockout slots from heater back.
   NOTE: ⅝" wide knockout slot is located on the heater back approximately 3½" from the bottom of heater with a small knockout on either side.
2) Remove the knob from the switch by loosening the screw in the center of the knob and pulling it off.
3) Connect the incoming power supply leads to terminals L1-L2-L3 of the disconnect switch. Connect the incoming ground lead to the grounding screw (or lug).
4) Mount the switch inside the heater control compartment, with the shaft extending through the knockout, using the two #8 x ⅝" phillips head screws provided. The switch should be oriented so the side with the date label is facing the open side of the compartment (visible when installed).
5) Connect the leadwires on the switch, marked T1-T2-T3 to the heater power terminal block marked L1-L2-L3.
6) Install the knob and tighten the screw.
7) Attach the "ON-OFF" decal located per Fig. 1. Peel off the backing paper, position carefully then press firmly onto the heater cabinet. Note that knob rotation clockwise is "ON" and counterclockwise is "OFF".
8) Check all connections for tightness and electrical clearances. Close cover and latch, then restore electrical power and check heater in each mode of operation.

REV 05/96
Form 9555

SERIES 5100

TASKMASTER

Installation Instructions

TASKMASTER SERIES

T5100, T5102, T5122, TC5102 and TC5103 Built-in Thermostat Kits (for Field Installation in the 5100 Series Unit Heaters.

T5100 Provides SPST line voltage control for single phase heaters up to 277V, 25A.
or
Pilot duty control (24-277 volt) for contactor equipped heaters.

T5102 Provides double pole line voltage control breaking all ungrounded conductors for single phase heaters up to 277V, 25 amperes.
or
Two pole line cycling control for 3 phase heaters up to 240 volts, 25 amps but does *not* break all ungrounded conductors on 3 phase applications.

T5122 Provides two stage low voltage (24V) control for two stage heaters. Two separate circuits are controlled by the same sensing element. Switches controlling these circuits are calibrated to make or break in sequence.

TC5102 is a thermostat and relay for use with 480 & 600 volt heaters to control the fan motor. It provides for sensing of heat accumulation (strat-stat) near the ceiling and switches the fan motor on to recirculate and recover this heat.

TC5103 provides control of the fan motor on 208, 240 & 277 volt heaters to recover and recirculate the stratified heat accumulated near the ceiling.

Please read each installation instruction carefully before beginning installation.

INSTALLATION INSTRUCTIONS T5100, T5102, T5122

1) CAUTION:
To avoid possible electric shock, turn heater OFF at distribution panel. On heaters equipped with a disconnect switch, rotate switch to the OFF position.

2) Unlock the 2 screws on the control panel door and let door swing down. Some models have an additional center door catch. Squeeze catch to open.

3) Remove ½ (13mm) dia. thermostat bulb exit knockout from back of heater, Fig. 1. Feed thermostat bulb and capillary thru knockout.
CAUTION: Keep capillary tubing away from internal electrical components.

4) Remove 2 small thermostat bulb clip knockouts on the rear of the heater, see Fig. 1. Insert 2 bulb clips (supplied). Snap thermostat bulb into clips.

5) Remove the three stat mounting knockouts from side of control compartment: 1) $^{9}/_{16}$ & 2) $^{3}/_{16}$. Remove backing from label (supplied). Align label with thermostat shaft hole and position as in Fig. 1. Press label on heater side as shown.

6) Note orientation of leg on thermostat bracket (see Fig. 1). Position *only* as shown.
Install thermostat with the 2 No. 8 mounting screws provided.

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Photo/Design 615/764-3346

Form 56628-605
REV 05/96

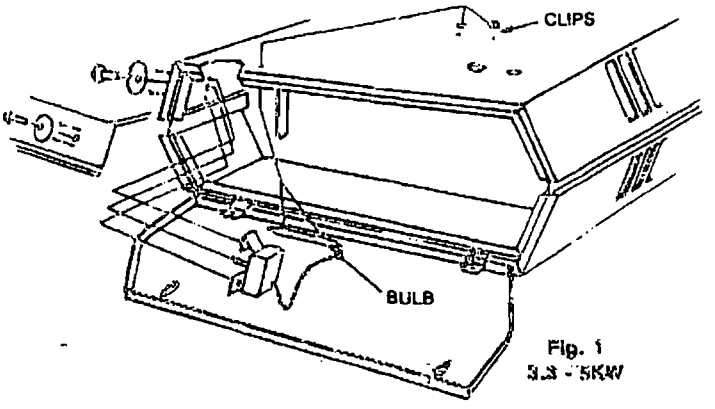


Fig. 1
3.3 - 5KW

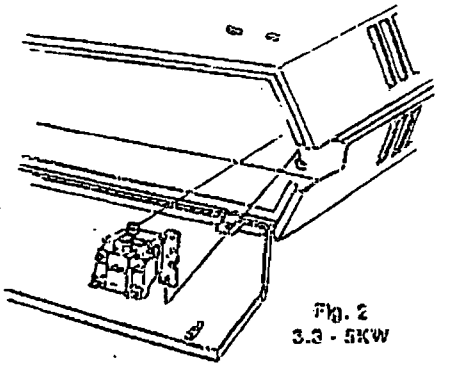


Fig. 2
3.3 - 5KW

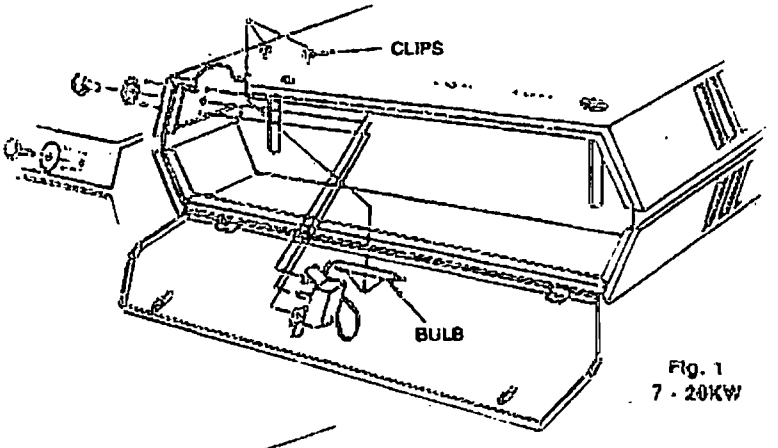


Fig. 1
7 - 20KW

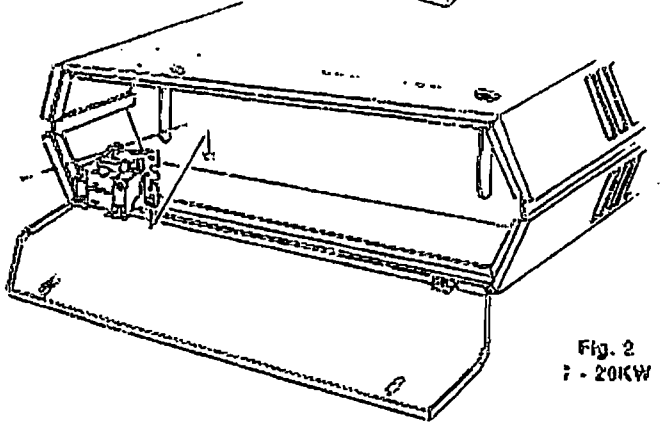


Fig. 2
7 - 20KW

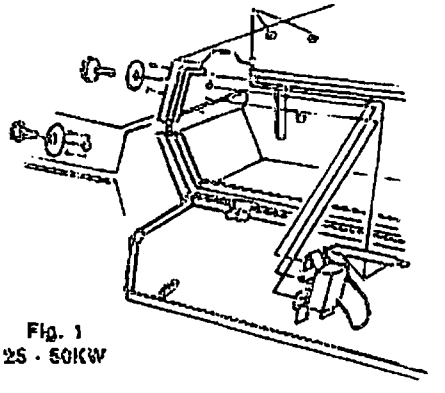


Fig. 1
25 - 50KW

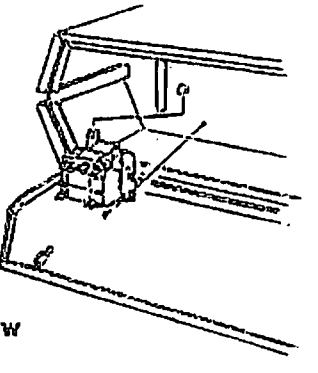


Fig. 2
25 - 50KW

7) Install knob by pushing onto thermostat shaft.

8) Connect lead wires from the thermostat to the control terminal board as shown in the wiring diagrams located on the inside of the control panel door.

9) Set thermostat for desired turn on temperature. Rotate thermostat knob fully clockwise. When the room temperature has reached the comfort level turn thermostat counterclockwise until it clicks off. The thermostat may require one or two additional settings to maintain your desired comfort level.

HEAT RECOVERY THERMOSTAT TC5102, TC5103

9) The TC5102 thermostat package requires a relay to operate the fan motor. Install the thermostat by following steps 1 through 8.

10) Install the relay by slipping extended relay leg under mounting lip on control panel. Mount relay with one No. 8 screw as shown in Fig. 2. Each lead wire is marked for proper terminal location; connect lead wires as indicated on the wiring diagram located on the inside of the control panel door.

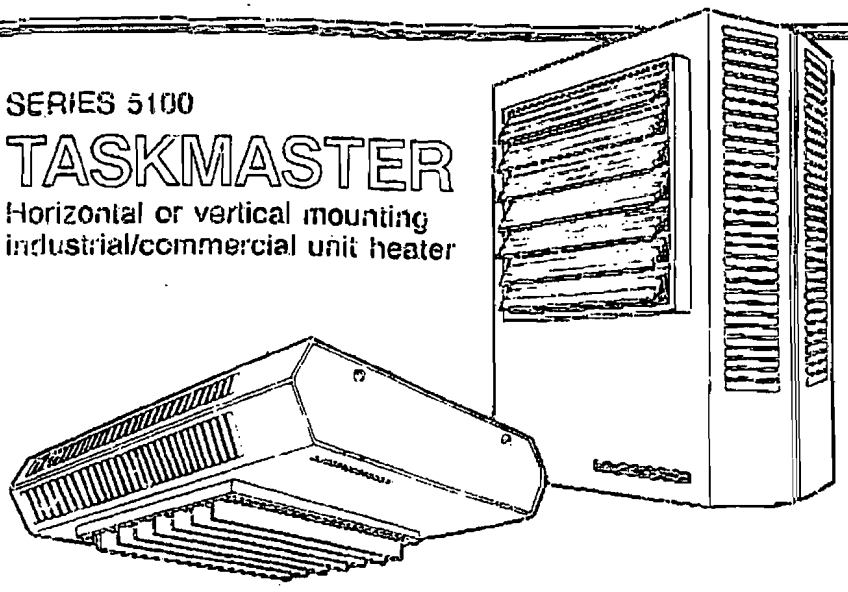
11) Set the thermostat for desired turn on temperature for fan control.

TASKMASTER

SERIES 5100

TASKMASTER

Horizontal or vertical mounting
industrial/commercial unit heater



INSTALLATION INSTRUCTIONS & PARTS LIST

ATTENTION: READ CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THE TASKMASTER UNIT HEATER. RETAIN THESE INSTRUCTIONS FOR FUTURE USE.

FEATURES

Forced air electric unit heater available in 208, 240/208, 277, 480 or 600 volt as standard.

Ten standard heating capacities of 3.3 KW/11,250 BTUH thru 50.0 KW/170,500 BTUH.

208 and 240/208 volt models are single phase field convertible to three phase on 3.3 thru 10.0 KW Models. (Single phase only available on 3.3, 5.0, 7.5 and 10 KW 277 volt models.

Specially designed inlet louver allows the fan to pull cool air evenly across the high mass all-steel element.

Outward drawn venturi and adjustable louver assembly further directs the outlet air in a uniform pattern to meet specific air pattern requirements in either the horizontal or vertical mounting position.

Optional wall/ceiling or vertical mounting brackets. (As required).

Four position weld nuts supplied in case top and back for field mounting by drill rods or eye bolt with chain. (Hardware supplied by others.)

Optional radial or anemostat diffusers lending air pattern versatility when mounted vertically.

Modular control kits for field installation. Disconnect switch, thermostat, summer fan switch, heat recovery thermostat. All kits with spade terminals (Except disconnect switch).

Single point terminal board wiring of integral control kits.

24 volt low voltage control circuit standard on all contactor and transformer models.

Roomy control box with access door locked into position by two (2) ¼ turn fasteners for ease of installation.

Revised 10/95
Form 9632

PROPER LOCATION INSTRUCTIONS

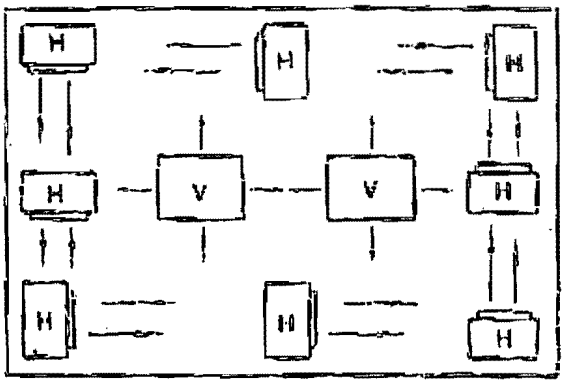
Once the total heating load is calculated, the quantity and capacity of the unit heaters must be determined. Because a large number of low-capacity heaters provides more uniform heat distribution, this approach is recommended when the area will be occupied by a relatively large number of sedentary personnel, perhaps working on production lines and at benches.

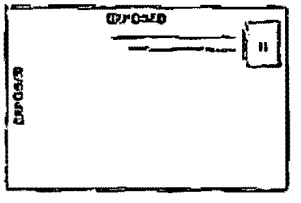
A large number of smaller capacity unit heaters tends to prevent hot drafts, reduces noise levels, and increases diversity of load to help reduce electrical demand and operating costs.

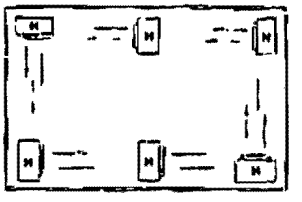
In warehouses where even heat distribution and constant temperatures are less important, a smaller number of high capacity units can be used - in many cases reducing first cost. To maintain reasonable heat distribution and reduce severe stratification even in lower bay areas, the total air volume of the space should pass through the unit heaters about three times per hour. (Take total cubic feet and divide by 20 in order to determine proper total heater CFM rating.)

It is important that the rated voltage of the heating equipment match the supply voltage. Supply voltage in excess of the heater rated voltage can damage equipment. Supply voltage lower than the rated heater voltage will decrease heater output as well as run the risk of damaging some components.

Horizontal unit heaters are recommended in low bay areas with maximum 15 to 18 foot ceilings. These should be concentrated along outside wall or other areas of greatest heat loss, spaced to set up a generally circular air movement, each heater supporting the air stream of the other. Additional vertical down blow unit heaters with appropriate accessory diffusers can be located to counteract ceiling heat losses.







GENERAL SAFETY INFORMATION

CAUTION:

Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

To avoid possible electrical shock, be sure the electrical current is turned off at the main switch prior to wiring or servicing of unit.

If the power disconnect is not integral and is out-of-sight, lock it in the open position and tag to prevent unexpected application of power prior to performing any service or maintenance on the unit.

The unit when installed must be electrically grounded in accordance with the National Electrical Code and standard industry practice.

Make certain that the power source conforms to the requirements of your equipment. See Table 2 for information as to wire size, circuit size, etc.

Check heater voltage and phase on rating label to confirm it is the same as the electric service supply.

Wiring diagrams of the heaters and supply connections are permanently attached to the inside of the heater access door. All terminals are coded in accordance with the wiring diagram. Accessory wiring are shown on the unit wiring diagram and supporting literature.

The heater must be mounted at least 7' above the floor to prevent accidental contact with the fan blade which could cause injury. Install unit so there are no obstructions to the intake or discharge. Maintain clearances as shown on Table 1, 2, Fig. 1 & 2.

The wall/ceiling mounting structure and anchoring provisions must be of sufficient strength to support the combined weight of the heater and mounting bracket.

PRINCIPLES OF OPERATION

Upon a call for heat from the floor level or unit mounted optional accessory thermostat, the unit fan motor and heating elements shall be energized and remain on until temperature reaches setting of thermostat; at which time the heating elements shall be deenergized. The fan motor shall continue to run and purge heater casing of residual heat until setting of fan override is reached, then the fan motor shall be deenergized. For those units with a factory installed two speed fan switch (25-50KW), the unit as shipped from the factory is set for the "low" speed fan position. Customer option to set to "high" speed. For those units available with subdivided circuits, the accessory two stage thermostat (optional) will, upon a call for heat, energize fan motor and the first stage heating element. Should temperature continue to fall, the thermostat shall energize the second stage heating element. Upon a rise in space conditions towards setting of the thermostat, the two stages of heating elements shall be deenergized in reverse sequence. The fan motor shall continue to run and purge heater casing of residual heat until setting of fan override is reached, then the fan motor shall be deenergized.

The accessory unit mounted stratification thermostat will energize the unit heater fan motor upon a rise in temperature above its setting. When the unit mounted stratification thermostat closes on a temperature rise and at the same time the floor thermostat calls for heat, the motor shall be energized immediately and the heating element shall be energized, as previously described.

The automatic reset safety high limit shall deenergize the heating elements and control circuits should the temperature exceed the setting of this device. The fan safety override shall energize fan motor any time the setting of this device is exceeded so as to purge heater casing of excess residual heat. When the accessory fan switch is placed in the ON position (for summer air circulation), the unit heater fan motor shall be energized.

NOTE: The wall thermostat is to be set to the OFF Position during this mode of operation (units with contactors).

For those accessory thermostats equipped with an integral fan switch, place the switch in the HEAT, or AUTO position for operation of the fan and elements which shall then be under control of the thermostat as described above. When switch is placed in the OFF position, the unit shall be deenergized. When switch is placed in the FAN position, elements shall be deenergized and fan shall be immediately energized.

VERTICAL DISCHARGE UNITS — AIR PATTERNS

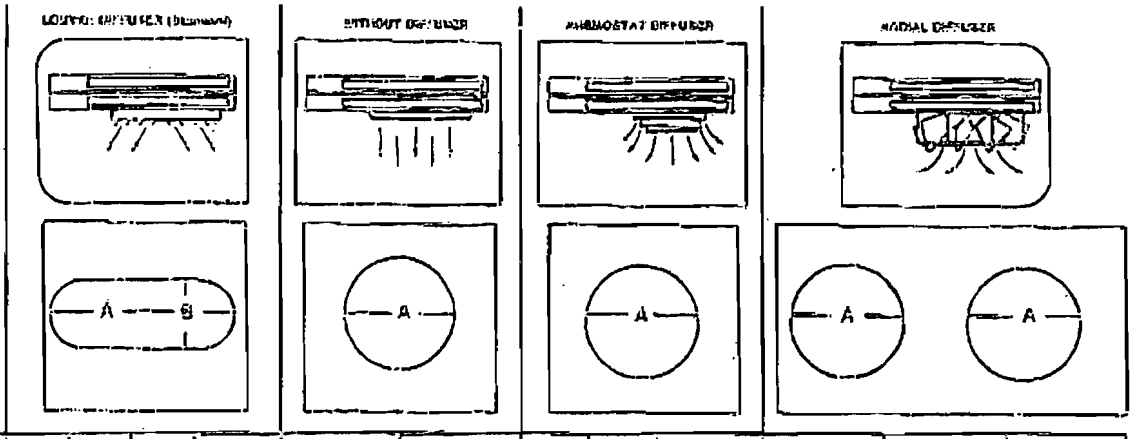
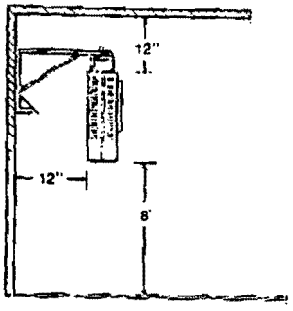


TABLE 1

USED ON	MAX. MTG HT.	A	B	STOCK NO.	MAX. MTG HT.	A	MAX. MTG HT.	A	STOCK NO.	STOCK NO.	MAX. MTG. HEIGHT 45°	MAX. MTG. HEIGHT OPEN	A 45°	A OPEN
3.3 & 5.0 KW	9	20	10	STD	9	15	—	—	N/A	N/A	—	—	—	—
7.5 & 10.0 KW	12	40	22	STD	12	30	10	30	AD5120	RD5120	0	14	36	30
15.0 & 20.0 KW	18	52	30	STD	18	40	15	38	AD5120	RD5120	14	21	42	35
25.0 & 30.0 KW	22	75	42	STD	22	55	17	50	AD5150	RD5150	20	30	52	44
40.0 & 50.0 KW	24	84	47	STD	24	64	20	60	AD5150	RD5150	18	28	68	54

STD = Standard N/A = Not Applicable

Optional diffusers lend added air pattern versatility to individual vertical down blow installations as shown in above illustrations.



MOUNTING CLEARANCE

Fig. 1
HORIZONTAL DISCHARGE

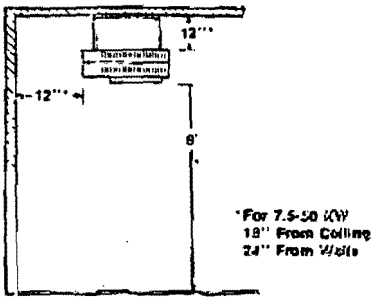


Fig. 2
VERTICAL DISCHARGE

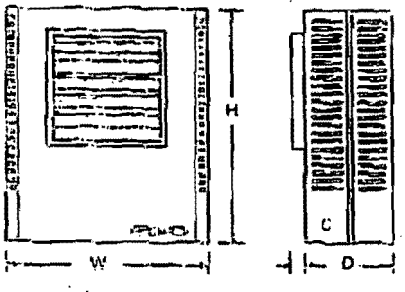


Fig. 3 DIMENSIONS (INCHES)

KW	H	W	D
3.3, 5.0	17-3/4	14-15/32	6-1/2
7.5, 10.0	24-5/16	21-1/2	6-1/2
15.0, 20.0	28-11/16	21-1/2	6-1/2
25.0, 50.0	34	29-1/4	10-1/16

Fig. 3A

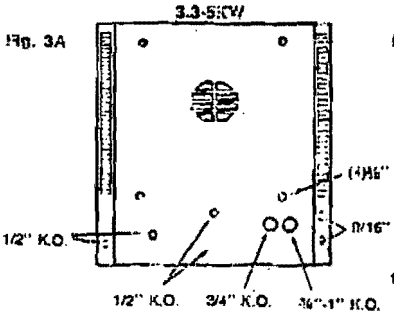


Fig. 3B

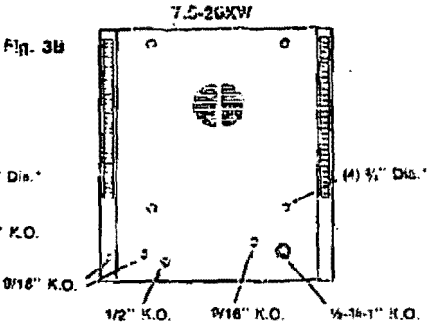
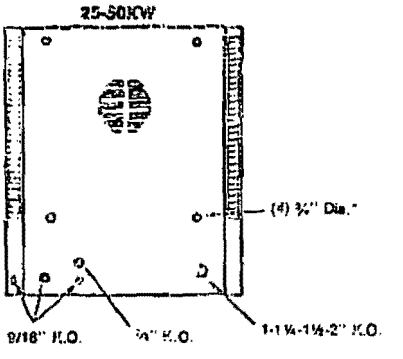


Fig. 3C



*For vertical discharge mounting bracket

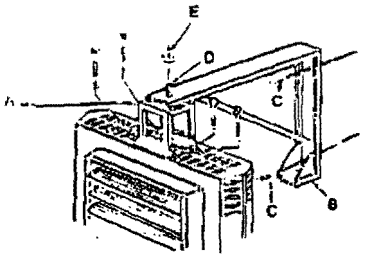


Fig. 5
WALL MOUNT
HORIZONTAL DISCHARGE

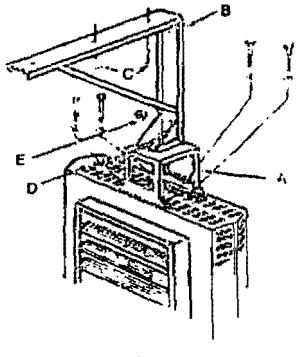


Fig. 6
CEILING MOUNT
HORIZONTAL DISCHARGE

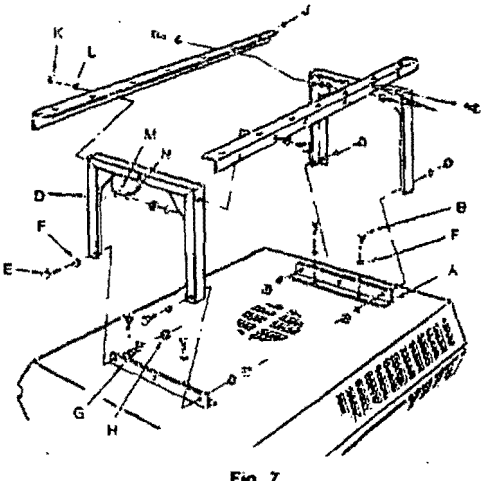


Fig. 7
CEILING MOUNT
VERTICAL DISCHARGE

INSTALLATION INSTRUCTIONS

5100 Series Unit Heaters

All electric unit heaters are shipped fully assembled. Installation includes hanging the unit, mounting the built-in and remote accessories, wiring of optional control devices, and electrical wiring to the unit.

To insure proper delivery of the heated air to desired areas, follow the mounting height and air projection tables included in these instructions. Follow Fig. 1 & 2 for minimum wall and ceiling clearances.

The wall and/or ceiling structure must be sufficient to support the combined weight of the heater and any mounting bracket and accessories.

Be sure power source is de-energized before installing heater. Check heater voltage and phase listed on heater data tape on back of unit to make sure they are the same as the electrical service supplied.

Certain units are adaptable from single to three phase service. Follow instructions noted on the unit wiring diagram for this conversion. Units that carry a dual voltage rating (HF) require specific wiring changes when converting from 240 to 208 volt service. Carefully follow the instructions on the unit wiring diagram.

Open the access panel (2 ¼ turn fasteners).

Remove the desired knock-out(s) on back of the heater.

Install any optional accessories following their installation instructions before mounting unit. Following the correct unit/accessory wiring diagram, connect the power supply, electrical ground and accessories to the correct terminals or termination points using accepted practices.

NET JUNCTION BOX VOLUME

KW	CUBIC INCHES	CC
3.3 - 5	74.4	1219
7.5 - 10	198	3245
15.0 - 20	198	3245
25.0 - 50	341	5592

Heaters may be mounted in the horizontal or vertical air discharge configuration using factory optional supplied accessory mounting equipment or using special hardware facilities supplied by others.

After the installation is complete, replace the access panel.

Set the controls (thermostat, switch) at their desired control point and apply power to the unit.

Check for correct operation.

HORIZONTAL AIR DISCHARGE MOUNTING

Swivel hanger brackets may be used to suspend unit heaters from either the wall (Fig. 5) or the ceiling (Fig. 6). Attach hanger base "A" to top of heater with the four 5/16 x 18 cap screws and lockwashers (provided in envelope).

Attach main hanger frame "B" to wall or ceiling in desired location using lag screws "C" or other suitable attachments (supplied by others).

Lift heater into position inserting stud "D" through hole in main hanger frame and attach lock nut (provided in envelope) "E" tightening to within two turns of being tight.

Swivel heater to desired position, tighten lock nut.

VERTICAL AIR DISCHARGE MOUNTING

(Fig. 7)

Attach short angle brackets "A" to back of heater with four 5/16 x 18 capscrews "B", lockwashers "F". Be sure vertical leg of angle brackets face top and bottom of heater.

Attach inverted U frames "D" to short angle brackets with four 5/16 x 18 capscrews "E", washers "F", lockwashers "G" and nuts "H".

Attach long angle brackets "J" to inverted frames "D" with four 5/16 x 18 capscrews "K", washers "L", lockwashers "M" and nuts "N".

Attach heater and bracket assembly to ceiling in desired location using customer supplied equipment sufficient to support the assembly.

NOTE: When mounting heater using 5/16" all thread rod (by others) do not screw the rod more than ½" beyond the inside of the case.

5100 SERIES TECHNICAL DATA

TABLE 2

ELECTRICAL DATA

CATALOG NUMBER	KW RATING	BTU/HR (000)	HEATER/ MOTOR VOLTAGE	HEATER PHASE	CONTROL VOLTAGE	AMPS PER PHASE	BRANCH CIRCUIT PROTECTION SIZE (A)	SUPPLY WIRE SIZE 60°C AWG **
F1F5103	3.3	11.2	208	1	208	15.9	20	12
F2F5103	3.3	11.2	208	1	208	15.9	20	12
			208	3	208	9.2	15	14
HF1B5103	3.3/2.5	11.2/8.5	240/208	1	240/208	13.7/11.9	20/15	12/14
HF2B5103	3.3/2.5	11.2/8.5	240/208	1	240/208	13.7/11.9	20/15	12/14
			240/208	3	240/208	7.9/6.9	10/10	14/14
G1G5103	3.3	11.2	277	1	277	11.9	15	14
P3P5103CA1	3.3	11.2	480	3	24	4.0	15	14
F1F5105	5.0	17.1	208	1	208	24.1	35	8
F2F5105	5.0	17.1	208	1	208	24.1	35	8
			208	3	208	13.9	20	12
HF1B5105	5.0/3.7	17.1/12.8	240/208	1	240/208	20.9/18.1	30/25	10/10
HF2B5105	5.0/3.7	17.1/12.8	240/208	1	240/208	20.9/18.1	30/25	10/10
			240/208	3	240/208	12.1/10.4	20/15	12/14
G1G5105	5.0	17.1	277	1	277	18.1	25	10
P3P5105CA1	5.0	17.1	480	3	24	6.1	15	14
F2F5107CA1	7.5	25.6	208	1	24	36.1	50	6
			208	3	24	20.9	30	10
HF2B5107CA1	7.5/5.6	25.6/19.2	240/208	1	24	31.3/27.1	40/35	8/8
			240/208	3	24	18.1/15.6	25/20	10/12
G1G5107CA1	7.5	25.6	277	1	24	27.1	35	8
P3P5107CA1	7.5	25.6	480	3	24	9.1	15	14
F2F5110CA1	9.9	33.8	208	1	24	47.8	60	4
			208	3	24	27.8	35	8
HF2B5110CA1	10.0/7.5	34.1/25.6	240/208	1	24	41.6/36.1	60/50	4/6
			240/208	3	24	24/20.8	30/30	8/10
G1G5110CA1	10.0	34.1	277	1	24	36.1	50	6
P3P5110CA1	10.0	34.1	480	3	24	12.1	20	12
F3F5115CA1	15.0	51.2	208	3	24	41.7	60	4
HF3B5115CA1	15.0/11.2	51.2/38.4	240/208	3	24	36.1/31.3	50/40	6/8
P3P5115CA1	15.0	51.2	480	3	24	18.1	25	10
HF3B5120CA1	19.5/14.8	67.2/50.5	240/208	3	24	47.8/41.1	60/60	4/6
P3P5120CA1	20.0	68.3	480	3	24	24.1	35	8
F3F5125CA1	25.0	85.3	208	3	24	69.5	90	2
HF3B5125CA1	25.0/18.7	85.3/64.0	240/208	3	24	60.2/52.1	80/70	3/4
P3P5125CA1	25.0	85.3	480	3	24	30.1	40	8
F3F5130CA1	30.0	102.4	208	3	24	83.4	110	2*
HB3B5130CA1	30.0/22.5	102.4/76.8	240/208	3	24	72.3/62.5	100/80	2/3
P3P5130CA1	30.0	102.4	480	3	24	36.2	50	6
F3F5140CA1	40.0	136.5	208	3	24	111.2	150	1/0*
HF3B5140CA1	40.0/30.0	136.5/102.4	240/208	3	24	96.4/83.4	125/110	1*/2*
P3P5140CA1	39.0	133.1	480	3	24	47.0	60	4
F3F5150CA1	49.6	169.9	208	3	24	139.0	175	2/0*
HF3BB5150CA1	50.0/37.5	170.5/128.0	240/208	3	24	120.5/104.3	175/150	2/0*1/0*
P3P5150CA1	50.0	170.5	480	3	24	60.3	80	3
***U3H5105CA4	5.0	17.1	600-240	3	240	5.1	15	14
U3H5107CA4	7.5	25.6	600-240	3	240	7.7	15	14
U3H5110CA4	10.0	34.1	600-240	3	240	10.2	15	14
U3H5115CA4	15.0	51.2	600-240	3	240	15.5	20	12
U3H5120CA4	20	68.3	600-240	3	240	20.3	25	10
U3H5125CA4	25.0	85.3	600-240	3	240	24.5	35	8
U3H5130CA4	30.0	102.4	600-240	3	240	29.4	40	8
U3H5140CA4	40	136.5	600-240	3	240	39.8	50	6
U3H5150CA4	50	170.7	600-240	3	240	49.4	60	4

**Use Copper Conductors on All Heaters *Use 75°C Wire

***NOTE: THIS UNIT (ONLY) BUILT IN 7.5 & 10KW CASE SIZE

AIR DELIVERY DATA				FAN MOTOR DATA				
CFM at OUTLET	FPM at OUTLET	TEMP. RISE °F	HP	MOTOR RPM	MAX MTG. HEIGHT HOR	MAX MTG. HEIGHT VERT	AIR THROW (HORIZ)	WEIGHT LBS.
400	1030	26	1/125	1550	9	9	12 Ft.	25
400	1030	26	1/125	1550	9	9	12 Ft.	25
400	1030	26	1/125	1550	9	9	12 Ft.	25
400	1030	26	1/125	1550	9	9	12 Ft.	25
400	1030	26	1/125	1550	9	9	12 Ft.	25
400	1030	26	1/125	1550	9	9	12 Ft.	27
400	1030	40	1/125	1550	9	9	12 Ft.	25
400	1030	40	1/125	1550	9	9	12 Ft.	25
400	1030	40	1/125	1550	9	9	12 Ft.	25
400	1030	40	1/125	1550	9	9	12 Ft.	25
400	1030	40	1/125	1550	9	9	12 Ft.	27
700	1000	34	1/50	1550	10	12	22 Ft.	50
700	1000	34	1/50	1550	10	12	22 Ft.	50
700	1000	34	1/50	1550	10	12	22 Ft.	50
700	1000	34	1/50	1550	10	12	22 Ft.	50
700	1000	45	1/50	1550	10	14	22 Ft.	50
700	1000	45	1/50	1550	10	14	22 Ft.	50
700	1000	45	1/50	1550	10	14	22 Ft.	50
700	1000	45	1/50	1550	10	14	22 Ft.	50
1100	1580	43	1/20	1550	11	20	32 Ft.	65
1100	1580	43	1/20	1550	11	20	32 Ft.	65
1100	1580	43	1/20	1550	11	20	32 Ft.	65
1100	1580	57	1/20	1550	12	18	32 Ft.	65
1100	1580	57	1/20	1550	12	18	32 Ft.	65
2000/1800	1300/1100	40/44	1/12	1550/1250	12	22	45 Ft.	120
2000/1800	1300/1100	40/44	1/12	1550/1250	12	22	45 Ft.	120
2000/1800	1300/1100	40/44	1/15	1550/1250	12	22	45 Ft.	120
2000/1800	1300/1100	47/53	1/12	1550/1250	12	20	40 Ft.	120
2000/1800	1300/1100	47/53	1/12	1550/1250	12	20	40 Ft.	120
2000/1800	1300/1100	47/53	1/15	1550/1250	12	20	40 Ft.	120
3100/2800	2000/1800	40/45	1/4	1550/1310	15	25	55 Ft.	120
3100/2800	2000/1800	40/45	1/4	1550/1310	15	25	55 Ft.	120
3100/2800	2000/1800	40/45	1/4	1550/1310	15	25	55 Ft.	120
3100/2800	2000/1800	51/56	1/4	1550/1310	15	22	50 Ft.	120
3100/2800	2000/1800	51/56	1/4	1550/1310	15	22	50 Ft.	120
3100/2800	2000/1800	51/56	1/4	1550/1310	15	22	50 Ft.	120
559	929	30	1/125	1300	9	9	12 Ft.	50
700	1000	34	1/50	1550	10	12	22 Ft.	50
700	1000	45	1/50	1550	10	14	22 Ft.	50
1100	1580	43	1/20	1550	11	20	32 Ft.	65
1100	1580	57	1/20	1550	12	18	37 Ft.	65
2000/1800	1300/1100	40/44	1/12	1550/1250	12	22	45 Ft.	120
2000/1800	1300/1100	47/53	1/12	1550/1250	12	20	40 Ft.	120
3100/2800	2000/1800	40/45	1/4	1550/1310	15	25	55 Ft.	120
3100/2800	2000/1800	51/56	1/4	1550/1310	15	22	50 Ft.	120

TROUBLE SHOOTING CHART

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Thermostat calls for heat, but heater does not function	1. Open (blown) fuse	1. Replace fuses, check for cause. (see Replacement Parts List for fuse size)
	2. INCORRECT WIRING	2. CHECK WIRING CONNECTIONS
	3. Thermal cut-out open, deenergizing heater element and control circuit.	3. Check for the following: Correct supply volts & phase Correct control wiring (heater control must be thru thermostat control wiring section only) Power interruption to heater during heater operation Restriction of air around heater 1-5 minute fan purge after thermostat off
Fan motor runs "hot"	1. Dust accumulation or excessive dirt on motor	1. Clean fan motor and casing of grease and oil accumulation.
	2. Dirt accumulation	2. Clean louvers and between heating elements
	3. Motor needs lubrication.	3. See Maintenance.
Fan motor runs, but no heat.	1. Element contactor not operating correctly.	1. Check wiring for open circuit. Replace contactor if defective.
	2. Element fuse blown.	2. Replace fuses, check for cause. (See Replacement Parts List for fuse size.)

MAINTENANCE

CAUTION: Make certain that the power source is disconnected before attempting to service or disassemble any component. If the power disconnect is out of the line of sight, lock it in the OPEN position and tag to prevent the application of power.

ELECTRICAL

Once a year inspect the control panel wiring to make certain insulation is intact and all connections are tight. Inspect all heater and relay contacts. If the contacts appear badly pitted or burned, replace the contactor/relay.

For proper circuit protection during operation, the correct size fuse must be used. The parts list contains the fuse size for all units.

CLEANING

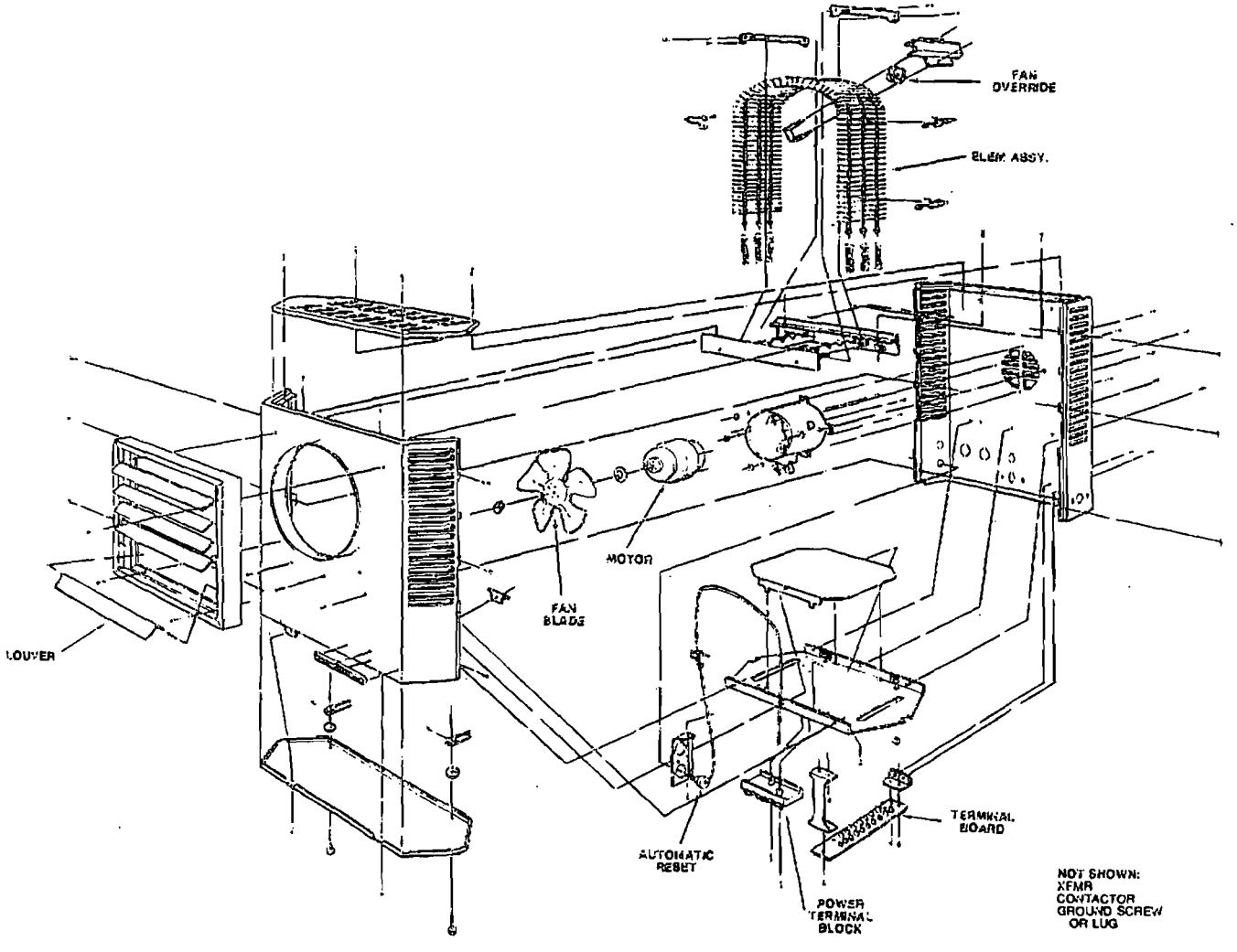
Clean the unit casing, fan and motor once a year. A dirty motor will tend to run hot and eventually will be damaged internally. Any rust spots on the casing should be cleaned and repainted.

LUBRICATION

All units up to 20KW have fan motors that are permanently lubricated so that only occasional cleaning is required. Units above 20KW have fan motors lubricated for 5 years of continuous duty or 10 years of intermittent operation. When required, remove the oil access plug on back of heater at motor intake grill, open oil cap, fill with S.A.E. No. 10 electric motor oil, replace plugs and access plug.

WIRING DIAGRAM SCHEDULE

DIAGRAM NUMBER	MODEL CODE (PREFIX)	MODEL CODE (SIZE AND CONTROL SYSTEM)		
WD5101	FIF-GIG-HFIB	5103N	5105N	
WD5104	GIG	5107CAIL	5110CAIL	
WD5106	F2F-HF2B	5103N	5105N	
WD5113	F2F	5107CAIL	5110CAIL	
WD5114	HF2B	5107CAIL	5110CAIL	
WD5138	P3P	5103CAIN	5105CAIN	5107CAIN
	P3P	5110CAIN	5115CAIN	5120CAIN
WD5121	F3F	5115CAIL		
WD5122	HF3B	5115CAIL	5120CAIL	
WD5125	F3F	5125CAIL	5130CAIL	5140CAIL
	F3F	5150CAIL		
WD5126	HF3B	5125CAIL	5130CAIL	5140CAIL
	HF3B	5150CAIL		
WD5139	P3P	5125CAIN	5130CAIN	
WD5140	P3P	5140CAIN		
WD5141	P3P	5150CAIN		
WD5142	U3H	5105CA4N	5107CA4N	5110CA4N
		5115CA4N	5120CA4N	
WD5143	U3H	5125CA4N	5130CA4N	5140CA4N
		5150CA4N		


FAN OVERRIDE
ELEM. ASSY.
MOTOR
FAN BLADE
LOUVER
AUTOMATIC RESET
TERMINAL BOARD
POWER TERMINAL BLOCK
NOT SHOWN:
XFMR
CONTACTOR
GROUND SCREW OR LUG

PARTS LIST
CATALOG NUMBERS

REVISED
3/91

HEATER MODEL	MOTOR	ELEMENT ASSEMBLY	AUTOMATIC RESET	FAN OVERRIDE	XFMR	CONTACTOR	POWER TERMINAL BLOCK
F1F5103N F2F5103N	56562-012 56562-012	60715-001 60715-011	57640-006 57640-006	56811-001 56811-001			56815-001 56815-001
HF1B5103N HF2B5103N	56562-017 56562-017	60715-002 60715-012	57640-006 57640-006	56811-001 56811-001			56815-001 56815-001
G1G5103N P3P5103CA1N	56562-016 56562-016	60715-007 60715-008	57640-005 57640-006	56811-001 56811-001	60719-006	50378-016	56815-001 56815-001
F1F5105N F2F5105N	56562-012 56562-012	60715-003 60715-004	57640-006 57640-006	56811-001 56811-001			56815-001 56815-001
HF1B5105N HF2B5105N	56562-017 56562-017	60715-005 60715-006	57640-006 57640-006	56811-001 56811-001			56815-001 56815-001
G1G5105N P3P5105CA1N	56562-013 56562-016	60715-009 60715-010	57640-006 57640-006	56811-001 56811-001	60719-006	50378-016	56815-001 56815-001
F2F5107CA1L HF2B5107CA1L	56823-011 56823-012	56954-004 56954-006	57640-003 57640-003	56811-001 56811-001	60719-001 60719-001	50378-022 50378-013	56816-001 56816-001
G1G5107CA1L P3P5107CA1N	56824-002 56824-011	56954-001 56954-002	57640-003 57640-003	56811-001 56811-001	60719-005 60719-006	50378-013N 50378-016	56815-001 56815-001
F2F5110CA1L HF2B5110CA1L	56823-011 56823-012	56954-003 56954-004	57640-003 57640-003	56811-001 56811-001	60719-001 60719-001	50378-031 50378-031	56816-001 56816-001
G1G5110CA1L P3P5110CA1N	56824-002 56824-011	56954-007 56954-008	57640-003 57640-003	56811-001 56811-001	60719-005 60719-006	50378-022 50378-013	56816-001 56815-001
F3F5115CA1L HF3B5115CA1L	56825-001 56825-002	56954-009 56954-010	57640-004 57640-004	56811-001 56811-001	60719-001 60719-001	50378-031 50378-022	56816-001 56816-001
P3P5115CA1N HF3B5120CA1L	56825-003 56825-002	56954-011 56954-012	57640-004 57640-004	56811-001 56811-003	60719-006 60719-001	50378-016 50378-031	56815-001 56816-001
P3P5120CA1N	56825-003	56954-013	57640-004	56811-003	60719-005	50378-016	56815-001

HEATER MODEL	MOTOR	ELEMENT ASSY	AUTOMATIC RESET	FAN OVERRIDE	XFMR	S.D. FUSE BLOCK 2 ROD	S.D. FUSE 6 ROD	CONTACTOR 2 ROD	POWER TERMINAL BLOCK	FAN SPEED SW
F3F5125CA1L HF3B5125CA1L	56943-001 56943-002	56954-017 56954-018	57640-005 57640-005	56811-002 56811-002	60719-009 60719-009	50836-012 50836-012	41280-002 41280-007	50378-025 50378-025	57097-001 57097-001	57112-001 57112-001
P3P5125CA1N F3F5130CA1L	56944-001 56943-001	56954-019 56954-020	57640-005 57640-005	56811-002 56811-002	60719-012 60719-009	— 50836-003	— 41280-008	50378-013 50378-025	57098-001 57097-001	57090-001 57112-001
HF3B5130CA1L P3P5130CA1N	56943-002 56944-001	56954-021 56954-022	57640-005 57640-005	56811-002 56811-002	60719-009 60719-012	50836-012 —	41280-002 —	50378-025 50378-018	57097-001 57098-001	57112-001 57090-001
F3F5140CA1L HF3B5140CA1L	56945-001 56945-002	56954-023 56954-024	57640-005 57640-005	56811-002 56811-002	60719-009 60719-009	50836-003 50836-003	41280-004 41280-003	50378-025 50378-025	57097-001 57097-001	57112-001 57112-001
P3P5140CA1N F3F5150CA1L	56946-001 56945-001	56954-025 56954-026	57640-005 57640-005	56811-002 56811-003	60719-012 60719-009	— 50836-003	— 41280-005	50378-016 50378-034	57098-001 57097-001	57090-001 57112-001
HF3B5150CA1L P3P5150CA1N	56945-002 56946-001	56954-027 56954-028	57640-005 57640-005	56811-003 56811-003	60719-009 60719-012	50836-003 57110-001	41280-004 57111-006	50378-025 50378-016	57097-001 57097-001	57112-001 57090-001

KW	FAN BLADE	TERMINAL BOARD	GROUND CONN.	MOTOR CAPACITOR	LOUVER
3.3-5	56806-001	56809-001	1458	—	(5) 56986-001
7.5-10	51554-002	56809-001	1458	—	(7) 56986-003
15-20	56813-001	56809-001	1458	—	(7) 56986-003
25-30	57114-001	56809-001	3981	57100-001	(9) 56987-001
40-50	57115-001	56809-001	3981	57100-001	(9) 56987-001

PARTS LIST — 900 VOLT MODELS

	U3H5105CA4N	U3H5107CA4N	U3H5110CA4N	U3H5115CA4N	U3H5120CA4N
Motor	56562-017	56823-012	56823-012	56825-002	56825-002
Element Assy.	56954-029	56954-030	56954-031	56954-032	56954-035
Auto. Reset Limit	57640-003	57640-003	57640-003	57640-004	57640-004
Fan Override	56811-001	56811-001	56811-001	56811-001	56811-003
XFMR	57641-003(100VA)	57641-001(150VA)	57641-001	57641-002(300VA)	57641-002
Contactor	50378-018	50378-018	50378-018	50378-018	50378-018
Power Trml Block	56815-001	56815-001	56815-001	56815-001	56815-001
Fan Blade	51554-002	51554-002	51554-002	56813-001	56813-001
Terminal Board	56809-001	56809-001	56809-001	56809-001	56809-001
Ground Conn.	1458	1458	1458	1458	1458
Louver	56956-003(7)	56956-003(7)	56956-003(7)	56956-003(7)	56956-003(7)

	U3H5125CA4N	U3H5130CA4N	U3H5140CA4N	U3H5150CA4N
Motor	56943-002	56943-002	56945-002	56945-002
Element Assy.	56954-033	56954-034	56954-036	56954-037
Auto. Reset Limit	57640-005	57640-005	57640-005	57640-005
Fan Override	56811-002	56811-002	56811-002	56811-003
XFMR	57641-001	57641-001	57641-004(350VA)	57641-004
Contactor	50378-018(2)	50378-018(2)	50378-018(2)	50378-018(2)
Power Trml Block	57098-001	57098-001	57098-001	57098-001
Fan Blade	57114-001	57114-001	57115-001	57115-001
Terminal Board	56809-001	56809-001	56809-001	56809-001
Ground Conn.	3991	3991	3991	3991
Louver	56956-004(9)	56956-004(9)	56956-004(9)	56956-004(9)
XFMR PRI Fuse Block	57643-001	57643-001	57643-001	57643-001
XFMR PRI Fuse (2)	57644-001(2)	57644-001(2)	57644-001(2)	57644-001(2)
Fan Speed SW	57112-001	57112-001	57112-001	57112-001
Motor Capacitor	57100-001	57100-001	57100-001	57100-001

TPI Corporation

LIMITED WARRANTY

Products manufactured by TPI Corporation are warranted to the original consumer to be free from defects in material and workmanship for twelve (12) months from the original date of purchase. The TPI warranty does not cover products modified outside our factory, damage or failure caused by acts of God, abuse, misuse, use on other than rated voltage, abnormal usage, faulty installation, failure to provide suggested maintenance procedures enclosed with the product, improper maintenance or any repairs other than these provided by an authorized TPI Corporation service center.

THERE ARE NO OBLIGATIONS OR LIABILITIES ON THE PART OF TPI CORPORATION FOR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT OR OTHER INDIRECT DAMAGES WITH RESPECT TO LOSS OF PROPERTY, REVENUES, OR PROFIT, OR COSTS OF REMOVAL, INSTALLATION OR REINSTALLATION.

ALL IMPLIED WARRANTIES WITH RESPECT TO TPI PRODUCTS, INCLUDING IMPLIED WARRANTIES FOR MERCHANTABILITY AND IMPLIED WARRANTIES FOR FITNESS, ARE LIMITED IN DURATION TO TWELVE (12) MONTHS FROM ORIGINAL DATE OF PURCHASE, EXCEPT THOSE PRODUCTS OR PARTS OF PRODUCTS WHICH ARE WARRANTED FOR LONGER PERIODS. ON SUCH PRODUCTS OR PARTS OF PRODUCTS ALL IMPLIED WARRANTIES FOR MERCHANTABILITY AND FITNESS ARE LIMITED TO THE DURATION OF THE EXTENDED WARRANTY PERIOD THEREON.

Some states do not allow the exclusion or limitation of incidental or consequential damages and some states do not allow limitations on how long an implied warranty lasts, so the above exclusions or limitations may not apply to you.

During the warranty period, TPI Corporation will, at its sole option, repair or replace any defective parts or products returned, freight prepaid, to the TPI Corporation factory or such other location as TPI Corporation may designate. Returned products must be packaged carefully and TPI Corporation shall not be responsible for damage in transit. When returning parts, the owner must provide the model number of the product and nature of difficulty being experienced. This warranty does not obligate TPI Corporation to bear the cost of labor in replacing any assembly, unit or component part thereof, nor does the company assume any liability for secondary charges, expenses for installing or removal, Freight or damages. There will be charges rendered for product repairs made after our warranty period has expired. Proof of purchase, including date, must accompany request for in-warranty service. In any event, TPI Corporation's maximum liability shall not in any case exceed the list price for the product claimed to be defective. This warranty gives to you specific legal rights and you may have other rights which may vary from state to state. For the name of your nearest authorized TPI Corporation service center, please write to TPI Corporation, P.O. Box 4973, Johnson City, Tennessee, 37602.

In addition to the Limited Warranty stated above covering general products, TPI Corporation extends this warranty on the following listed products, which are warranted to the original consumer from the original date of purchase for the total time periods indicated herein below:

HEATING PRODUCTS	
1. Elements in 101 Series Portable All Other Portable Heater Elements	Life of Heater 10 years
2. Elements in Baseboards	10 year
3. Elements in Wall Heaters	1 year
4. All Other Products	1 year

TPI Corporation
P.O. Box 4973
Johnson City, TN 37602
(423)477-4131
(423)477-0064

Instructions d'Installation

SÉRIES TASKMASTER

Nécessaires de thermostat incorporés T5100, T5102, T5122, TC5102 et TC5103 (pour être installés sur place les radiateurs de séries 5100)

Le T5100, Unipolaire à une direction (SPST), contrôle la tension de ligne pour les radiateurs monophasés jusqu'à 277V, 25A.
ou
veilleuse (24-277 volts) pour les radiateurs munis de contacteurs.

Le T5102, bipolaire contrôle la tension de ligne interrompant tous les conducteurs non mis à la terre pour les radiateurs monophasés jusqu'à 277V, 25A.
ou
bipolaire à une direction pour les radiateurs bipolaires jusqu'à 240V, 25A mais n'interrompant pas tous les conducteurs non mis à la terre pour les applications triphasées.

Le T5122 a un contrôle basse tension (24V) à 2 étages pour radiateurs à 2 étages. Les deux circuits sont séparés et contrôlés par le même élément sensitif. Les interrupteurs contrôlant ces circuits sont calibrés pour ouvrir et fermer en série.

Le TC5102 est un relais/thermostat qui est utilisé avec des radiateurs de 480 & 600 volts pour contrôler le moteur du ventilateur. Il sert à détecter l'arrivée de la chaleur (therm.de strat.) au plafond et à faire démarrer le moteur du ventilateur pour faire recirculer accumulation de chaleur.

Le TC5103 sert à contrôler le moteur du ventilateur sur les radiateurs de 208, 240 & 277 volts pour faire recirculer la chaleur stratifiée accumulée au plafond.

Lisez S.V.P. chaque instruction d'installation soigneusement avant de commencer l'installation.

INSTRUCTIONS D'INSTALLATION DES T5100, T5102 & T5122

1) ATTENTION:
Afin d'éviter un choc électrique possible, mettez le radiateur à la position ARRÊT au niveau du panneau de distribution. Sur les radiateurs équippés d'un interrupteur de courant, mettez l'interrupteur à la position ARRÊT.

2) Desserez les deux vis situées sur la porte du panneau de contrôle et laissez celle-ci pendre. Quelques modèles ont un dispositif d'arrêt supplémentaire. Comprimez ce dispositif afin qu'il s'ouvre.

3) Enlevez la rondelle défonçable de dia. ½" (13mm) alimentant l'ampoule du thermostat Fig. 1 afin de connecter celle-ci par le trou ainsi fait.
ATTENTION: Gardez le tube capillaire loin des dispositifs et des fils électriques internes.

4) Enlevez les 2 petites rondelles défonçables pour les attaches des ampoules du thermostat à l'arrière du radiateur, (voir Fig. 1). Insérez les deux attaches fournies. Agrafez les ampoules sur les attaches.

5) Enlevez le papier du dos de l'étiquette (fournie). Alignez l'étiquette sur le trou de l'arbre du thermostat et positionnez-là (voir Fig. 1). Collez l'étiquette sur le côté du radiateur comme montré.

6) Notez l'orientation de la patte sur le support du thermostat (voir Fig. 1). Positionnez-là comme montré seulement. Installez le thermostat avec les 2 vis de montage No. 8 fournies.

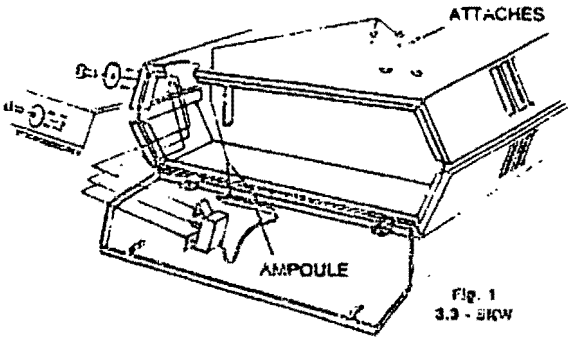


Fig. 1
3.3 - 5KW

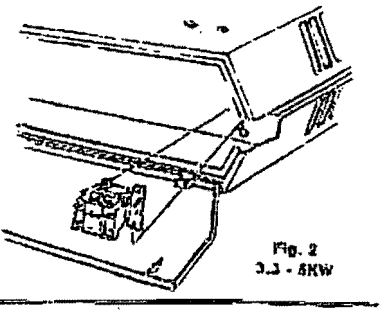


Fig. 2
3.3 - 5KW

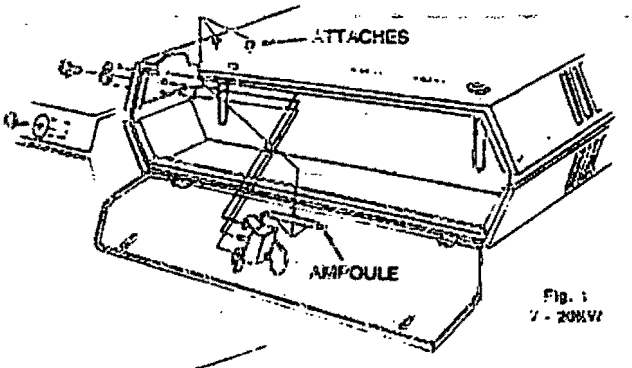


Fig. 1
7 - 20KW

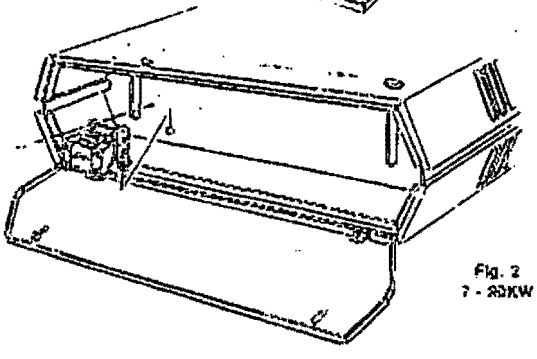


Fig. 2
7 - 20KW

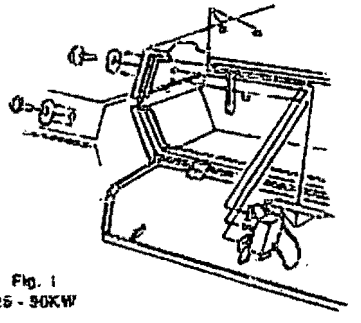


Fig. 1
25 - 50KW

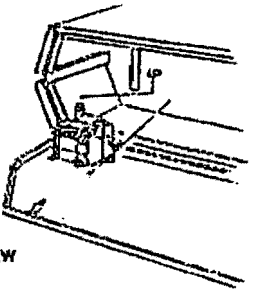


Fig. 2
25 - 50KW

7) Installez le bouton en le poussant sur l'arbre du thermostat.

8) Connectez les fils conducteurs du thermostat aux bornes de contrôle comme montré sur les shémas de filerie situés à l'intérieur de la porte du panneau de contrôle.

9) Réglez le thermostat à la température désirée. Tournez le thermostat à fond dans le sens des aiguilles d'une montre. Lorsque la température de la pièce a atteint le niveau désiré tournez le thermostat dans le sens contraire des aiguilles d'une montre jusqu'à ce qu'il s'ouvre (déclique). Le thermostat doit peut être, être réglé de nouveau une è deux fois afin de maintenir une température confortable.

THERMOSTAT À RÉCUPERATION DE CHALEUR TC5102 & TC5103

10) Le thermostat monté TC5102 doit être muni d'un relais afin de faire fonctionner le moteur du ventilateur. Installez le thermostat en suivant les paregraphes de 7 à 8.

11) Installez le relais en glissant sa patte sous le rebord de montage du panneau de contrôle. Montez le relais avec une vis No. 8 comme montré aur la Fig. 2. Chaque fil conducteur est marqué pour être connecté correctement; Connectez les fils conducteurs comme indiqué sur le shéma de filerie situé à l'intérieur de la porte du panneau de contrôle.

12) Réglez le thermostat de nouveau pour contrôler le ventilateur, si vous désirez une autre température que celle réglée à la fabrique.

IN USA:
TPI Corporation
P.O. Box 4973
Johnson City, TN 37602

LISTE DE MATERIEL DES NUMEROS DE CATALOGUE

	U3H5105CA4N	U3H5107CA4N	U3H5110CA4N	U3H5115CA4N	U3H5120CA4N
MOTEUR	56562-017	56823-012	56823-012	56825-002	56825-002
ELEMENT MONTÉ	56954-029	56954-030	56954-031	56954-032	56954-035
REENCLENCH. AUTOMATIQUE	57640-003	57640-003	57640-003	57640-004	57640-004
DEROGATION DU VENTILATEUR	56811-001	56811-001	56811-001	56811-001	56811-003
TRANSF.	57641-003(100VA)	57641-001(150VA)	57641-001	57641-002(300VA)	57641-002
CONTACTEUR	50378-018	50378-018	50378-018	50378-018	50378-018
BLOC DES BORNES D'ALIM.	56815-001	56815-001	56815-001	56815-001	56815-001
AILETTE DE VENTIL.	51554-002	51554-002	51554-002	56813-001	56813-001
PLAQUETTE DE BORNES	56809-001	56809-001	56809-001	56809-001	56809-001
CONNECT. DE MALT	1458	1458	1458	1458	1458
VOLET	56986-003(7)	56986-003(7)	56986-003(7)	56986-003(7)	56986-003(7)

	U3H5125CA4N	U3H5130CA4N	U3H5140CA4N	U3H5150CA4N
MOTEUR	56943-002	56943-002	56945-002	56945-002
ELEMENT MONTÉ	56954-033	56954-034	56954-036	56954-037
REENCLENCH. AUTOMATIQUE	57640-005	57640-005	57640-005	57640-005
DEROGATION DU VENTILATEUR	56811-002	56811-002	56811-002	56811-003
TRANSF.	57641-001	57641-001	57641-004(350VA)	57641-004
CONTACTEUR	50378-018(2)	50378-018(2)	50378-018(2)	50378-018(2)
BLOC DES BORNES D'ALIM.	57098-001	57098-001	57098-001	57098-001
AILETTE DE VENTIL.	57114-001	57114-001	57115-001	57115-001
PLAQUETTE DE BORNES	56809-001	56809-001	56809-001	56809-001
CONNECT. DE MALT	3981	3981	3981	3981
VOLET	56986-004(9)	56986-004(8)	56986-004(9)	56986-004(9)
BLOCK DE FUSIBLE	57643-001	57643-001	57643-001	57643-001
FUSIBLE (2)	57644-001(2)	57644-001(2)	57644-001(2)	57644-001(2)
INTERRUPT. DE VITESSE DU VENTIL.	57112-001	57112-001	57112-001	57112-001
CONDENSAT. DU MOTEUR	57100-001	57100-001	57100-001	57100-001

GARANTIE LIMITEE DE

TPI Corporation

La fabrication et l'exécution des produits fabriqués par Markel Products Co. sont garantis au premier consommateur pendant douze (12) mois à partir de la date d'achat. Ceci ne couvre pas les produits modifiés à l'extérieur de notre fabrique, les dégâts ou une panne provoqués par une cause naturelle, un emploi abusif, une mauvaise utilisation, leur utilisation sur une tension autre que celle indiquée, une utilisation anormale, une mauvaise installation, l'inobservation des instructions d'entretien indiquées et incluses avec le produit. Un entretien incorrect ou des réparations autres que celles faites par un centre de réparation Markel autorisé.

MARKEL N'A AUCUNE OBLIGATION OU RESPONSABILITE POUR DES DEGATS DECOULANT DE, OU EN RAPPORT AVEC L'UTILSATION OU LE RENDEMENT DE CE PRODUIT OU AUTRES DEGATS INDIRECTS CONCERNANT LA PERTE DE LA PROPRIETE, LES PERTES DE REVENUS OU DE PROFIT OU LES COUTS D'ENLEVEMENT, D'INSTALLATION OU DE REINSTALLATION.

TOUTES LES GARANTIES SOUS-ENTENDUES CONCERNANT LES PRODUITS MARKEL, INCLUANT LES GARANTIES SOUS-ENTENDUES DE MISE EN MARCHÉ ET LES GARANTIES SOUS-ENTENDUES DE RAPPORTANT A LA QUALITE SONT LIMITEES POUR UNE PERIODE DE DOUZE (12) MOIS A PARTIR DE LA DATE D'ACHAT D'ORIGINE A L'EXEPTION DE CES PRODUITS OU DES PIECES DE CEUX-CI, QUI SONT GARANTIS POUR UNE PLUS GRANDE PERIODE. SUR CES DITS PRODUITS ET CES DITES PIECES, TOUTES LES GARANTIES SOUS-ENTENDUES DE MISE EN MARCHÉ ET SE RAPPORTANT A LA QUALITE SONT LIMITEES A LA PERIODE DE LA GARANTIE PROLONGEE CI-APRES.

Certains états ne permettent pas l'exclusion ou la limitation des dégâts indirects ou accidentels, certains également ne permettent pas la limitation de la durée de la garantie sous-entendue, de sorte que les exclusions ou les limitations ci-dessus ne s'appliquent peut être pas dans votre cas.

Durant la période de la garantie, Markel Products Co. remplacera ou réparera à son choix toutes les pièces ou produits retournés, port payé à la fabrique de Markel Products Co. ou à d'autres endroits désignées par Markel Products Co. Les produits retournés doivent être emballés soigneusement et Markel Products Co. ne sera pas responsable des dégâts encourus durant le transport. Lorsque vous retournez les pièces faites nous savoir le numéro du produit et la nature des difficultées que vous avez rencontré. Cette garantie n'oblige pas Markel Products Co. de rembourser les frais de main d'oeuvre afin de remplacer tout ensemble monté, appareil ou pièce. La compagnie n'assume aucune responsabilité pour les frais secondaires, les dépenses encourues pour installer ou enlever des éléments de l'appareil, le fret ou les dégâts qui en découlent. Des frais seront présentés pour des réparations de produits faits après l'expiration de la période de garantie. La preuve datée de l'achat doit accompagner une réclamation afin de réparer le produit sous grantie. La responsabilité maximum de Markel Products Co. n'excédera pas en aucun cas le prix de vente du produit donné pour défectueux. Cette garantie vous donne des droits légaux spécifiques et vous pouvez avoir d'autres droits qui peuvent varier d'état en état. Afin de savoir le nom de votre centre réparations Markel le plus proche, écrivez S.V.P. à Markel Products Company.

En supplément à la garantie limitée mentionnée ci-dessus couvrant les produits en général, Markel Products Co. prolonge cette garantie sur les produits suivants qui sont garantis au premier consomateur à partir de la date d'origine de l'achat, pendant les périodes de temps indiquées ci-dessous:

Eléments dans les séries 5100	5 ans

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(USA) JOHNSON CITY, TN 37602-4973

Printed in U.S.A.

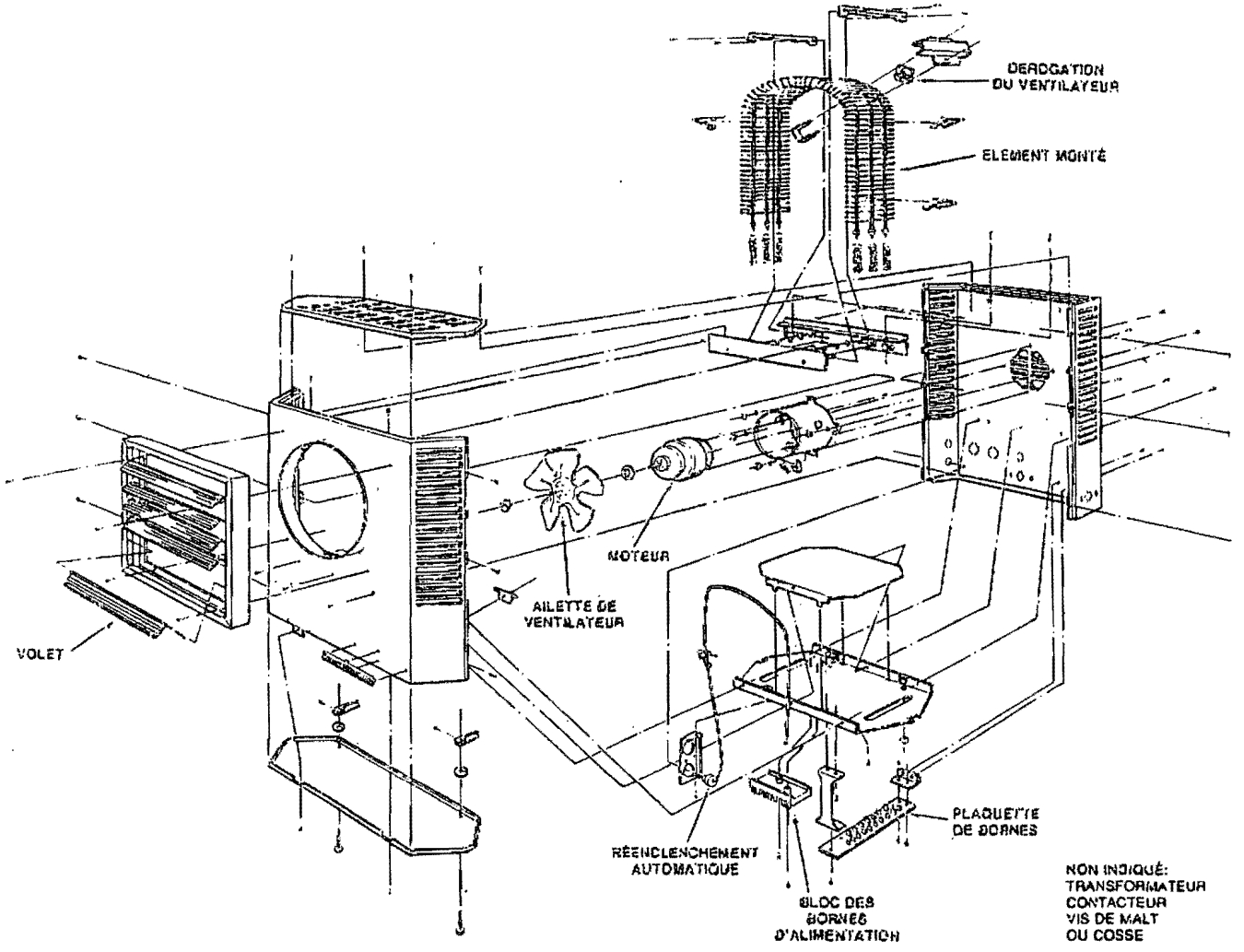
LISTE DE MATERIEL
DES NUMEROS DE
CATALOGUE

REVISED
3/91

HEATER MODELS	MOTEUR	ELEMENT MONTÉ	REENCLENCH. AUTOMATIQUE	DEROGATION DU VENTILATEUR	TRANSF.	CONTACTEUR	BLOC DES BORNES D'ALIM.
F1F5103N	56562-012	60715-001	57640-006	56811-001			56815-001
F2F5103N	56562-012	60715-011	57640-006	56811-001			56815-001
HF1B5103N	56562-017	60715-002	57640-006	56811-001			56815-001
HF2B5103N	56562-017	60715-012	57640-006	56811-001			56815-001
G1G5103N	56562-016	60715-007	57640-006	56811-001			56815-001
P3P5103CA1N	56562-016	60715-006	57640-006	56811-001	60719-006	50378-016	56815-001
F1F5105N	56562-012	60715-003	57640-006	56811-001			56815-001
F2F5105N	56562-012	60715-004	57640-006	56811-001			56815-001
HF1B5105N	56562-017	60715-005	57640-006	56811-001			56815-001
HF2B5105N	56562-017	60715-006	57640-006	56811-001			56815-001
G1G5105N	56562-016	60715-009	57640-006	56811-001			56815-001
P3P5105CA1N	56562-016	60715-010	57640-006	56811-001	60719-006	50378-016	56815-001
F2F5107CA1L	56823-011	56954-004	57640-003	56811-001	60719-001	50378-022	56816-001
HF2B5107CA1L	56823-012	56954-005	57640-003	56811-001	60719-001	50378-013	56816-001
G1G5107CA1L	56824-002	56954-001	57640-003	56811-001	60719-005	50378-013N	56815-001
P3P5107CA1N	56824-011	56954-002	57640-003	56811-001	60719-003	50378-016	56815-001
F2F5110CA1L	56823-011	56954-003	57640-003	56811-001	60719-001	50378-031	56816-001
HF2B5110CA1L	56823-012	56954-004	57640-003	56811-001	60719-001	50378-031	56816-001
G1G5110CA1L	56824-002	56954-007	57640-003	56811-001	60719-005	50378-022	56816-001
P3P5110CA1N	56824-011	56954-008	57640-003	56811-001	60719-008	50378-016	56815-001
F3F5115CA1L	56825-001	56954-009	57640-004	56811-001	60719-001	50378-031	56816-001
HF3B5115CA1L	56825-002	56954-010	57640-004	56811-001	60719-001	50378-022	56816-001
P3P5115CA1N	56825-003	56954-011	57640-004	56811-001	60719-008	50378-016	56815-001
HF3B5120CA1L	56825-002	56954-012	57640-004	56811-003	60719-001	50378-031	56815-001
P3P5120CA1N	56825-003	56954-013	57640-004	56811-003	60719-006	50378-016	56815-001

HEATER MODELS	MOTEUR	ÉLÉMENT MONTÉ	REENCLENCH AUTOMATIQUE	DÉROGATION DU VENTILATEUR	TRANSF.	(2) BLOC DE FUSIBLES	(5) FUSIBLES	(2) CONTACTEUR	BLOC DES BORNES D'ALIM	INTERR DE VITESSE DU VENT
F3F5125CA1L	56943-001	56954-017	57640-005	56811-002	60719-009	50636-012	41260-002	50378-025	57097-001	57112-001
HF3B5125CA1L	56943-002	56954-018	57640-005	56811-002	60719-009	50636-012	41260-007	50378-025	57097-001	57112-001
P3P5125CA1N	56944-001	56954-019	57640-005	56811-002	60719-012	—	—	50378-016	57090-001	57090-001
F3F5130CA1L	56943-001	56954-020	57640-005	56811-002	60719-009	50636-003	41260-008	50378-025	57097-001	57112-001
HF3B5130CA1L	56943-002	56954-021	57640-005	56811-002	60719-009	50636-012	41260-002	50378-025	57097-001	57112-001
P3P5130CA1N	56944-001	56954-022	57640-005	56811-002	60719-012	—	—	50378-016	57090-001	57090-001
F3F5140CA1L	56945-001	56954-023	57640-005	56811-002	60719-009	50636-003	41260-004	50378-025	57097-001	57112-001
HF3B5140CA1L	56945-002	56954-024	57640-005	56811-002	60719-009	50636-003	41260-003	50378-025	57097-001	57112-001
P3P5140CA1N	56946-001	56954-025	57640-005	56811-002	60719-012	—	—	50378-016	57090-001	57090-001
F3F5150CA1L	56945-001	56954-026	57640-005	56811-003	60719-009	50636-003	41260-005	50378-034	57097-001	57112-001
HF3B5150CA1L	56945-002	56954-027	57640-005	56811-003	60719-009	50636-003	41260-004	50378-025	57097-001	57112-001
P3P5150CA1N	56946-001	56954-028	57640-005	56811-003	60719-012	57110-001	57111-008	50378-016	57097-001	57090-001

KW	AILETTI DE VEN	PLAQUETTE DE BORNES	CONNECT. DE MALT	CONDENSAT. DU MOTEUR	VOLET
3.3-5	56806-001	56809-001	1458	—	(5) 56986-001
7.5-10	51554-002	56809-001	1458	—	(7) 56986-003
15-20	56813-001	56809-001	1458	—	(7) 56986-003
25-30	57114-001	56809-001	3981	57100-001	(9) 56987-001
40-50	57115-001	56809-001	3981	57100-001	(9) 56987-001



DESSIN DES PIECES

SHEMA DE FILERIE & TABLEAU

SHEMA	CODE	CALIBRE		
WD5101	FIF-GIG-HFIB	5103N	5105N	
WD5104	GIG	5107CAIL	5110CAIL	
WD5106	F2F-HF2B	5103N	5105N	
WD5113	F2F	5107CAIL	5110CAIL	
WD5114	HF2B	5107CAIL	5110CAIL	
WD5138	P3P	5103CAIN	5105CAIN	5107CAIN
	P3P	5110CAIN	5115CAIN	5120CAIN
WD5121	F3F	5115CAIL		
WD5122	HF3B	5115CAIL	5120CAIL	
WD5125	F3F	5125CAIL	5130CAIL	5140CAIL
	F3F	5150CAIL		
WD5126	HF3B	5125CAIL	5130CAIL	5140CAIL
	HF3B	5150CAIL		
WD5139	P3P	5125CAIN	5130CAIN	
WD5140	P3P	5140CAIN		
WD5141	P3P	5150CAIN		
WD5142	U3H	5105CA4N	5107CA4N	5110CA4N
		5115CA4N	5120CA4N	
WD5143	U3H	5125CA4N	5130CA4N	5140CA4N
		5150CA4N		

TABLEAU DES PANNES

SYMPTOMES	CAUSE(S) POSSIBLE(S)	MESURES DE CORRECTION
Le thermostat est excité mais le radiateur ne fonctionne pas	1. Le fusible a sauté	1. Remplacez les fusibles, cherchez la cause de la panne (voir la liste des pièces de rechange pour l'intensité des fusibles).
	2. FILERIE INCORRECTE	2. VERIFIEZ LES CONNECTIONS DES FILS CONDUCTEURS
	3. Le coupe-circuit thermique est ouvert coupant le courant à l'élément du radiateur et du circuit de contrôle.	3. Vérifiez ce qui suit: La tension et l'ordre des phases de l'alimentation. La filerie de contrôle (le contrôle du radiateur doit passer par la filerie de cotrôle du thermostat seulement. Interruption de l'alimentation du radiateur durant son fonctionnement. Manque d'air autour du radiateur. Après l'ouverture du thermostat faites tourner le moteur du ventilateur pendant 1 à 5 minutes afin de dégager la chaleur ainsi emmagasinée.
Le moteur du ventilateur "chauffe".	1. Accumulation de poussière ou saleté excessive sur le moteur.	1. Nettoyez les accumulations de graisse et d'huile du moteur du ventilateur et du boîtier.
	2. Accumulation de saleté.	2. Nettoyez les volets et entre les éléments de chauffage.
	3. Le moteur a besoin d'être lubrifié.	3. Voil l'entretien.
Le moteur du ventilateur tourne mais il n'y a pas de chauffage.	1. Le contacteur de l'élément ne fonctionne pas correctement.	1. Vérifiez s'il n'y a pas un circuit ouvert dans la filerie. Si le contacteur est défectueux remplacez-le.
	2. Le fusible de l'élément a sauté	2. Remplacez les fusibles, cherchez la cause de la panne (voir la liste des pièces de rechange pour l'intensité des fusibles).

A moins d'un cas d'urgence, n'ouvrez pas l'interrupteur principal lorsque le radiateur fonctionne. Il se pourrait que le coupe-circuit thermique s'ouvre car le contact de dérogation du ventilateur ne pourra fonctionner et dégager le boîtier du radiateur de la chaleur ainsi emmagasinée.

ENTRETIEN

ATTENTION: S'assurer que l'alimentation de courant est débranchée avant de commencer l'entretien de l'appareil ou de le démonter. Si l'interrupteur de l'alimentation n'est pas visible, vérrouillez-le en position "OUVERT" et étiquettez-le afin d'empêcher que l'on mette le courant.

ENTRETIEN ELECTRIQUE

Inspectez la filerie du panneau de contrôle une fois par an afin de vous assurer que l'isolant est intact et que toutes les connections sont solides. Inspectez tous les contacts du relais et du radiateur. Si les contacts apparaissent très piqués ou brûlés, remplacez le relais/contacteur.

Pour une protection correcte du circuit durant le fonctionnement l'intensité correcte du fusible doit être choisie. La liste de matériel indique l'intensité des fusibles pour tous les appareils.

NETTOYAGE

Nettoyez le boîtier de l'appareil, le ventilateur et le moteur une fois par an. Un moteur encrassé aura tendance à chauffer et éventuellement à se détériorer. Les endroits rouillés du boîtier doivent être nétoyés et repeints.

LUBRIFICATION

Les appareils jusqu'à 20 KW ont des moteurs de ventilateurs qui sont lubrifiés en permanence de sorte qu'ils ont besoin d'un nettoyage occasionel seulement. Les appareils au-dessus de 20 KW ont des moteurs de ventilateurs lubrifiés pour un fonctionnement continu de 5 ans ou pour un fonctionnement intermittant de 10 ans. Quand il est nécéssaire, enlevez le bouchon d'accès de l'huile à l'arrière du radiateur, près de la grille d'entrée, ouvrez le capuchon d'huile, remplissez avec de l'huile moteur électrique S.A.E. No. 10, puis replacez les capuchons et le bouchon.

CARACTERISTIQUES DE LA PROPULSION DE L'AIR

CARACTERISTIQUES DU MOTEUR DU VENTILATEUR

PCM à la SORTIE	LPM à la SORTIE	ELEV. DE TEMP. DE L'AIR °F	CV	RPM DU MOTEUR	HAUTEUR MAX. DE MONT. HOR.	VERT.	AIR PROPULSE (HORIZ)		POIDS LBS.	KG.
400	1030	26	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	26	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	26	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	28	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	26	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	26	1/125	1550	2m747	2m747	12 FT.	3m658	27	12.3
400	1030	40	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	40	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	40	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	40	1/125	1550	2m747	2m747	12 FT.	3m658	25	11.4
400	1030	40	1/125	1550	2m747	2m747	12 FT.	3m658	27	12.3
700	1000	34	1/50	1550	3m052	3m663	22 FT.	6m705	50	22.7
700	1000	34	1/50	1550	3m052	3m663	22 FT.	6m705	50	22.7
700	1000	34	1/50	1550	3m052	3m663	22 FT.	6m705	50	22.7
700	1000	34	1/50	1550	3m052	3m663	22 FT.	6m705	50	22.7
700	1000	45	1/50	1550	3m052	4m273	22 FT.	6m705	50	22.7
700	1000	45	1/50	1550	3m052	4m273	22 FT.	6m705	50	22.7
700	1000	45	1/50	1550	3m052	4m273	22 FT.	6m705	50	22.7
700	1000	45	1/50	1550	3m052	4m273	22 FT.	6m705	50	22.7
1100	1580	43	1/20	1550	3m358	6m105	32 FT.	9m754	65	29.60
1100	1580	43	1/20	1550	3m358	6m105	32 FT.	9m754	65	29.60
1100	1580	43	1/20	1550	3m358	6m105	32 FT.	9m754	65	29.60
1100	1580	57	1/20	1550	3m663	5m495	32 FT.	9m754	65	29.60
1100	1580	57	1/20	1550	3m663	5m495	32 FT.	9m754	65	29.60
2000/1800	1300/1100	40/44	1/12	1550/1250	3m663	6m716	45 FT.	13m716	120	54.60
2000/1800	1300/1100	40/44	1/12	1550/1250	3m663	6m716	45 FT.	13m716	120	54.60
2000/1800	1300/1100	40/44	1/15	1550/1250	3m663	6m716	45 FT.	13m716	120	54.60
2000/1800	1300/1100	47/53	1/12	1550/1250	3m663	6m105	40 FT.	12m192	120	54.60
2000/1800	1300/1100	47/53	1/12	1550/1250	3m663	6m105	40 FT.	12m192	120	54.60
2000/1800	1300/1100	47/53	1/15	1550/1250	3m663	6m105	40 FT.	12m192	120	54.60
3100/2800	2000/1800	40/45	1/4	1550/1310	4m579	7m632	55 FT.	16m764	120	54.60
3100/2800	2000/1800	40/45	1/4	1550/1310	4m579	7m632	55 FT.	16m764	120	54.60
3100/2800	2000/1800	40/45	1/4	1550/1310	4m579	7m632	55 FT.	16m764	120	54.60
3100/2800	2000/1800	51/56	1/4	1550/1310	4m579	6m716	50 FT.	15m240	120	54.60
3100/2800	2000/1800	51/56	1/4	1550/1310	4m579	6m716	50 FT.	15m240	120	54.60
3100/2800	2000/1800	51/56	1/4	1550/1310	4m579	6m716	50 FT.	15m240	120	54.60
558	929	30	1/125	1300	2m747	2m747	12 FT.	3m658	50	22.7
700	1000	34	1/50	1550	3m052	3m663	22 FT.	6m705	50	22.7
700	1000	45	1/50	1550	3m052	4m273	22 FT.	6m705	50	22.7
1100	1580	43	1/20	1550	3m358	6m105	32 FT.	9m754	65	29.60
1100	1580	57	1/20	1550	3m663	5m495	32 FT.	9m754	65	29.60
2000/1800	1300/1100	40/44	1/12	1550/1250	3m663	6m716	45 FT.	13m716	120	54.60
2000/1800	1300/1100	47/53	1/12	1550/1250	3m663	6m105	40 FT.	12m192	120	54.60
3100/2800	2000/1800	40/45	1/4	1550/1310	4m579	7m632	55 FT.	16m764	120	54.60
3100/2800	2000/1800	51/56	1/4	1550/1310	4m579	6m716	50 FT.	15m240	120	54.60

CARACTERISTIQUES TECHNIQUES DES SERIES 5100

TABLE 2

CARACTERISTIQUES ELECTRIQUES

NUMERO DE CATALOGUE	PUISSANCE EN KW	BTU/HR (000)	TENSION DU MOTEUR RADIATEUR	PHASE	TENSION DE CONTROLE	INTENSITE EN AMP. PAR PHASE	PROTECTION DU CIRCUIT DE BRANCH. CALIBRE(A)	CALIBRE DU CONDUCTEUR D'ALIM. 60°C AWG **
F1F5103	3.3	11.2	208	1	208	15.9	20	12
F2F5103	3.3	11.2	208	1	208	15.9	20	12
			208	3	208	9.2	15	14
HF1B5103	3.3/2.5	11.2/8.5	240/208	1	240/208	13.7/11.9	20/15	12/14
HF2B5103	3.3/2.5	11.2/8.5	240/208	1	240/208	13.7/11.9	20/15	12/14
			240/208	3	240/208	7.9/6.9	10/10	14/14
G1G5103	3.3	11.2	277	1	277	11.9	15	14
P3P5103CA1	3.3	11.2	480	3	24	4.0	15	14
F1F5105	5.0	17.1	208	1	208	24.1	35	8
F2F5105	5.0	17.1	208	1	208	24.1	35	8
			208	3	208	13.9	20	12
HF1B5105	5.0/3.7	17.1/12.8	240/208	1	240/208	20.9/18.1	30/25	10/10
HF2B5105	5.0/3.7	17.1/12.8	240/208	1	240/208	20.9/18.1	30/25	10/10
			240/208	3	240/208	12.1/10.4	20/15	12/14
G1G5105	5.0	17.1	277	1	277	18.1	25	10
P3P5105CA1	5.0	17.1	480	3	24	6.1	15	14
F2F5107CA1	7.5	25.6	208	1	24	36.1	50	6
			208	3	24	20.8	30	10
HF2B5107CA1	7.5/5.6	25.6/19.2	240/208	1	24	31.3/27.1	40/35	8/8
			240/208	3	24	18.1/15.6	25/20	10/12
G1G5107CA1	7.5	25.6	277	1	24	27.1	35	8
P3P5107CA1	7.5	25.6	480	3	24	9.1	15	14
F2F5110CA1	9.9	33.8	208	1	24	47.8	60	4
			208	3	24	27.8	35	8
HF2B5110CA1	10.0/7.5	34.1/25.6	240/208	1	24	41.6/36.1	60/50	4/6
			240/208	3	24	24/20.8	30/30	8/10
G1G5110CA1	10.0	34.1	277	1	24	36.1	50	6
P3P5110CA1	10.0	34.1	480	3	24	12.1	20	12
F3F5115CA1	15.0	51.2	208	3	24	41.7	60	4
HF3B5115CA1	15.0/11.2	51.2/38.4	240/208	3	24	36.1/31.3	50/40	6/6
P3P5115CA1	15.0	51.2	480	3	24	18.1	25	10
HF3B5120CA1	19.5/14.8	67.2/50.5	240/208	3	24	47.8/41.1	60/50	4/6
P3P5120CA1	20.0	68.3	480	3	24	24.1	35	8
F3F5125CA1	25.0	85.3	208	3	24	69.5	90	2
HF3B5125CA1	25.0/18.7	85.3/64.0	240/208	3	24	60.2/52.1	80/70	3/4
P3P5125CA1	25.0	85.3	480	3	24	30.1	40	8
F3F5130CA1	30.0	102.4	208	3	24	83.4	110	2*
HF3B5130CA1	30.0/22.5	102.4/76.8	240/208	3	24	72.3/62.5	100/80	2/3
P3P5130CA1	30.0	102.4	480	3	24	36.2	50	6
F3F5140CA1	40.0	136.5	208	3	24	111.2	150	1/0*
HF3B5140CA1	40.0/30.0	136.5/102.4	240/208	3	24	96.4/83.4	125/110	1*/2*
P3P5140CA1	39.0	133.1	480	3	24	47.0	60	4
F3F5150CA1	49.6	169.9	208	3	24	139.0	175	2/0*
HF3B5150CA1	50.0/37.5	170.6/128.0	240/208	3	24	120.5/104.3	175/150	2/0* 1/0*
P3P5150CA1	50.0	170.6	480	3	24	60.3	80	3
***U3H5105CA4	5.0	17.1	600-240	3	240	5.1	15	14
U3H5107CA4	7.5	25.6	600-240	3	240	7.7	15	14
U3H5110CA4	10.0	34.1	600-240	3	240	10.2	15	14
U3H5115CA4	15.0	51.2	600-240	3	240	15.5	20	12
U3H5120CA4	20	68.3	600-240	3	240	20.3	25	10
U3H5125CA4	25.0	85.3	600-240	3	240	24.5	35	8
U3H5130CA4	30.0	102.4	600-240	3	240	29.4	40	8
U3H5140CA4	40	136.5	600-240	3	240	39.8	50	6
U3H5150CA4	50	170.7	600-240	3	240	49.4	60	4

**Use Copper Conductors on All Heaters *Use 75°C Wire

***NOTE: THIS UNIT (ONLY) BUILT IN 7.5 & 10KW CASE SIZE

INSTRUCTIONS D'INSTALLATIONS

Radiateurs séries 5100

Tous les radiateurs électriques sont expédiés complètement montés. L'installation comprend la suspension de l'appareil, le montage des accessoires incorporés ou de commande à distance, la filerie des dispositifs de contrôle (en option) et la filerie électrique de tout l'appareil.

Afin de s'assurer que l'air chaud se propage aux endroits voulus, consultez les tables relatives aux distances de montage et à la propultion de l'air incluses dans ces instructions. Voir les Fig. 1 & 2 pour les distances à maintenir de l'appareil au mur et au plafond.

La structure du mu et/ou du plafond doit être assez solide afin de supporter le poids combiné du radiateur, de ses supports et de ses accessoires.

S'assurer que le courant d'alimentation soit coupé avant d'installer le radiateur. Vérifiez la tension et l'ordre des phases du radiateur inscrits sur la plaque de caractéristiques de ce dernier à l'arrière de l'appareil afin de s'assurer qu'ils soient les mêmes que ceux de l'alimentation de courant.

Certains appareils unipolaires peuvent se transformer en appareil tripolaire. Suivez les instructions inscrites sur le shema de filerie de l'appareil pour cette conversion. On doit modifier la filerie des appareils ayant une tension double (HF) si on veut changer la tension de 240 à 208 volts. Suivez soigneusement les instructions du shema de filerie de l'appareil.

Ouvrir la porte d'accès (2 attaches ¼ de tour)

Enlevez les rondelles défonçables que vous avez choisi à l'arrière du radiateur.

Installez les accessoires (en option) en suivant les instructions à leur sujet avant de monter l'appareil. Suivant le bon shema de filerie de l'appareil et de ses accessoires, branchez l'alimentation de courant, la mise à la terre et les accessoires aux bornes correspondantes ou aux points de branchement en utilisant les pratiques d'usage.

Volume De La Boîte De Jonction		
KW	Pouces Carrés	CC
3.3 - 5	74.4	1219
7.5 - 10	198	3245
15.0 - 20	198	3245
25.0 - 50	341	5592

Les radiateurs peuvent être montés la propulsion d'air étant horizontale ou verticale en utilisant léquipement de montage des accessoires (en option) de la fabrique ou en utilisant de la visserie fournie par d'autres.

L'installation finie, replacez la porte d'accès.

Réglez le thermostat et l'interrupteur au point désiré puis mettez l'appareil en marche.

Verifiez si le fonctionnement du radiateur est correct.

MONTAGE AVEC PROPULSION D'AIR HORIZONTALE

Les supports de suspension à pivot peuvent être utilisés afin de suspendre les radiateurs au mur (Fig. 5) ou au plafond (Fig. 6).

Montez la base de soutien "A" au dessus du radiateur avec les quatres vis de $\frac{5}{16}$ x 18 et les rondelles d'arrêt (dans l'enveloppe).

Fixez le support de suspension principal "S" au mur ou au plafond à l'emplacement désiré en utilisant les tire-fonds "C" ou des pièces de fixation adéquates (fournies par d'autres).

Soulevez le radiateur, faites rentrer la tige "D" dans le trou du support de suspension principal et vissez l'écrou de blocage "E" (dans l'enveloppe) jusqu'à ce qu'il soit à deux tours d'être serré.

Faites pivoter le radiateur à la position désirée puis serrez l'écrou de blockage.

MONTAGE AVEC PROPULSION D'AIR VERTICALE

(Fig. 7)

Fixez les petites cornières "A" à l'arrière du radiateur avec quatre vis de $\frac{5}{16}$ x 18 "E", et les rondelles d'arrêt "F". S'assurer que l'aile perpendiculaire des cornières fait face au dessus et au dessous du radiateur.

Fixez les cadres en U "D" aux petites cornières avec quatre vis de $\frac{5}{16}$ x 18 "E", les rondelles "F", les rondelles d'arrêt "G" et les écrous "H".

Fixez les grandes cornières "J" aux cadres en U "D" avec quatre vis de $\frac{5}{10}$ x 18 "K", les rondelles "L", les rondelles d'arrêt "M" et les écrous "N".

Fixez le radiateur et son support monté au plafond, à l'emplacement désiré en utilisant un équipement assez robuste pour le supporter, fourni par le client.

NOTE: Lorsque vous montez le radiateur en utilisant des tiges filetées de $\frac{5}{16}$" (par d'autres), ne pas visser la tige de plus de ½" à l'intérieur du boîtier.

PRINCIPES DE FONCTIONNEMENT

Si le thermostat intégré du radiateur (en option) ou celui qui est installé sur le mur est excité, le moteur du ventilateur de l'appareil et les éléments de chauffage seront mis sous tension et le resteront jusqu'à ce que la température atteigne le réglage du thermostat; à ce moment, les éléments de chauffage seront mis hors tension. Le moteur du ventilateur continuera de tourner et dégagera ainsi la chaleur emmagasinée dans le boîtier jusqu'à ce que le réglage de dérogation du ventilateur soit atteint; dès lors, le moteur du ventilateur ne sera plus sous tension. Les appareils avec un interrupteur de ventilateur à deux vitesses installé à la fabrique (25 - 50 KW), seront expédiés avec les ventilateurs réglés sur la "petite" vitesse. Le client a le choix de les régler sur la "grande" vitesse. Pour les appareils disponibles avec des circuits séparés, le thermostat à deux réglages (en option) devra, quand on le fermera, mettre sous tension le moteur du ventilateur et l'élément de chauffage de première phase. Si la température continue de tomber, le thermostat mettra sous tension l'élément de chauffage de deuxième phase. Le courant des deux phases des éléments de chauffage sera coupé en séquence inverse lorsque la température s'élèvera jusqu'au réglage du thermostat. Le moteur du ventilateur continuera de tourner et dégagera ainsi la chaleur emmagasinée dans le boîtier jusqu'à ce que le réglage de dérogation du ventilateur soit atteint; dès lors, le moteur du ventilateur ne sera plus sous tension.

Le thermostat de stratification monté sur l'appareil mettra sous tension le moteur du ventilateur jusqu'à ce que la température s'élève au-dessus de son réglage. Lorsque le thermostat de stratification monté se ferme quand la température s'élève et qu'au même moment le thermostat mural se ferme aussi, le moteur du ventilateur et l'élément de chauffage seront mis sous tension immédiatement, comme décrit plus haut.

La limite maximum de sécurité du réenclenchement automatique coupera le courant alimentant les éléments de chauffage et les circuits de contrôle lorsque la température s'élèvera au-dessus du réglage de ce dispositif. La dérogation de sécurité du ventilateur devra mettre sous tension le moteur du ventilateur chaque fois que le réglage de ce dispositif est dépassé afin de dégager ainsi la chaleur emmagasinée dans le boîtier. Lorsque l'interrupteur du ventilateur est placé sur la position "MARCHE" (pour la saison d'été), le moteur du ventilateur sera alimenté.

NOTE: Le thermostat mural doit être réglé à la position "ARRET" durant ce type d'opérations (appareils munis de contacteurs).

Pour les thermostats équippés avec un interrupteur de ventilateur intégré, placez l'interrupteur à la position "CHALEUR" ou à la positoin "AUTO" afin de faire fonctionner le ventilateur et les élérments qui seront sous le contrôle du thermostat comme décrit plus haut. Lorsque l'interrupteur est placé à la position "ARRET", l'alimentation de courant de l'appareil devra être coupée. Lorsque l'interrupteur sera à la position "VENTILATEUR", l alimentation de courant des éléments sera coupée et le ventilateur sera immédiatement mis sous tension.

APPAREILS A PROPULSION D'AIR VERTICALE — MODELES

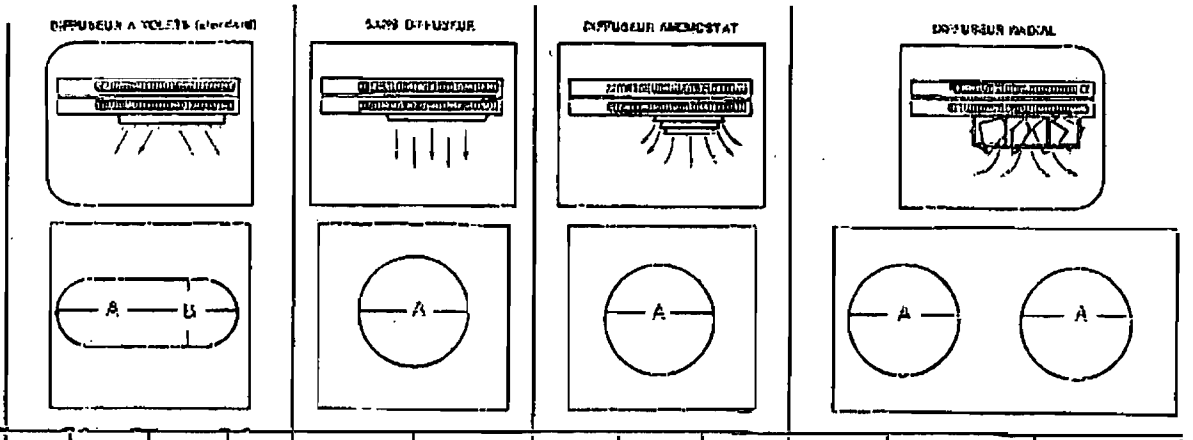
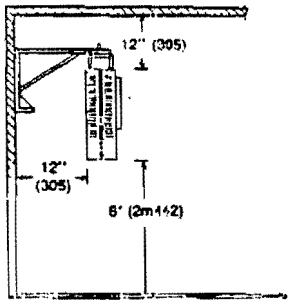


TABLE 1

USED ON	HAUT. MAX. MONT.	A	B	NO. DE STOCK	HAUT. MAX. MONT.	A	HAUT. MAX. MONT.	A	NO. DE STOCK	NO. DE STOCK	HAUT. MAX. DE MONTAGE 45°	OUVERT	A 45°	OUVERT
3.3 à 5.0 KW	2m747	6m105	3m052	STD	2m747	4m579	—	—	N/A	N/A	—	—	—	—
7.5 à 10.0 KW	3m663	12m211	6m716	STD	3m663	9m158	3m052	9m158	AD5120	RD5120	0	4m273	10m990	9m158
15.0 à 20.0 KW	5m495	15m874	9m158	STD	5m495	12m236	4m579	11m660	AD5120	RD5120	1m273	6m410	12m821	10m694
25.0 à 30.0 KW	6m716	22m896	12m821	STD	6m716	15m790	5m189	15m264	AD5150	RD5150	6m105	9m158	18m927	13m432
40.0 à 50.0 KW	7m326	25m643	14m348	STD	7m326	19m537	6m105	18m316	AD5150	RD5150	5m495	8m547	20m759	16m485

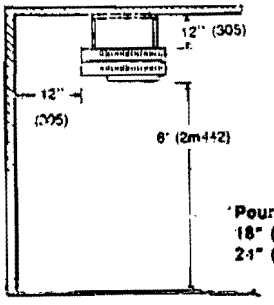
STD = Standard N/A = Not Appliquable

Les diffuseurs (en option) donnent une propulsion d'air supplémentaire aux installations à sortie d'air verticale. Voir les illustrations ci-dessus.



DISTANCES DE MONTAGE

Fig. 1
PROPULSION HORIZONTALE



*Pour 7.5-60 KW
18" (457) du plafond
24" (610) des murs

Fig. 2
PROPULSION VERTICALE

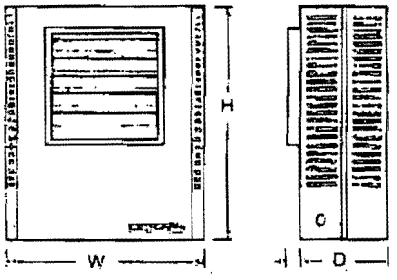


Fig. 3 DIMENSIONS

KW	H	W	D
3.3, 5.0	451	367	135
7.5, 10.0	618	546	165
15.0, 20.0	729	548	165
25.0, 50.0	894	743	258

Fig. 3A

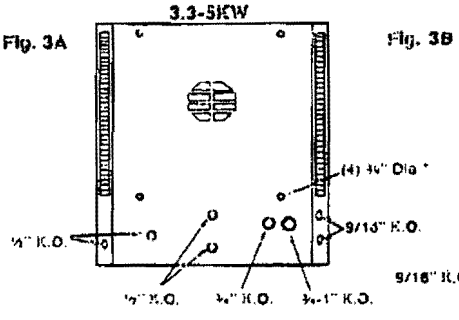


Fig. 3B

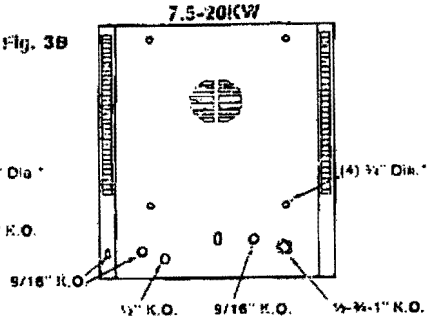
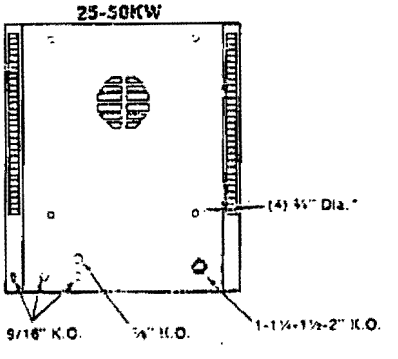


Fig. 3C



*Avec support de montage pour propulsion verticale.

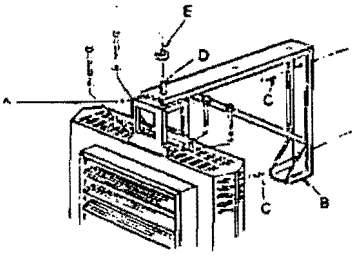


Fig. 5
MONTAGE AU MUR
PROPULSION HORIZONTALE

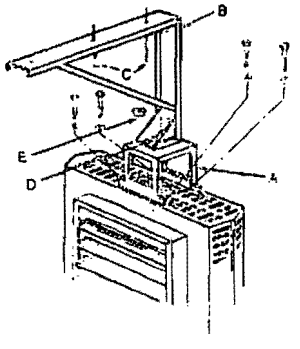


Fig. 6
MONTAGE AU PLAFOND
PROPULSION HORIZONTALE

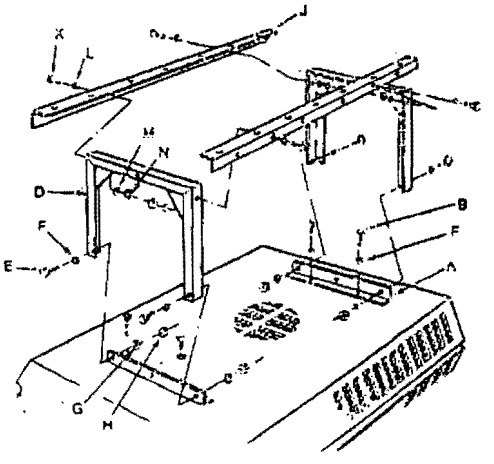


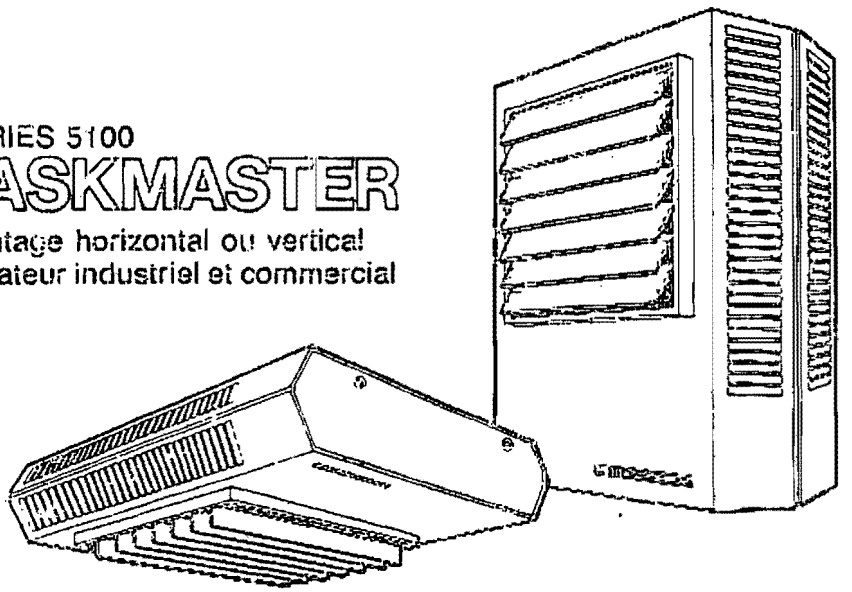
Fig. 7
MONTAGE AU PLAFOND
PROPULSION VERTICALE

TPI Corporation
(USA) JOHNSON CITY, TN 37602-4973

SERIES 5100

TASKMASTER

Montage horizontal ou vertical
radiateur industriel et commercial



INSTRUCTIONS D'INSTALLATION ET LISTE DE MATERIEL

ATTENTION: LISEZ LES INSTRUCTIONS SOIGNEUSEMENT AVANT DE COMMENCER L'INSTALLATION, LA MISE EN MARCHE OU L'ENTRETIEN DU RADIATEUR TASKMASTER. GARDEZ CES INSTRUCTIONS POUR UTILISATION ULTERIEURE.

CARACTERISTIQUES

Radiateur électrique avec ventilateur, disponible suivant les tensions standards de 208, 240/208, 277, 480 ou de 600 volts.

Dix puissances de chauffage standard de 3.3 KW/11,250 BTUH jusqu'à 50.0 KW/170,600 BTUH.

Les modèles unipolaires de 3.3 jusqu'à 10.0 KW de 208 et de 240/208 volts peuvent se transformer sur le chantier en modèle tripolaire. (les modèles unipolaires de 3.3, 5.0, 7.5 et 10 KW de 277 volts ne peuvent être transformés).

Le volet intérieur spécialement conçu permet au ventilateur d'appeler l'air uniformément à travers l'élément massif en acier.

Le diffuseur conçu vers l'extérieur et les volets montés dirigent plus encore uniformément la propulsion de l'air afin de répondre aux exigences spécifiques du montage horizontal ou vertical de l'appareil.

Supports de montage mur/plafond ou verticaux en option. (comme requis).

Quatre écrous soudés sont disposés au dessus et à l'arrière du boîtier pour le montage de l'appareil au chantier avec des tiges filetées ou des boulons avec chaîne. (visserie fournie par d'autres).

Diffuseur anémostat ou radial (en option), donnant une propultion d'air diversifiée lors du montage vertical de l'appareil.

Instruments de contrôle variés pour installation sur le chantier. Interrupteur, thermostat, interrupteur du ventilateur pour la saison estivale, thermostat pour récupération de chaleur. Tous ont leurs conducteurs équippés de serre-fils à laine. (à l'exception de l'interrupteur)

Tableau de branchement de la filerie de tous les instruments de contrôle intégrés, en un seul endroit.

Circuit de contrôle standard basse tension de 24 volts sur tous les modèles avec transformateur ou contracteur.

Boîte de contrôle spacieuse ayant une porte d'accès fermée à l'aide de deux attaches ¼ de tour pour rendre l'installation facile.

INSTRUCTIONS POUR UN EMPLACEMENT CORRECT

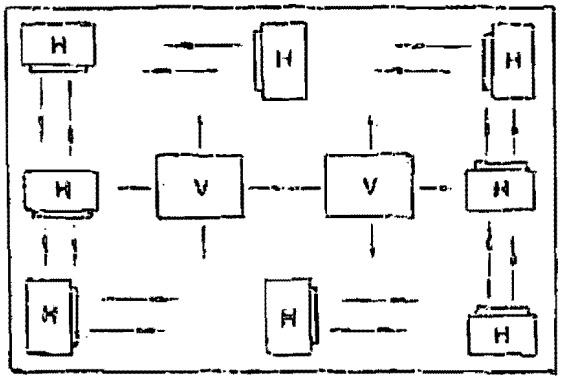
Une fois que la charge totale de chauffage est calculée, le nombre et la puissance des radiateurs doivent être déterminés. Un grand nombre de radiateurs à faible puissance donnent une répartition de chaleur uniforme; cette solution est recommandée lorsque la surface sera occupée par un nombre relativement élevé de personnel sédentaire, travaillant peut être sur des lignes de production ou sur des bancs.

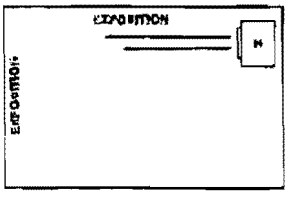
Un nombre élevé de radiateurs de plus faible puissance ont tendance à prévenir des courants d'air chauds, à réduire le niveau du bruit, et à augmenter la répartition de la charge afin d'aider à réduire la demande en électricité et les coûts d'opération.

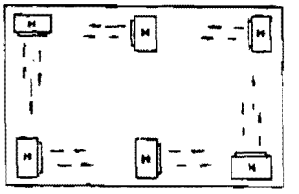
Dans les entrepôts où la répartition de la chaleur et une température constante sont moins importantes, un plus grand nombre de radiateurs à haute puissance peuvent être utilisés; dans bien des cas réduisant ainsi les coûts d'origine. Afin de maintenir une répartition de chaleur raisonnable et réduire de sévères stratifications même dans les endroits où le plafond est plus bas, le volume d'air total de tout l'espace doit passer à travers le radiateur à peu près trois fois par heure. (divisez par 20 le volume total en pieds cubes afin de déterminer le débit total en PCM des radiateurs).

Il est important que la tension nominale de l'équipement de chauffage soit la même que celle de l'alimentation de courant. La tension de courant en excès de la tension nominale du radiateur peut endommager l'équipement. La tension d'alimentation plus basse que celle de la tension nominale du radiateur diminuera la puissance de celui-ci et en même temps vous prendrez le risque d'endommager les pièces.

Les radiateurs horizontaux sont recommandés pour les endroits ou les plafonds sont bas (maximum de 15 à 18 pieds). Ces radiateurs devront être concentrés le long des murs donnant sur l'extérieur ou sur d'autres endroits où il y a de grandes pertes de chaleur, espacés afin d'obtenir un mouvement d'air circulaire, chaque radiateur acceptant l'air propulsé par l'autre. Des radiateurs verticaux supplémentaires propulsant l'air vers le bas avec des diffuseurs appropriés peuvent être installés pour contrebalancer les pertes de chaleur au plafond.







RENSEIGNEMENTS GENERAUX SUR LA SECURITE

ATTENTION:

Suivez tous les codes locaux d'électricité et sur la sécurité, NEC, OSHA et l'ACNOR.

Afin d'éviter les chocs électriques possibles, s'assurer que le courant électrique est coupé au niveau de l'interrupteur principal avant le filage ou l'entretien de l'appareil.

Si l'interrupteur de l'alimentation n'est pas intégré et si il n'est pas visible, verrouillez-le en position "ouvert" et étiquettez-le afin d'empêcher une fermeture de courant inattendue avant que l'on fasse l'entretien de l'appareil.

Quand l'appareil est installé il doit être électriquement mis à la terre en accord avec NEC, les ussages standards de l'industrie et l'ACNOR.

S'assurer que l'alimentation est conforme aux exigences de votre équipement. Voir la table 2 pour se renseigner sur le calibre du fil conducteur, l'intensité du circuit, etc.

Vérifiez la tension et l'ordre des phases du radiateur sur sa plaque de caractéristiques afin de s'assurer qu'ils sont les mêmes que ceux de l'alimentation électrique.

Les shémas de filerie des radiateurs et les connections de l'alimentation sont en permanence à l'intérieur de la porte d'accès du radiateur. Toutes les bornes sont marquées conformément avec le shéma de filerie. Le filage des accessoires est montré sur le shéma de filerie de l'appareil et sur la documentation le concernant.

Le radiateur doit être monté au moins à 8' au dessus du plancher afin d'empêcher un contact accidentel avec les ailettes du ventilateur pouvant occasionner des blessures. Installez l'appareil de façon à ce qu'il n'y ait aucune obstruction à l'entrée ou à la sortie. Maintenir les dimensions indiquées sur les tables 1 & 2, Fig. 1 & 2.

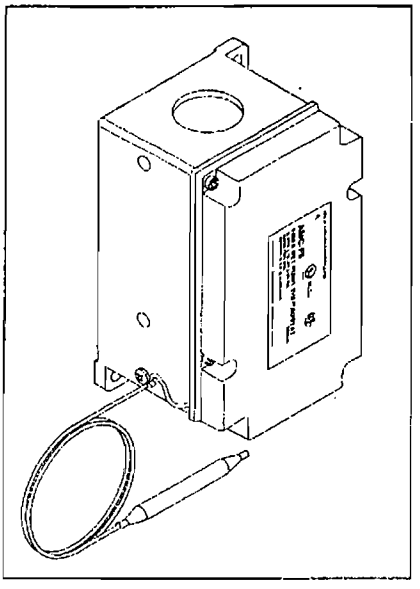
Le support de montage mur/plafond et les provisions pour l'ancrage doivent être assez résistants pour supporter le poids combiné du radiateur et du support.

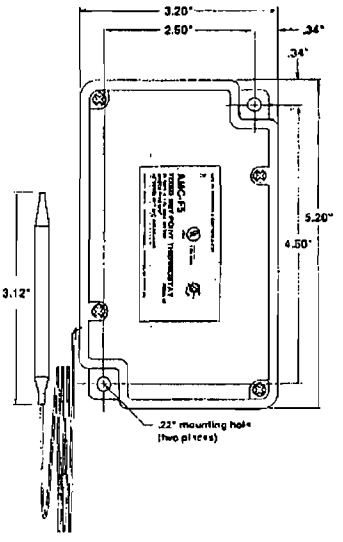
Raychem

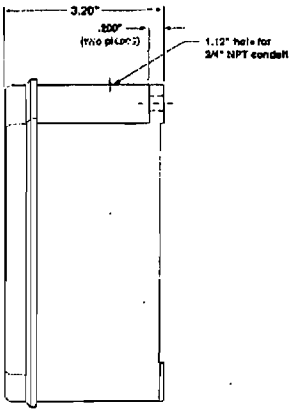
AMC-F5

Fixed Setpoint Thermostat 40°F (4.4°C) for Ordinary Areas

Installation Instructions







Description

The AMC-F5 thermostat is designed for controlling freeze protection heat-tracing circuits in ordinary areas. The thermostat has a fixed nonadjustable set point of 40°F (4.4°C) and can be used in an ambient-sensing mode (with capillary coiled) or a line-sensing mode, or it can be used to control a contactor coil.

Additional Materials Required

AT-180 aluminum tape (for line-sensing applications)
Wire nuts

Specifications

Enclosure:	NEMA 4X Lexan 940 plastic
Sensor exposure limits:	–30°F to 140°F (–34°C to 60°C)
Housing exposure limits:	–30°F to 140°F (–34°C to 60°C)
Switch:	SPST
Electrical rating:	22 A at 125/250/480 Vac
Accuracy:	±3°F (±1.7°C)
Deadband:	3°F to 9°F (1.7°C to 5°C) above actuation temperature
Set point:	40°F (4.4°C) non-adjustable
Set point repeatability:	±3°F (±1.7°C)

Sensor type:	Fluid-filled (silicone) bulb and 30-inch capillary
Sensor material:	Tin plated copper
Connection:	Wire nuts (customer supplied). 3/4" NPT conduit hub.

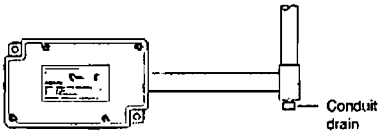
Approvals

Ordinary Areas

⚠ WARNING: This component is an electrical device. It must be installed correctly to ensure proper operation and to prevent shock or fire. Read these important warnings and carefully follow all the installation instructions.

Component approvals and performance are based on the use of specified parts only. Do not use substitute parts or vinyl electrical tape to make connections.

Installing the Thermostat

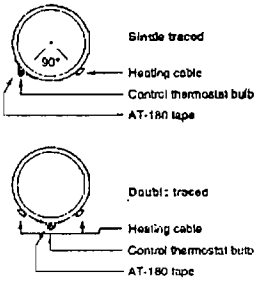


1. Verify that the thermostat is suitable for the area where it is to be installed.
2. Check the line voltage and the heat-tracing load to ensure that the thermostat ratings are not exceeded.
3. Mount the unit in a position that prevents condensation from draining into the enclosure from the connecting conduit, (see diagram at left).

Positioning (Ambient)

4. Mount ambient-sensing units in the area exposed to the coldest temperature and most wind. **Do not mount on the side of a warm building or in a location that is exposed to warm air currents or direct sunlight.**

Positioning the Sensor Bulb (Line Sensing)



5. Position the bulb in the lower quadrant of the pipe as shown in the diagrams to the left. **Place the bulb at least three feet from pipe supports, valves, or other heat sinks; protect the capillary from kinks or bends less than 1/2 inch in radius.**
6. Tape the bulb firmly to the pipe with AT-180 aluminum tape, making sure there is no air space between the bulb and pipe. **Do not overlap the bulb and heating cable with the same piece of AT-180 tape.**
7. For metal-tank-wall sensing, use the BCK-35 bulb clamp (purchased separately from Raychem) and install the clamp per the instructions provided. Make sure there is no air space between the tank wall and the bulb.

   For installation on plastic tanks, contact Chemelex at (800) 545-6258.

Wiring

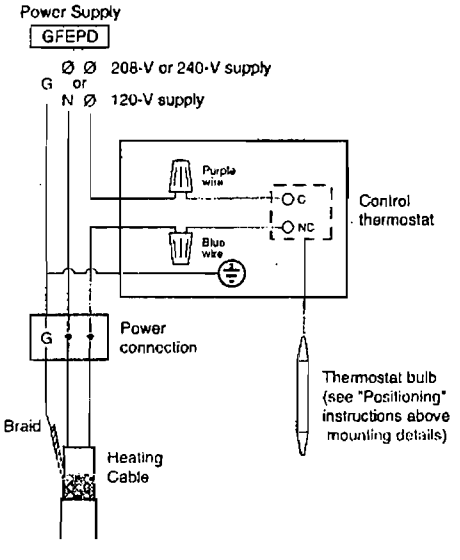


Figure 1. Heat-tracing control

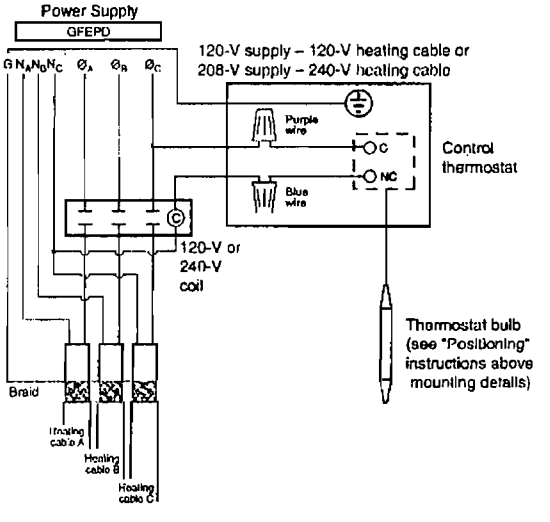


Figure 2. Contactor control

For switching heat-tracing loads greater than 22 A or switching multiple heat-tracing circuits.

Raychem Corporation
Chemelex Division
300 Constitution Drive
Menlo Park, CA 94025-1164
Tel (800) 545-6258
Fax (415) 361-6711

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Raychem

MATERIAL SAFETY DATA SHEET

Issue No: 6 | Effective Date: October 1994 | Serial No.: RAY/3122

PRODUCT IDENTIFICATION

THIS MSDS IS FURNISHED FOR A GROUP OF PRODUCTS WHICH HAVE SIMILAR PROPERTIES DURING NORMAL CONDITIONS OF USE, BUT WHICH MAY EMIT DISSIMILAR THERMAL DEGRADATION BYPRODUCTS IF OVERHEATED. FOR MORE SPECIFIC INFORMATION, PLEASE CALL (415) 361-4907.

Product Name: Thermofit Heat-Shrinkable Polymeric Products (excluding Solder Sleeves see separate MSDS)

Manufacturer: Raychem Corporation
300 Constitution Drive
Menlo Park, CA 94025

Chemical Name: Not applicable, mixture
CAS #: Not applicable, mixture
DOT Proper Shipping Name: Not regulated
DOT Identification No.: Not regulated
DOT Hazard Classification: Not regulated
TSCA Inventory Status: Exempt

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE or ACCIDENT
Call CHEMTREC - Day or Night - 1-800-424-9300 Toll free in the continental U.S., Hawaii, Puerto Rico, Canada, Alaska or Virgin Islands. For calls originating elsewhere: (202) 483-7616 (collect calls accepted)

For non-emergency health and safety information, call: (415) 361-4907

HAZARDOUS INGREDIENTS

Heat-Shrinkable Polymeric Products are not hazardous during proper installation, but may emit hazardous thermal decomposition and combustion byproducts if overheated to degradation. See "Thermal Degradation and Combustion Byproduct" section of this MSDS for more specific information. Base polymer materials include polyethylene and olefin copolymers, fluoropolymers, chloropolymers, polyamides, polyesters, and silicones. Heat-shrinkable products may be coated with or used in conjunction with adhesives/mastics which are based on olefin copolymers or polyamides.

PRODUCT APPLICATIONS

Typical uses of heat-shrinkable polymeric products include primary electrical insulation, EMI/RFI shielding, cable jacketing and repair, strain relief, component encapsulation, waterproofing, packaging, environmental/mechanical protection, and cable joining, splicing, and termination in commercial and military/aerospace electronic applications.

PHYSICAL PROPERTIES

Appearance and Odor: Plastic tubing and molded parts in a variety of shapes, sizes and colors. No odor.

Boiling Point: Not applicable

Vapor Pressure (mm Hg @ 20°C): Not applicable

Volatility (% by Volume): Not applicable

Vapor Density: Not applicable

Specific Gravity (Water=1): Not applicable

Evaporation Rate: Not applicable

Flash Point (°F)/Method: Not applicable

Solubility in Water (%): Insoluble

Flammable Limits in Air (volume %): Lower Not applicable Upper Not applicable

HEALTH HAZARD INFORMATION

Exposure Limits: There are no established exposure limits for polymer mixtures.

Health Effects/Symptoms of Exposure:

Proper installation of this product creates no known acute or chronic health hazards.

Acute (Short-Term Exposure):

Eye Contact:	Contact with molten material may cause thermal burns.
Skin Contact:	This product is not expected to be a skin irritant. Contact with the molten material may cause thermal burns. No harmful effects are expected from skin absorption of this product.
Ingestion (Swallowing):	Ingestion of this product is highly unlikely. There is insufficient information available on this material to predict the effects from ingestion.
Inhalation (Breathing):	In common with most organic materials, thermal degradation and combustion byproducts may be toxic and should not be inhaled. (See Comments below and the Thermal Degradation and Combustion Byproducts Section for more specific information.)

Chronic (Long-Term Exposure):

None of the ingredients to which users may be exposed and which are present at equal to or greater than 0.1% of the product, are listed by OSHA, NTP, or IARC as suspect carcinogens.

Comments: Overheating the product to charring or burning may produce vapors that may cause eye, skin, nose and throat irritation. Persons with pre-existing eye, skin, or respiratory disorders (e.g., asthma conditions) may be more susceptible to the effects of these vapors.

STORAGE, HANDLING, AND PREVENTATIVE MEASURES

Stability at room temperature: This product is stable under normal conditions.

Conditions to Avoid: Avoid overheating of product.

Incompatibilities (Materials to Avoid): None known.

Hazardous Polymerization: Will not occur. No known polymerization conditions to avoid.

Thermal Degradation and Combustion Byproducts: In common with most organic materials, degradation and combustion byproducts may be toxic and should not be inhaled. Thermal degradation is not significant at temperatures achieved during proper installation, as directed by product installation guides. At temperatures higher than those recommended for proper installation, most significantly if the product burns, the thermal degradation and combustion byproducts will depend on the base polymer used, and may include, but are not limited to, carbon monoxide, carbon dioxide, aldehydes, acetic acid, low molecular weight hydrocarbons, silicon dioxide, hydrogen chloride, hydrogen fluoride, hydrogen bromide, fluoro-olefins, and oxides of nitrogen, phosphorus, and sulfur.

Handling: Avoid any vapors given off if the product is heated to decomposition, as shown by a darkening and browning of the sleeve. Avoid contact with molten material. Heat-resistant gloves are required if hot products are handled after installation. Do not consume food, beverages or tobacco in the immediate work area. Wash hands before eating, drinking or smoking.

Other Precautions: Avoid heating products beyond temperatures required for normal installation. See installation instructions for proper installation procedures. If product chars or burns, immediately stop heating. Avoid inhaling any fumes which may be given off under such circumstances. Allow any vapors to disperse and ventilate before continuing

This information is supplied in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the California Safe Drinking Water and Toxics Enforcement Act of 1986 (California Health & Safety Code 25249.6). Users are advised that they may have additional disclosure obligations under other federal, state, and local laws. Users are advised to ensure that this information is brought to the attention of the employees, agents, or contractors handling this product. Distributors of this product are advised to forward this document, or the information contained herein, to their purchaser. Raychem makes no warranties as to its accuracy or completeness and disclaims any liability in connection with its use. Raychem's obligations shall be only as set forth in Raychem's standard terms and conditions of sale for this product and in no case will Raychem be liable for any incidental, indirect, or consequential damages arising out of the sale, resale, use or misuse of the product. Users of Raychem products should make their own evaluation to determine the suitability of each such product for the specific application and to establish safe handling and installation procedures.

Data Sheet Prepared By: Linda Massey, Corporate Toxicology Date: October 1994

Data Sheet Approved By: Yutaka Kawazoye, Thermofit Division Date: October 1994

Recommended safety practices

For Users and Installers of

INDUSTRIAL AND COMMERCIAL FANS

AMCA Publication 410-90

FOREWORD

This publication has been prepared by the Air Movement Division of the Air Movement and Control Association, Inc. (AMCA). The information contained in this publication has been derived from many sources. The suggestions made must of necessity be general in their meaning and cannot be applied literally to all specific situations or conditions.

The safety recommendations contained herein are intended to assist installers, maintainers or other users of air moving devices in the safe operation and use of the devices mentioned. These recommendations do not represent the only methods, procedures or devices appropriate for the situations discussed. Caution should be used at all times when working in or around moving parts and one must not rely solely upon the general cautionary instructions offered in this booklet. Your safety will depend upon your exercise of reasonable care and caution in the presence of moving parts.

AMCA disclaims any and all warranties, express or implied, regarding the products sold by the manufacturer with which this booklet has been provided. Further, AMCA recommends that competent personnel be consulted in deciding what is the preferred or recommended safety procedure in a particular instance where the guidelines contained in this booklet are unclear or in any way incomplete.

AMCA has offered the information within this booklet to assist in the safe operation, maintenance and use of the products sold by members of AMCA. In so doing, AMCA expressly disclaims liability for any injury or damage arising out of the operation or use of the product or the warnings or instructions contained herein.

These recommended safety practices were adopted by the AMCA membership on October 25, 1990.

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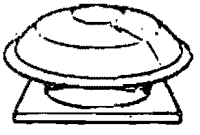
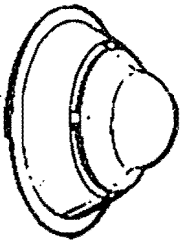
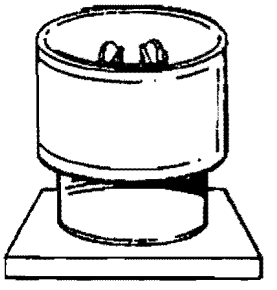


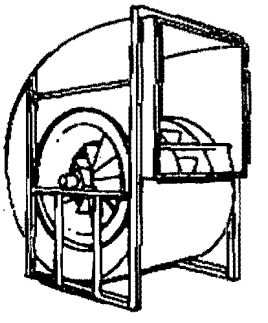
POWER ROOF VENTILATOR



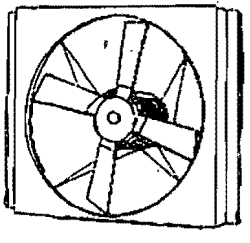
WALL EXHAUSTER



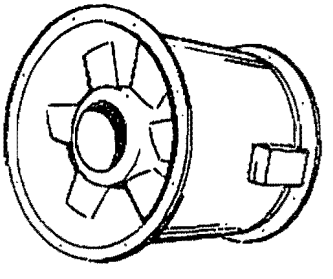
UPBLAST ROOF EXHAUSTER



CENTRIFUGAL FAN



PROPELLER FAN



AXIAL FAN

1. INTRODUCTION

Fans and other air moving devices are made in a wide variety of types, sizes and arrangements. This publication addresses the proper use and installation of industrial and larger commercial fans. It is not intended to address residential fans and small commercial fans.

Various "size" factors are important when assessing potential for injury; some factors are: diameter of impeller (wheel, rotor, propeller), rotational inertia, voltage and current.

This guide is intended to assist in the safe installation of air moving equipment and to warn operating and maintenance personnel of the commonly recognized hazards associated with this equipment.

Handling and installation should always be performed by experienced and trained personnel. In addition to following the manufacturer's installation instructions, care must be taken to ensure compliance with federal, state and local rules, regulations, codes and standards.

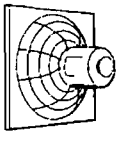
2. PERSONNEL SAFETY ACCESSORIES

Protective devices are incorporated as standard construction on some types of fans but on many fans, these devices are offered as optional accessories. This is done because the need for the devices and the design required will frequently depend upon the type of system, fan location and operating procedures being employed. The proper protective safety device to meet company standards, local codes, and the requirements of the Occupational Safety and Health Act must be determined by the user since safety requirements vary depending on the location and use of the equipment. If applicable local conditions, standards, codes or OSHA requirement require the addition of safety devices, the user should specify and obtain required protective safety devices from the fan manufacturer or others and should not allow the operation of the equipment without them. Examples of available guarding devices include the following:

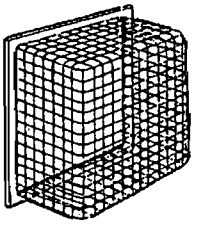
2.1 FAN GUARDS

All fans have moving parts which require guarding in the same way as other moving machinery. Fans located less than seven (7) feet above the floor require special consideration as specified in the Occupational Safety and Health Act. Local code requirements should be followed.

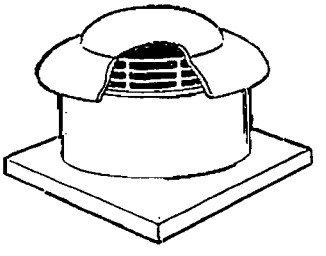
Roof mounted fans and other fans which are generally not accessible need not in all instances feature safety guards which might otherwise be appropriate. Where accessibility to these fans is occasional or infrequent, the expense of permanent guarding may be reduced through the use of lockout switches and suitable warnings. In such cases, maintenance personnel should engage the lockout switch before undertaking any maintenance or repairs. As in the case with other machinery involving moving parts, common sense and caution will preserve personal safety.



INDUSTRIAL TYPE GUARD
FOR PROPELLER FAN



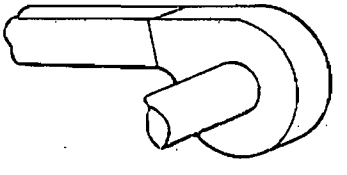
MAXIMUM SAFETY GUARD
FOR PROPELLER FAN



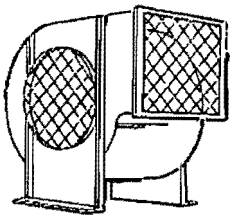
SCREEN ON ROOF VENTILATOR

2.2 INLET AND OUTLET GUARDS

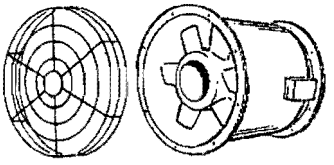
Axial and centrifugal fans are usually connected directly to ductwork which will prevent contact with the internal moving parts; when an exposed inlet or outlet represents a hazard, a suitable guard must be installed.



CENTRIFUGAL FAN PROTECTED BY DUCTWORK



INLET OR OUTLET GUARD
ON CENTRIFUGAL FAN

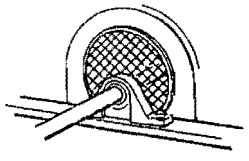


GUARD FOR AXIAL FAN
WITH NON-DUCTED INLET
OR OUTLET

2.3 DRIVE GUARDS

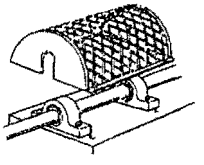
Fans may be driven directly from the motor shaft or through a belt drive. Where the bearing assembly, rotating shaft, sheaves, or belts are exposed a suitable guard may need to be provided. Some example guards are shown below.

DRIVE COUPLING GUARD



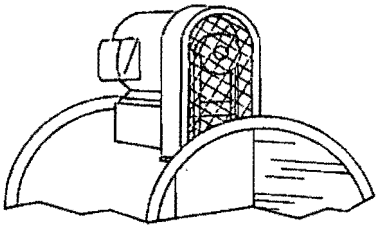
HEAT SLINGER GUARD

(Shaft and bearing guard omitted for clarity)



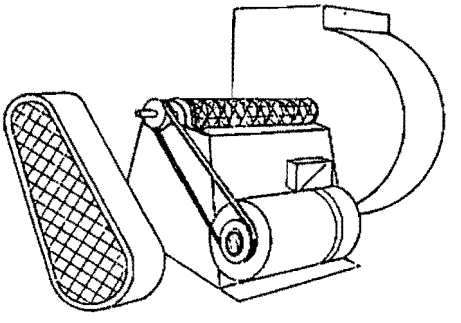
SHAFT AND BEARING GUARD

Drive guards may be required for tubular centrifugal or axial fans to cover the exposed drive sheave and belts outside the fan housing.



DRIVE GUARD - AXIAL FAN

A typical centrifugal fan drive guard may vary with the arrangement. Safety guards shall be used when drive systems are accessible to personnel. In restricted areas, omission of the back cover may be acceptable.

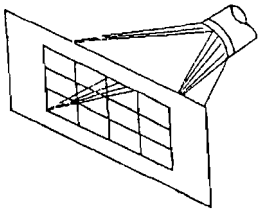


DRIVE GUARD - CENTRIFUGAL FAN

3. THE HIDDEN DANGER

In addition to the hazards of rotating machinery, fans present an additional potential hazard by virtue of their ability to draw in loose material. Solid objects passing through a fan represent potentially dangerous projectiles. Solid objects can cause fan failure by physically damaging the impeller blades.

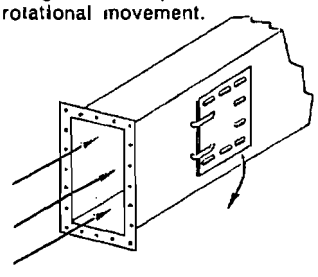
Whenever there is the possibility of solid objects being drawn into a remote intake, the intake shall be guarded at all times. In the event the guard is removed for any reason, the fan must be disconnected and locked out.



SPECIAL PURPOSE INTAKE SCREEN

Where fans are installed over an occupied area, safety guards should be provided to prevent dropped objects from entering this area during installation and maintenance.

Access doors to a fan or duct system should not be opened with the fan in operation or coasting to a stop. Power shall be locked out prior to access into a fan or ductwork. Even when locked out electrically, fans may cause injury or damage if the impeller is subject to "windmilling." The impeller should be secured to physically restrict rotational movement.



BOLTED ACCESS DOOR IN DUCT

On the downstream (or pressure) side of the system, releasing the door with the system in operation may result in an explosive opening. On the upstream (or suction) side the inflow may be sufficient to draw in tools and clothing, etc., and create a hazard.

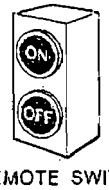
The stroboscopic effect of certain lights in combination with certain fan speeds may cause a rotating assembly to appear stopped.

4. ELECTRICAL ISOLATION

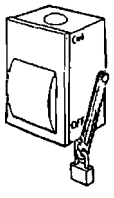
Every fan must be provided with a disconnect switch which will allow it to be isolated completely from the electrical supply.

Most roof-mounted fans and many others are started by remote switches or push-buttons, by interlocks with other equipment, or by automatic controls. In order to protect maintenance personnel from someone starting the equipment from a remote switch while maintenance is being performed, a disconnect switch should be provided close to the fan in order that the maintenance person can "positively" lock off the power when working on the fan.

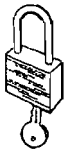
In some installations other equipment, such as gas burners, may be interlocked with the fan so that disconnecting the fan will automatically shut off the burner or other device. Maintenance on systems of this type should be performed only under the supervision of competent engineering personnel and in accordance with applicable codes and standards.



REMOTE SWITCH



DISCONNECT SWITCH



LOCK CARRIED BY
MAINTENANCE PERSONNEL

5. START-UP CHECK LIST

Before putting any fan into initial operation the manufacturer's instructions must be followed. In addition, the following check list must be completed.

1. Lock out the primary and all secondary power sources.
2. A complete inspection shall be made of all of the ductwork and the interior of the fan. Make certain there is no foreign material which can be drawn into or blown through the fan or ductwork. Eyes should be protected against undetected foreign material through the use of safety goggles or other appropriate means.
3. Make sure the foundation or mounting arrangement and the duct connections are adequately designed in accordance with recognized acceptable engineering practices and with the fan manufacturer's recommendations.
4. Check and tighten all hold-down (securing) bolts.
5. Check the fan assembly and bearings for proper grounding to prevent static electricity discharge.
6. Spin the impeller to determine whether it rotates freely and is not grossly out of balance.
7. Inspect impeller for proper rotation for the fan design.
8. Check all set screws and tighten, if necessary.
9. Check belt drive or coupling alignment; use recommended belt tension.
10. Check the belt drive for proper sheave selection and make sure they are not reversed (excessive speeds could develop).
11. Properly secure all safety guards.
12. Secure all access doors to the fan and ductwork.
13. Momentarily energize the fan to check the direction of rotation.
14. Switch on the electrical supply and allow the fan to reach full speed. Check carefully for:

    a) Excessive vibration
    b) Unusual noise
    c) Proper belt alignment
    d) Proper lubrication
    e) Proper amperage and voltage values.

    If any problem is indicated, SWITCH OFF IMMEDIATELY. Lock out the electrical supply, secure the fan impeller if there is a potential for windmilling, (impeller turning due to a draft through the system). Check carefully for the cause of the trouble and correct as necessary.

    Even if the fan appears to be operating satisfactorily, shut down after a brief period and recheck items 4 through 11 as the initial start up may have loosened the bolts and set screws.

The fan may now be put into operation but, during the first eight hours of running, it should be periodically observed and checked for excessive vibration and noise. At this time checks should also be made of motor input current and motor and bearing temperatures to ensure that they do not exceed manufacturer's recommendations.

After eight hours of satisfactory operation, the fan should be shut down to check the following items and adjust, if necessary (lock-out power).

1. All set screws and hold-down bolts
2. Drive coupling alignment
3. Belt drive alignment
4. Bearing housing temperature
5. Belt drive tension

After twenty-four hours of satisfactory operation the fan should be shut down (locked out) and the drive belt tension should be readjusted to recommended tension.

6. SPECIAL PURPOSE SYSTEMS

Fans which are used to move anything other than clean air at normal temperatures (up to 150°F) may require special precautions to ensure safe operation. Explosive or toxic fumes, vapors or gases, transported solids, high temperatures and corrosive contaminants will present special hazards which must be carefully considered. All applicable federal, state and local codes and industry standards shall be followed. The fan manufacturer's recommendations for the specific type of application shall be followed.

Where the system will handle explosive or flammable materials (i.e. dust, fumes, vapors or gases), fans of spark-resistant construction shall be used. AMCA Standard 99-0401 defines the industry's standard types of spark-resistant construction and shall be

consulted when specifying fans for this use.

When a fan is handling toxic or explosive materials--even in traces--care must be taken to ensure that they have not collected in areas which are accessible to workmen or other persons. Fumes or vapors can collect in "air trap" areas, particularly when a system is shut down.

Material-handling fans are specially designed to allow the fan to handle a specific type of material without excessive accumulation of material on the fan impeller. Fans handling corrosive gases or erosive materials must be checked periodically. If loss of material is evident, contact the manufacturer. To ensure satisfactory operation it is essential to observe the manufacturer's limitations concerning the type of material to be handled by the fan.

Fan ratings and maximum speed limits are based on the use of air at 70°F. At temperatures above the normal range (above 150°F) a reduction must be made in the maximum speed limit. Information on this reduction and on other precautions to be taken for high temperature applications should be obtained from the fan manufacturer. Personnel working near high temperature fans should be aware that coming in contact with the fan's housing or ductwork could result in serious burns. Gloves or other appropriate protective apparel should be worn whenever working in close contact with heated housings or ductwork.

Corrosive contaminants can be formed when moisture combines with an active airborne chemical. Fans subjected to corrosive attack will corrode but suitable protective coatings or material used in the fan construction can delay corrosion. Protected fans must be regularly inspected to ensure that the protection remains effective.

In outdoor installations where water can accumulate within the fan housing, provide for the installation of adequately sized drains.

7. WARNING SIGNS

A preventive maintenance program is an important aspect of an effective safety program. Investigate any changes to the fan. Refer to AMCA Publication 202, *Troubleshooting*, for a more detailed explanation of investigating procedures. Consult your manufacturer or other qualified consultant with questions concerning changes observed during periodic inspections.

7.1 EXCESSIVE VIBRATION

If excessive vibration is observed stop the fan until the cause is corrected. Check for material build-up on the impeller. Generally this will show up as material flaking off the fan impeller and causing an imbalance which may lead to fatigue failure of the impeller. Excessive vibration can also be caused by looseness in the drive train, misalignment or impeller damage. Contact the fan manufacturer for the maximum vibration level if it is not included in maintenance instructions.

7.2 NOISE

Changes to the sound level may indicate troubleshooting is needed. For information relative to sound developed by fans please refer to AMCA Publication 303, *Application of Sound Power Level Ratings for Fans.*

7.3 HIGH MOTOR TEMPERATURES

Check that cooling air to the motor has not been diverted or blocked by dirty guards or similar obstacles. Check the input amperage. An increase in amperage may indicate that some major change has been made in the system.

7.4 HIGH BEARING TEMPERATURES

This condition is usually caused by improper lubrication; this can be either "over," "under" or "unsuitable" lubrication. In every case if the cause of the trouble is not easily seen, experienced personnel must examine the equipment before it is put back in operation.

8. ROUTINE MAINTENANCE

Maintenance should always be performed by experienced and trained personnel. Do not attempt any maintenance on a fan unless the electrical supply has been locked out or tagged out and the impeller has been secured.

Under normal circumstances, handling clean air, the system should require cleaning only about once a year. However, the fan and system should be checked at regular intervals to detect any unusual accumulation.

The fan impeller should be specially checked for build-up of material or dirt which may cause an imbalance with resulting undue wear on bearings and belt drives. A regular maintenance program should be established as needed to prevent material build-up.

Periodic inspection of the rotating assembly must be made to detect any indication of weakening of the rotor because of corrosion, erosion, or metal fatigue.

INDEX

— INSTRUCTIONS —

TYPE 1A10-SERIES LIGHT DUTY LINE VOLTAGE HEATING-COOLING THERMOSTAT

READ ALL INSTRUCTIONS CAREFULLY, BEFORE INSTALLING OR OPERATING THIS THERMOSTAT
KEEP INSTRUCTION SHEET FOR FUTURE USE

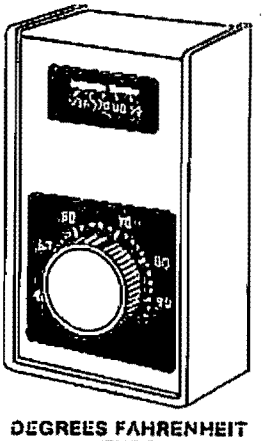
This Light Duty Line Voltage Heating-Cooling Thermostat is designed for controlling fan motors, circulator motors, contactors, motor starters, valves, etc. To provide greater room comfort, the thermostat is equipped with fixed anticipators.

Two dial stops are supplied, which may be used for making a maximum or minimum setting, a limited temperature range or a locked dial setting. (See parts package).

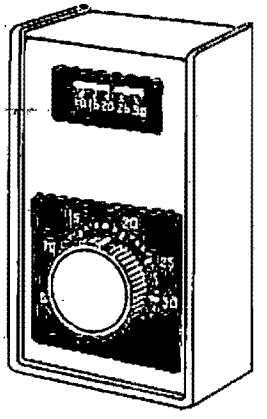
The thermostat may be converted to horizontal mounting by applying the adhesive backed horizontal dial over the vertical dial. (See dial package).

The temperature may be set anywhere between 36° and 90° F or 2° and 32° C by turning knob to the desired temperature on the dial.

Positive off or system selection can be obtained by using a switching sub-base.



DEGREES FAHRENHEIT TYPE



DEGREES CENTIGRADE TYPE

SPECIFICATIONS

Switch Action: S.P.D.T.
(Heating, open on rise)
(Cooling, close on rise)

Range: 36 to 90° F. or 2° to 32° C.

CAUTION **When thermostat is set below 40° F or 5° C, damage to the building and/or contents may result due to freezing. This is possible due to factory calibration tolerances, thermostat location and operating characteristics of the heating equipment.**

Contact Structure: Snap Switch

Electrical Rating:

Voltage (A.C.)	120v.	240v.	277v.
Full Load Amps.	8	4	4
Locked Rotor Amps.	48	24	24
Resistive Amps.	8	8	8
Pilot Duty	125 VA		

SELECTING LOCATION

The proper location of the room thermostat is most important to insure that it will provide a comfortable home temperature. Observe the following general rules when selecting a location:

1. Locate it about 5 ft. above the floor.
2. Install it on a partitioning wall, not on an outside wall.
3. Never expose it to direct light from lamps, sun, fireplaces or any temperature radiating equipment.
4. Avoid locations close to doors that lead outside, windows, or adjoining outside walls.
5. Avoid locations close to air registers, or in the direct path of air from them.
6. Make sure there are no pipes or duct work in that part of the wall chosen for the thermostat location.
7. Never locate it in a room that is warmer or cooler than the rest of the home, such as the kitchen.
8. Avoid location with lack of air circulation, such as behind doors or alcoves.
9. The living or dining room is normally a good location, provided there is no cooking range or refrigerator on opposite side of wall.

INSTALLATION

CAUTION **To prevent electrical shock and/or equipment damage, disconnect electric power to system, at main fuse or circuit breaker box, until installation is complete.**

The thermostat may be mounted in any standard 3" x 2" or 4" x 2" electrical outlet box. For ease of installation, use a deep type box. **USE COPPER CONDUCTORS ONLY.**

Installation should be made as follows:

1. Cut field just long enough to reach wiring terminals with thermostat held in palm of hand. (Appx. 6")
2. Strip field wires 1/2" and make connections to wiring terminals. Connect load (or loads) as shown on the diagram for your application. (See wiring)
3. Remove thermostat cover by grasping top and bottom of cover and pull straight out. Dress wiring into switch box and secure thermostat to outlet box with mounting screws.

   NOTE: DO NOT PUSH OR DAMAGE THE KNOB SENSING ELEMENT DURING INSTALLATION.
4. Install thermostat cover and turn knob to desired setting.

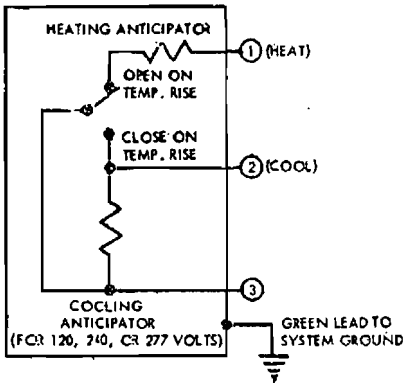
Printed in U.S.A.

PART No. 37-3911
Replaces 37-3655-1, 37-3657, 37-3842, 37-3867

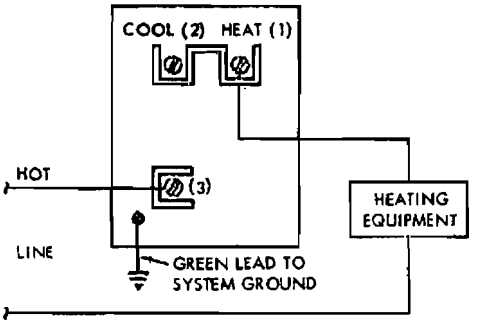
WIRING

NOTE: All wiring should be installed according to local and national electrical codes and ordinances.

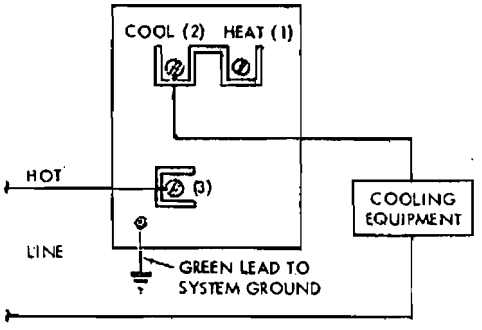
INTERNAL SCHEMATIC OF 1A10



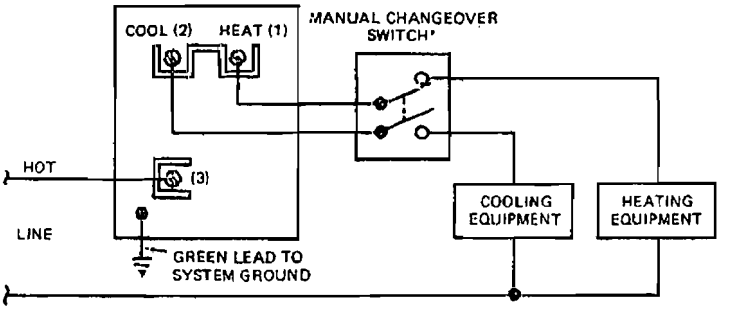
TYPICAL HOOK-UP FOR HEATING ONLY SYSTEM



TYPICAL HOOK-UP FOR COOLING ONLY SYSTEM

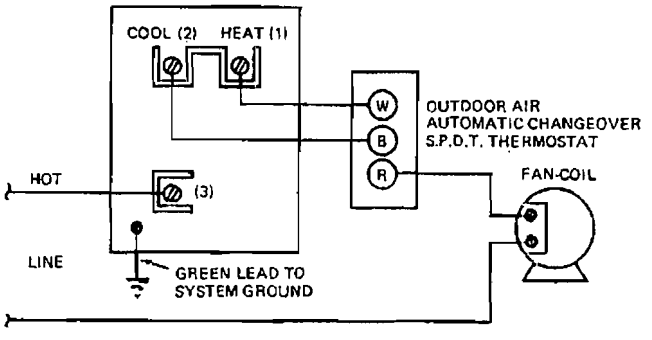


HEATING-COOLING SYSTEM USING A MANUAL CHANGEOVER SWITCH

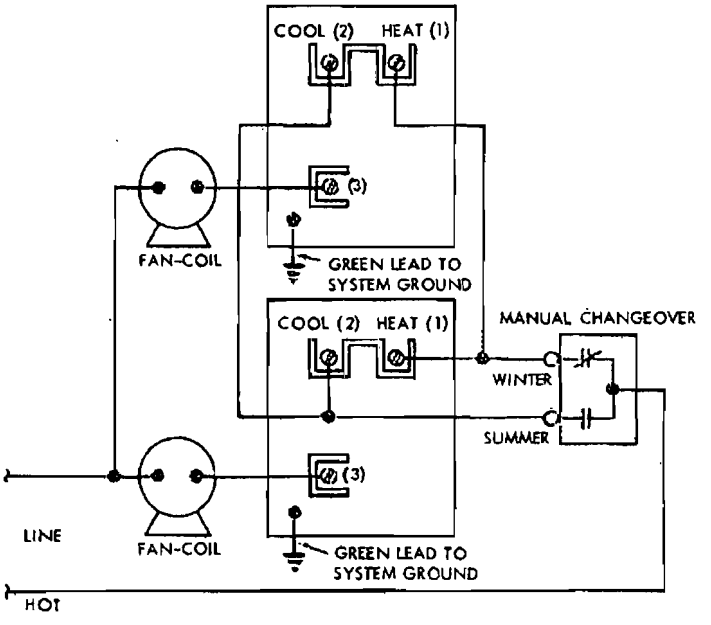


* POSITIVE OFF OR SYSTEM SELECTION CAN BE OBTAINED BY USING A SWITCHING SUB-BASE.

FAN COIL SYSTEM



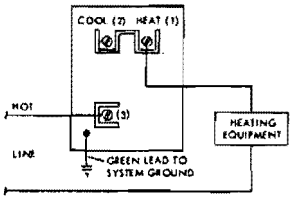
HEATING-COOLING FAN-COIL SYSTEM USING TWO OR MORE THERMOSTATS



WIRING

ıd according to local and national electrical codes and ordinances.

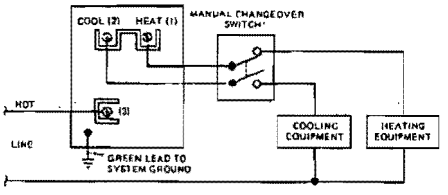
TYPICAL HOOK-UP FOR HEATING ONLY SYSTEM



EN LEAD TO TEM GROUND

LY SYSTEM

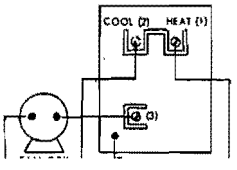
HEATING-COOLING SYSTEM USING A MANUAL CHANGEOVER SWITCH



* POSITIVE OFF OR SYSTEM SELECTION CAN BE OBTAINED BY USING A SWITCHING SUB-BASE.

HEATING-COOLING FAN-COIL SYSTEM USING TWO OR MORE THERMOSTATS

OOR AIR MATIC CHANGEOVER T. THERMOSTAT



FAN-COIL

LOCKED DIAL SETTING OR LIMITED SETTING STOPS

The enclosed stops may be used to provide "LOCKED DIAL SETTING" or "LIMITED SETTING". Instructions for installing the stops to perform either of these functions are given below.

NOTE: Once stops are installed, they cannot be removed.

CAUTION To prevent electrical shock and/or equipment damage, disconnect electric power to system, at main fuse or circuit breaker box, until installation is complete.

PACKAGE CONTAINS:

2 — stops

2 — pins

STOP PIN

INSTALLATION

MAXIMUM LIMIT DIAL SETTING — By installing one Stop, the maximum limit temperature may be set. (Example: Fig. A, Max. Limit Setting 78°F or 26°C)

1. From Figure "A" select the hole at the outer edge of the knob which corresponds to the maximum dial setting you desire.
2. Rotate knob counter-clockwise to lowest setting. Remove thermostat cover by grasping top and bottom and pull straight out.
3. Position stop under knob so the hole in the stop and selected hole in thermostat base are aligned. Insert pin into aligned holes, but do not push pin completely down. (Fig. "D")
4. Rotate knob clockwise to its newly selected maximum setting. With the thermostat cover in place, this should now be the maximum temperature setting you selected in step #1. If setting is incorrect, the stop is still removable and may be moved to another hole.
5. With stop installed in the correct hole, the pin can now be seated down on the stop by pushing with the blade of a screwdriver or gently tapping with a light object. **Use care not to hit the knob.** The stop is now installed and cannot be removed.

MINIMUM LIMIT DIAL SETTING — By installing one Stop, the minimum temperature may be set. (Example: Fig. B, Min. Limit Setting 69°F or 21°C)

1. From Figure "B" select the hole at the outer edge of the knob which corresponds to the minimum dial setting you desire.
2. Rotate knob clockwise to highest setting. Remove thermostat cover by grasping top and bottom and pull straight out.
3. Position stop under knob so the hole in the stop and selected hole in thermostat base are aligned. Insert pin into aligned holes but do not push pin completely down. (Fig. D)
4. Rotate knob counter-clockwise to its newly selected minimum setting. With the thermostat cover in place, this should now be the minimum temperature setting you selected in step #1. If setting is incorrect, the stop is still removable and may be moved to another hole.
5. With stop installed in the correct hole, the pin can now be seated down on the stop by pushing with the blade of a screwdriver or gently tapping with a light object. **Use care not to hit the knob.**

LOCKED DIAL SETTING — By installing two Stops, the Knob may be locked at a selected temperature (Fig. C).

1. Select the temperature setting at which the knob is to be locked and locate the corresponding hole in fig. "A" (Minimum 66°F or 19°C, Maximum 81°F or 27°C). Install the first stop as described in maximum limit dial setting section.
2. Rotate the knob clockwise until it hits the first stop. Install the second stop in the same manner in the second hole down from first stop. (Example: Fig. C Knob setting is locked at 72°F or 22°C and cannot be changed.)

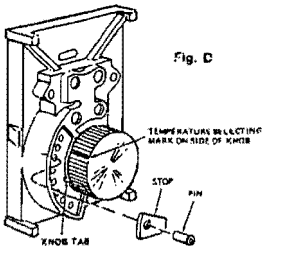


Fig. C

MAX. DIAL SETTING STOP

MIN. DIAL SETTING STOP

LOCKED DIAL SETTING

WESTON
MANAGERS DESIGNERS CONSULTANTS

Roy F. Weston, Inc.
Suite 400
3 Hawthorn Parkway
Vernon Hills, Illinois 60061-1450
847-918-4000 • Fax 847-918-4055

TO: MARY SPIVEY
EG&G MOUND

Recipient's Telecopy Telephone # 513-865-3835
Recipient's Telephone # 513-865-3709

FROM: BILL KARLOVITZ

847-918-4042
Originator's Telephone #

TOTAL PAGES: 3 (incl. cover sheet)

DATE: 19 DECEMBER 1996

W.O. #:

COMMENTS:

MARY, SPEC FOR WATER METER IS ATTACHED.

AIR RELEASE VALVE CAN BE OBTAINED FROM
APCO/VALVE & PRIMER CORP.
SCHAUMBURG, IL
847-524-9000
A 1/2" MODEL 50 SHOULD BE USED OR A COMBINATION AIR RELEASE AND VACUUM VALVE
LET ME KNOW IF YOU HAVE ANY OTHER QUESTIONS

RFW 04-02-009/A-04/94

Installation and Maintenance Instructions

CHEMCOCK & NEEDLE VALVES

INSTALLATION

Chemtrol Chemcock and Calibrated Needle Valves are available in the configurations shown at right. Since the needle is a globe design, flow must be in the direction indicated by the arrow. The Chemcock Valve is a ball design, therefore flow can be either direction. Listed is a summary of installation techniques.

Threaded Valves — Refer to the plastic thread joining instructions in the Chemtrol Thermoplastic Piping Technical Manual. Caution: Do not overtighten threads. Usually, one to two turns beyond hand tight, using a suitable strap-wrench if necessary, is sufficient. (ANSI B.20.1 defines hand tight as 4 to 4½ threads for sizes through 1".)

Hose End Valves — Slide a suitable clamp over the hose to be joined. Lubrication of the hose end with warm water may aid in assembly. Push the hose on and over all barbs and up to the wrench flats. Slide the clamp up and center over the largest barb. Tighten clamp, but **DO NOT OVERTIGHTEN.**

Adjustment — Valves are factory assembled and tested with no adjustment required.

MAINTENANCE

DISASSEMBLY & REASSEMBLY OF CHEMCOCK VALVE

To Disassemble:

1) Unscrew body halves using open end or adjustable wrench on flats provided.
2) Remove Phillips head screw.
3) Pull handle away from body.
4) Press stem/ball into valve body and remove from open end.

To Reassemble:

1) Check to make sure all ball seal "O"-rings are properly seated.
2) Insert stem/ball into stem boss from inside body with ball rotated to align port with waterway.
3) Screw body halves together, with body seal "O"-ring properly seated, using open end or adjustable wrench on flats provided.
4) Start stem "O"-ring seal over stem, then press into position as handle is pressed down over stem.
5) Insert and tighten Phillips head screw.

DISASSEMBLY & REASSEMBLY OF NEEDLE VALVE

To Disassemble:

1) Rotate knob to full open position.
2) Remove Phillips head screw.
3) Remove knob by counter-clockwise rotation, simultaneously, pull away from body.
4) Remove snap ring.
5) Grasp stem firmly and pull.

To Reassemble:

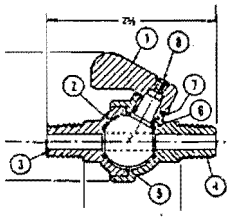
1) Insert stem into stem opening and press in to full-closed position.
2) Replace snap ring.
3) Pull stem back out to full-open position.
4) Replace knob such that flats are aligned.
5) Press down on knob and turn clockwise one full turn to properly engage threads on stem boss.
6) Insert and tighten Phillips head screw.
7) Rotate knob to full-closed and back to full-open to test for free rotation.

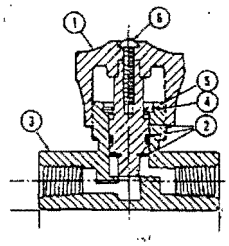
CHEMCOCK REPLACEMENT PARTS LIST

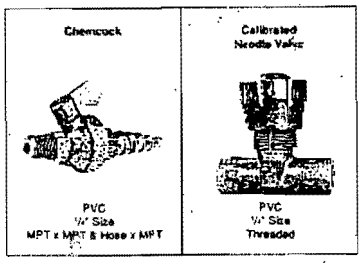
PART	MATERIAL
1. Handle	PVC
2. Ball/Stem	PVC
3. Body End — Hose or Thread	PVC
4. Body Half — Stem Side	PVC
5. "O"-Ring — Body Seal	FPM (Viton)
6. "O"-Ring — Ball Seals (2)	FPM (Viton)
7. "O"-Ring — Stem Seal	FPM (Viton)
8. Handle Screw	Cadimum Plated Steel

NEEDLE REPLACEMENT PARTS LIST

PART	MATERIAL
1. Adjustment Knob	PVC
2. Stem Assembly	PVC w/TFE Seat Seal & FPM Stem Seal
3. Body	PVC
4. Retainer Washer	PVC
5. Snap Ring	Stainless Steel
6. Screw	Stainless Steel







PRESSURE RATINGS OF CHEMTROL VALVES

The maximum pressure rating for Chemtrol valves, flanges, and unions, regardless of size, is 150 psi at 73°F. As with all other thermoplastic piping components, the maximum non-shock operating pressure is related to temperature. Above 100°F refer to the chart below.

Maximum Operating Pressure (psi) vs. Temperature

Operating Temperature (°F)	PVC	CPVC*	PP*	PVDF*
100	150	150	150	150
110	135	140	140	150
120	110	130	130	150
130	75	120	116	150
140	50	110	105	150
150	N.R.	100	93	140
160	N.R.	90	80	133
170	N.R.	80	70	125
180	N.R.	70	50	115
190	N.R.	60	N.R.	106
200	N.R.	50	N.R.	97
250	N.R.	N.R.	N.R.	50
280	N.R.	N.R.	N.R.	25

N.R. — Not Recommended
*Not available in valve styles shown on this page.

FOR SERVICE INFORMATION CALL (800) 343-5455 OR (502) 775-6431

To determine suitability of Chemtrol valves in your application, consult the Chemtrol Chemical Resistance Guide.

Do not use or test PVC Valves with compressed air or other gases. See Chemtrol Chem-Aire™ literature for information about a shatter-resistant thermoplastic piping system specifically designed for compressed air and other gases.

Angle and "Y" Pattern Valves — PVC

150 psi at 73°F water — non-shock

Installation and Maintenance Instructions

Angle & "Y" Pattern Valves

INSTALLATION

Threaded End Valves — Refer to the plastic thread joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Do not overtighten threads. Usually, one to two turns beyond hand tight, using a suitable strap-wrench if necessary, is sufficient. (ANSI B.20.1 defines hand tight as 4 to 4½ threads for sizes through 1".)**

Adjustment — Ordinarily, no adjustment to the valves is required because the Stem and Bonnet seals are "O"-ring energized. However, if a shaft leak should occur at either the Stem or Bonnet threads, make sure the Bonnet is fully seated by attempting to tighten by hand. Overtightening will serve no useful purpose. If a leak develops across the valve seat, do not attempt to overtighten the Handle/Stem. Serious damage to the valve may result. For any type of persistent leakage, the valve should be disassembled and inspected to determine the cause.

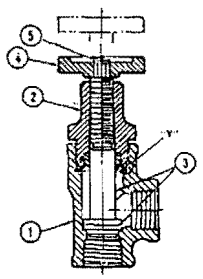
MAINTENANCE

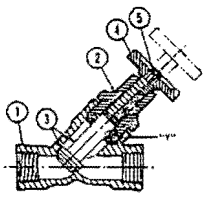
Should a valve need repair, refer to the drawing and proceed as follows:

1) Set Handle in open position.
2) Unscrew and remove Bonnet assembly.
3) Inspect and replace worn or damaged parts as necessary.
4) If necessary, the Stem and Stem Seal may be removed from the Bonnet by removing the Retainer Ring and Handle and screwing the Stem out the underside of the Bonnet.
5) Reassemble in the reverse order, and then with the Handle in the full open position, replace the top-works in the Body as follows:
   a) For ¼" size, slide the Body/Stem "O"-ring over the end of the Stem before installing the Bonnet assembly in the Body.
   b) For ⅜" and ½" sizes, momentarily stretch the Body-seal "O"-ring to approximately twice its diameter and then quickly place it over its retaining projection on the Back-up Washer. Hold the "O"-ring evenly in its retaining nest on the Washer with finger tips. When the "O"-ring has relaxed to grasp the shoulder projection, the Bonnet assembly may be assembled into the body with the "O"-ring clinging to the Back-up washer.
   c) For 1" size, place the Body-seal "O"-ring in its Body groove. Inspect to insure that it is fully contained by the groove before installing the Bonnet assembly.

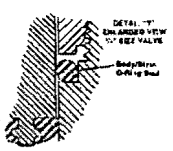
REPLACEMENT PARTS LIST

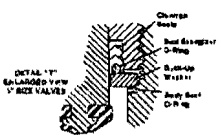
PART	MATERIAL
1. Body — Angle	PVC
or Y-Pattern	PVC
2. Bonnet	PVC
3. Stem Assembly	PVC w/TFE (Teflon) Seat
4. Handle	PVC
5. Retaining Ring	Cadmium Plated Steel
6. "O"-Ring - Body Seal	FPM (Viton)
7. Back-up Washer*	PVC
8. CV Seal — Stem Seal* (2)	TFE (Teflon)
9. "O"-Ring — Seal Energizer*	FPM (Viton)

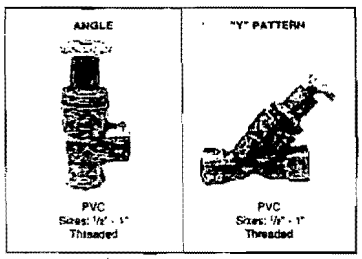




Size	Fluid Flow Coefficient For Valves	
	Y-PATTERN	ANGLE
	Cv	Cv
¼"	8.1	1.1
⅜"	17.7	5.4
½"	32.5	9.9
1"	48.3	15.8







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Operating Temperature (°F)	PVC	CPVC*	PP*	PVDF*
100	150	150	150	150
110	135	140	140	150
120	110	130	130	150
130	78	120	118	150
140	50	110	105	150
150	N.R.	100	93	140
160	N.R.	90	80	133
170	N.R.	80	70	125
180	N.R.	70	60	115
190	N.R.	60	N.R.	103
200	N.R.	50	N.R.	97
250	N.R.	N.R.	N.R.	50
280	N.R.	N.R.	N.R.	25

N.R. — Not Recommended
*Not available in valve styles shown on this page.

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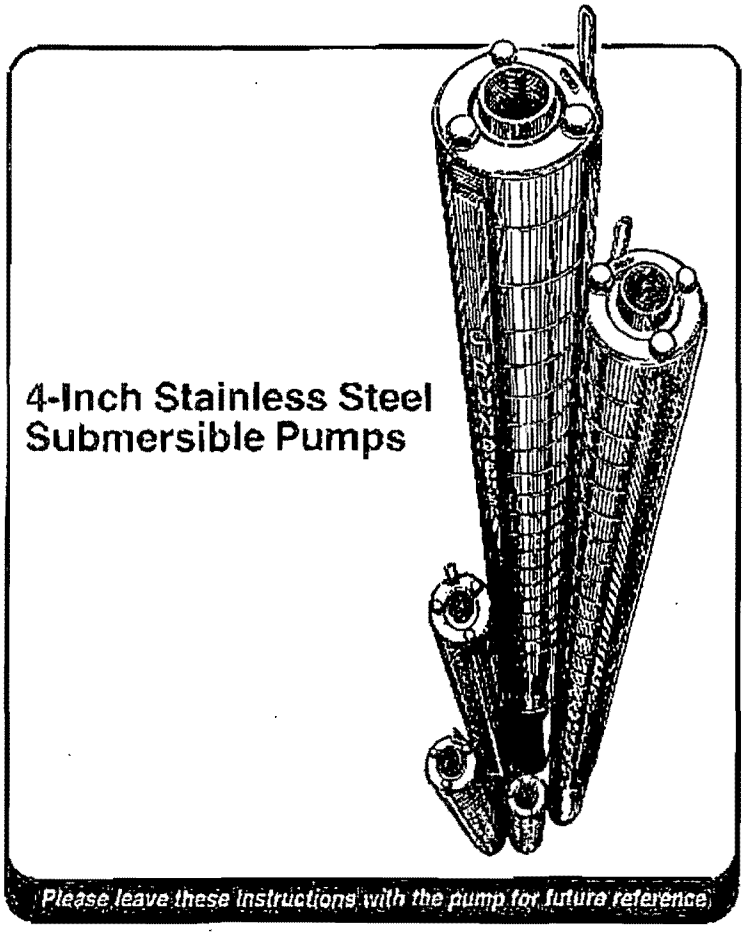
To determine suitability of Chemtrol valves in your application, consult the Chemtrol Chemical Resistance Guide.

Do not use or test PVC Valves with compressed air or other gases. See Chemtrol Chem-Aire™ literature for information about a shatter-resistant thermoplastic piping system specifically designed for compressed air and other gases.

TEFLON FITTED
BY
PUMPS OF OKLAHOMA
OKLAHOMA CITY
(405) 235-2695 • FAX (405) 235-9897

SP4 HB

Installation and Operating Instructions



4-Inch Stainless Steel Submersible Pumps

Please leave these instructions with the pump for future reference.

GRUNDFOS

SAFETY WARNING

Electrical Work

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

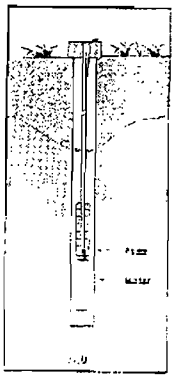
Pre-Installation Checklist

1. Well Preparation

If the pump is to be installed in a new well then the well should be fully developed and bailed or blown free of cuttings and sand. The stainless steel construction of the GRUNDFOS submersibles makes it resistant to abrasion; however, no pump made of any material can forever withstand the destructive wear that occurs when constantly pumping sandy water.
If this pump is used to replace an oil-filled submersible or oil-lubricated line-shaft turbine in an existing well, the well must be blown or bailed clear of oil.

2. Make Sure You Have the Right Pump

Determine the maximum depth of the well, and the drawdown level at the pump's maximum capacity. Pump selection and setting depth should be made based on this data.



3. Pumped Fluid Requirements

Submersible well pumps are designed for pumping clear, cold water; free of air or gases. Decreased pump performance and life expectancy can occur if the water is not clear, cold or contains air or gases. Water temperature should not exceed 102°F.

A check should be made to ensure that the installation depth of the pump will always be at least three feet below the maximum drawdown level of the well. The bottom of the motor should never be installed lower than the top the screen or within five feet of the well bottom.

Ensure that the requirement for minimum flow past the motor is met, as shown in the table below:

Minimum Water Flow Requirements for Franklin 4-Inch Submersible Pump Motors

Maximum Diameter	Casing or Sleeve I.D. in Inches	Min. GPM Flow Passing the Motor
4-Inch	4	1.2
	5	7
	6	13
	7	21
	8	30

NOTES:
a. For Franklin Motors Only: A flow inducer or sleeve must be used if the water enters the well above the motor or if there is insufficient water flow past the motor.
b. For Franklin Motors Only: The minimum water velocity over 4" motors is 0.25 feet per second.
c. Grundfos 4" submersible motors do not require a minimum flow or flow sleeve.

Pre-Installation Checklist

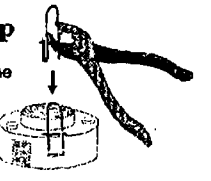
4. Splicing the Motor Cable

If the splice is carefully made, it will be as efficient as any other portion of the cable, and will be completely watertight. There are a number of cable splicing kits available today - epoxy filled, rubber-sealed and so on. Many perform well if the manufacturer's directions are followed carefully. If one of these kits is not used, we recommend the following method for splicing the motor cable:

Examine the motor cable and drop cable carefully for damage. Cut the motor leads off in a staggered manner. Cut the ends of the drop cable so that the ends match up with the motor leads. Be sure to match the colors. Strip back and trim off one-half inch of insulation from each lead, making sure to scrape the wire bare to obtain a good connection. Be careful not to damage the copper conductor when stripping off the insulation. Insert a properly sized Sta-Kon-type connector on each pair of leads, again making sure that colors are matched. Using Sta-Kon crimping pliers, indent the lugs. Be sure to squeeze down hard on the pliers, particularly when using large cable. Form a piece of electrical insulation putty tightly around each Sta-Kon. The putty should overlap on the insulation of the wire. Use a good quality tape such as ***#33 Scotch Waterproof or Plymouth Rubber Company Slipknot Grey.*** Wrap each wire and joint tightly for a distance of about 2½" inches on each side of the joint. Make a minimum of four passes over each joint and overlap each pass approximately one inch to assure a completely watertight seal.

Installation Procedures

1. Attach the Safety Hook to the Pump



Connect the safety hook to the pump using pliers to squeeze the sides of the hook so it fits into the slot in the pump.

2. Attach the Pump to the Pipe

A back-up wrench should be used when riser pipe is attached to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. Under no circumstances grip the body of the pump, cable guard or motor.
When tightened down, the threaded end of the first section of the riser pipe or the nipple must not come in contact with the check valve retainer in the discharge chamber of the pump. After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. Do not clamp the pump. When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only. It is recommended that plastic-type riser pipe be used only with the smaller domestic submersibles. The manufacturer or representative should be contacted to ensure the pipe type and physical characteristics are suitable for this use. Use the correct joint compound recommended by the specific pipe manufacturer. Besides making sure that joints are fastened, we recommend

(continued on next page)

the use of a torque arrestor when using plastic pipe.
Do not connect the first plastic riser section directly to the pump. Always attach a metallic nipple or adapter into the discharge chamber. The threaded end of the nipple or adapter must not come in contact with the check valve retainer in the discharge chamber when tightened down.

3. Lower the Pump Into the Well

Make sure the electrical cables are not cut or damaged in any way when the pump is being lowered in the well. Do not use the power cables to support the weight of the pump.

To protect against surface water entering the well and contaminating the water source, the well should be finished off above grade utilizing a locally approved well seal or pitless adaptor unit. We recommend that steel riser pipes always be used with the larger submersibles. A pipe thread compound should be used on all joints. Make sure that the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

The drop cable should be secured to the riser pipe at frequent intervals to prevent sagging, looping and possible cable damage. Nylon cable clips or waterproof tape may be used. The cable splice should be protected by securing it with clips or tape just above each joint.

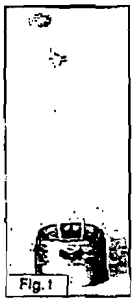


Fig.1


Fig.2

IMPORTANT: *Plastic pipe tends to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe. Leave three to four inches of slack between clips or taped points. This tendency for plastic pipe to stretch will also affect the calculation of the pump setting depth. As a general rule, you can estimate that plastic pipe will stretch to approximately 2% of its length. When plastic riser pipe is used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge chamber of GRUNDFOS 4-inch submersibles is designed to accommodate this cable.*

(See Figures 1 & 2)

Check Valves: A check valve should always be installed at the surface of the well and one at a max. of 25' above static water level. In addition, for installations deeper than 200 feet, check valves should be installed at no more than 200 foot intervals.

4. Electrical Connections

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

Verification of the electrical supply should be made to ensure the voltage, phase and frequency match that of the motor. Motor electrical data can be found on page 6. If voltage variations are larger than ± 10%, do not operate the pump. Single-phase motor control boxes should be connected as shown on the wiring diagram mounted on the inside cover of the control box supplied with the motor. The type of wire used between the pump control boxes should be approved for submersible pump application. The conductor insulation should be type RW, RUW, TW or equivalent.

A high-voltage surge arrestor should be used to protect the motor against lightning and switching surges. Lightning voltage surges in power lines are caused when lightning strikes somewhere in the area. Switching surges are caused by the opening and closing of switches on the main high-voltage distribution power lines.

The correct voltage-rated surge arrestor should be installed on the supply (line) side of the control box or starter (see Figure 3). The arrestor must be grounded in accordance with the National Electric Code and local governing regulations.

PUMPS SHOULD NEVER BE STARTED UNLESS THE PUMP IS TOTALLY SUBMERGED. SEVERE DAMAGE MAY BE CAUSED TO THE PUMP AND MOTOR IF THEY ARE RUN DRY.

The control box shall be permanently grounded in accordance with the National Electric Code and local governing codes or regulations. The ground wire should be a bare stranded copper conductor at least the same size as the drop cable wire size. Ground wire should be as short a distance as possible and securely fastened to a true grounding point. True grounding points are considered to be: a grounding rod driven into the water strata; steel well casing submerged into the water lower than the pump setting level; and steel discharge pipes without insulating couplings. If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel. Do not ground to a gas supply line. Connect the grounding wire to the ground point first, then to the terminal in the control box.

Single Phase Hookup

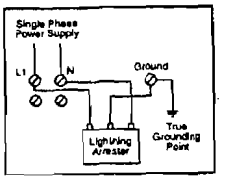


Fig.3

Installation Procedures

Single-Phase 2-Wire Wiring Diagram for Submersible Motors

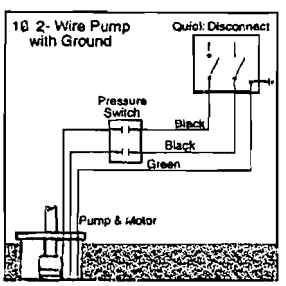


Fig.4

Three-Phase Wiring Diagram for Submersible Motors

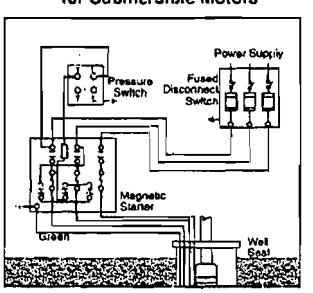


Fig.5

Single-Phase 3-Wire Control Box for Submersible Motors

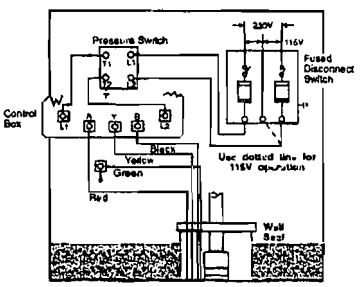


Fig.6

5. Starting the Pump for the First Time

A. Attach a temporary horizontal length of pipe to the riser pipe.
B. Install a gate valve and another short length of pipe to the temporary pipe.
C. Adjust the gate valve one-third of the way open.
D. Verify that the electrical connections are in accordance with the wiring diagram.
E. After proper rotation has been checked, start the pump and let it operate until the water runs clear of sand, silt and other impurities.
F. Slowly open the valve in small increments as the water clears until the valve is all the way open. The pump should not be stopped until the water runs clear.
G. If the water is clean and clear when the pump is first started, the valve should still be opened until it is all the way open.

Motor Information

GRUNDFOS 4 Inch (Two-Wire) Motors 60 Hz

Control Box Not Required

HP	Ph	VOLT	Ser. Fact.	Circ. Brk. or Stnd. Fuse	Dual Element Fuse	AMPERAGE Full Load	AMPERAGE Lock Rotor	AMPERAGE S.F. Amps	FULL LOAD Eff.	FULL LOAD Power Factor	Line-to-Line Resistance(Ohms) Black-Yel	Line-to-Line Resistance(Ohms) Red-Yel	KVA Code **	Max. Thrust (lbs)
											VOLTS			
SINGLE-PHASE														
1/3	1	230	1.75	15	5	3.0	25.5	4.4	47.3	63.0	6.8-8.2		S	750
1/2	1	230	1.60	15	7	4.3	34.5	5.9	50.6	64.7	5.2-6.3		R	750
3/4	1	230	1.50	20	9	6.6	40.5	8.0	57.0	70.0	3.2-3.8		N	750
1	1	230	1.40	25	12	8.0	47.4	9.6	59.8	74.3	2.5-3.1		M	750
1 1/2	1	230	1.30	35	15	10.6	60.8	13.1	64.3	77.2	1.9-2.3		L	750

Grundfos 4 Inch (Three-Wire*) Motors

SINGLE-PHASE														
1/3	1	230	1.75	15	5	3.0	14.0	4.4	47.0	63.0	6.8-8.3|1-7.3-21.1		L	750
1/2	1	230	1.60	15	7	4.3	20.0	5.9	50.7	64.6	4.7-5.71-5.8-19.6		L	750
3/4	1	230	1.50	20	9	6.6	30.8	8.0	57.3	70.0	3.2-3.91- 4-17.2		L	750
1	1	230	1.40	25	12	8.0	36.3	9.8	59.8	74.5	2.6-3.1-10.3-12.5		K	750
1 1/2	1	230	1.30	30	15	9.7	44.0	11.5	67.5	84.1	1.9-2.3 - 7.8-9.6		H	750
THREE-PHASE											Three Phase Overload Protection Starter Size	Three Phase Overload Protection Furnas Amb. Comp.	Line to Line Resist. (Ohms)	
2	3	230	1.25	20	10	6.0	12.8	7.5	73.0	86.8	0	K50	3.0	J 750
		460	1.25	10	5	3.0	19.0	3.8	73.0	86.6	0	K34	12.1	J 750
		575	1.25	10	4	2.4	15.2	3.0	73.0	86.8	0	K31	18.8	J 750
3	3	230	1.15	30	15	9.6	51.0	11.2	68.5	83.8	0	K54	2.2	H 1000
		460	1.15	15	7	4.8	25.5	5.6	68.5	83.8	0	K37	9.0	H 1000
		575	1.15	15	6	3.8	20.4	4.5	68.5	83.8	0	K36	13.0	H 1000
5	3	230	1.15	40	25	15.2	89	17.8	71.9	80.0	1	K81	1.2	H 1000
		460	1.15	20	12	7.6	45	8.9	71.9	80.0	0	K50	5.0	H 1000
		575	1.15	15	9	6.1	35	7.1	71.9	80.0	0	K43	7.3	H 1000

*All Grundfos 4" motors have a ground (green) wire.

Franklin Motors

(Refer to the Franklin Submersible Motors Application Maintenance Manual)

Motor Information

Maximum Cable Length
Motor Service to Entrance
(Length in feet)

SINGLE-PHASE 60 HZ

Motor Rating		Copper Wire Size								
VOLTS	HP	14	12	10	8	6	4	2	0	00
115	1/3	230	210	340	540	840	1300	2060	2910	
	1/2	190	160	250	390	620	960	1480	2160	
230	1/3	660	880	1390	2190	3400	5250	8360		
	1/2	480	650	1020	1610	2510	3880	6060		
	3/4	300	480	760	1200	1870	2890	4570	6470	
	1	250	400	630	990	1540	2380	3810	5360	6520
	1 1/2	190	310	480	770	1200	1870	2950	4280	5240
	2	160	250	395	620	970	1530	2350	3620	4480
	3	120	160	300	470	750	1100	1850	2860	3610
	5			240	280	450	710	1110	1740	2370

THREE-PHASE 60 HZ

VOLTS	HP	14	12	10	8	6	4	2
208	1 1/2	310	500	790	1260			
	2	240	350	610	970	1520		
	3	180	290	470	740	1160	1810	
	5	1170	280	4690	1080			4560
230	1 1/2	360	580	920	1450			
	2	280	450	700	1110	1740		
	3	210	340	540	860	1340	2080	
	5		200	320	510	800	1240	1900
460	1 1/2	1560						
	2	1380	2070					
	3	1060	1600	2520				
	5	590	950	1500	2360			
575	1 1/2	2620						
	2	1930						
	3	1680	2530					
	5	920	1480	2330				

FOOTNOTES:
1. If aluminum conductor is used, multiply lengths by 0.5. Maximum allowable length of aluminum is considerably shorter than copper wire of same size.
2. The portion of the total cable which is between the service entrance and a 3Ø motor starter should not exceed 25% of the total maximum length to ensure reliable starter operation. Single-phase control boxes may be connected at any point of the total cable length.
3. Cables #14 to #0000 are AWG sizes, and 250 to 300 are MCM sizes.

Troubleshooting

SUPPLY VOLTAGE

How to Measure
By means of a voltmeter, which has been set to the proper scale, measure the voltage at the control box. On single-phase units, measure between line and neutral.

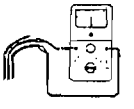
What it Means
When the motor is under load, the voltage should be within 10% of the nameplate voltage. Larger voltage variation may cause winding damage. Large variations in the voltage indicate a poor electrical supply and the pump should not be operated until these variations have been corrected.
If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage.

CURRENT MEASUREMENT

How to Measure
By use of an ammeter, set on the proper scale, measure the current on each power lead at the control box. See page 6, for motor amp draw information.
Current should be measured when the pump is operating at a constant discharge pressure with the motor fully loaded.

What it Means
If amp draw exceeds the listed service factor amps (SFA), check for the following:
1. Loose terminals in control box or possible cable defect. Check winding and insulation resistances.
2. Too high or low supply voltage.
3. Motor windings are shorted.
4. Pump is damaged causing a motor overload.

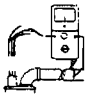
WINDING RESISTANCE



How to Measure
Turn off power and disconnect the drop cable leads in the control box. Using an ohmmeter, set scale selectors to Rx1 for values under 10 ohms and Rx10 for values over 10 ohms.
Zero-adjust the meter and measure the resistance between leads. Record the values. Motor resistance values can be found on page 6.

What it Means
If all the ohm values are normal, and the cable colors are correct, the windings are not damaged. If any one ohm value is less than normal, the motor may be shorted. If any one ohm value is greater than normal, there is a poor cable connection or joint. The windings or cable may also be open.
If some of the ohm values are greater than normal and some less, the drop cable leads are mixed. To verify lead colors, see resistance values on page 6.

INSULATION RESISTANCE



How to Measure
Turn off power and disconnect the drop cable leads in the control box. Using an ohm or mega ohmmeter, set the scale selector to Rx100k and zero-adjust the meter. Measure the resistance between the lead and ground(discharge pipe or well casing,if steel).

What it Means
For ohm values, refer to table below. Motors of all Hp, voltage, phase and cycle duties have the same value of insulation resistance.

OHM VALUE	MEGOHM VALUE	CONDITION OF MOTOR AND LEADS
		Motor not yet installed:
2,000,000(or more)	2.0	New Motor
1,000,000(or more)	1.0	Used motor which can be reinstalled in the well.
		Motor in well (Ohm readings are for drop cable plus motor):
500,000-1,000,000	0.5-1.0	A motor in reasonably good condition.
20,000-500,000	0.02-0.5	A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.
10,000-20,000	0.01-0.02	A motor which definitely has been damaged or with damaged cable. The pump should be pulled and repairs made to the cable or the motor replaced. The motor will still operate, but probably not for long.
less than 10,000	0-0.01	A motor which has failed or with complete loss of cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will not run.

Troubleshooting

Pump Won't Start

Possible Cause	Check This By . . .	Correct This By . . .
No power at the motor	Check for voltage at the control box or panel.	If there is no voltage at the control panel, check the feeder panel for tripped circuits and open loose circuits.
Fuses are blown or the circuit breakers have tripped.	Turn off line power and remove the fuses. Check for continuity with an ohmmeter.	Replace the blown fuses or reset the circuit breaker. If the new fuses blow or the circuit breaker trips, the electrical installation, motor, and wires must be checked for defects.
(3-phase motors only) Motor starter overloads are burned or have tripped	Check for voltage on the line and load side of the starter. Check the amp draw and make sure the heater is sized correctly.	Replace any burned heaters or reset. Inspect the starter for other damage. If the heater trips again, check the supply voltage. Ensure that heaters are sized correctly and the trip setting is appropriately adjusted.
(3-phase motors only) Starter does not energize	Energize the control circuit and check for voltage at the holding coil.	If there is no voltage, check the control circuit fuses. If there is voltage, check the holding coil for weak connections. Ensure that the holding coil is designed to operate with the available control voltage. Replace the coil if defects are found.
Defective controls	Check all safety and pressure switches for defects. Inspect the contacts in control devices.	Replace worn or defective parts or controls.
Motor or cable is defective	Turn off the power and disconnect the motor leads from the control box. Measure the lead-to-lead resistance with an ohmmeter (set to R x 1). Measure the lead-to-ground values with an ohmmeter (set to R x 100K).	If an open or grounded winding is found, remove the motor from the well and recheck the measurements with the lead separated from the motor. Repair or replace the motor or cable.
(1-phase motors only) Defective capacitor	Turn off the power and discharge the capacitor by shorting the leads together. Check it with an analog ohmmeter (set to R x 100K).	When the meter is connected to the capacitor, the needle should jump toward 0 (zero) ohms and slowly drift back to infinity (∞). Replace capacitor if it is defective.
Defective pressure switch or the tubing to it is plugged.	Watch the pressure gauges as the pressure switch operates. Remove the tubing and blow through it.	Replace as necessary.
The pump is mechanically bound or stuck	Turn off the power and manually rotate the pump shaft. Also check the motor shaft rotation, the shaft height, and the motor's amp draw (to see if it indicates a locked rotor).	If the pump shaft doesn't rotate, remove the pump and examine it. If necessary, disassemble it and check the impellers and seal for obstruction. Check for motor corrosion.

Pump Does Not Produce Enough Flow (GPM)

Possible Cause	Check This By . . .	Correct This By . . .
(3-phase motors only) Shaft is turning in the wrong direction.	Check to make sure the electrical connections in the control panel are correct.	Correct the wiring. For single phase motors, check the wiring diagram on the motor. For three phase motors, simply switch any two power leads.
Pump is operating at the wrong speed (too slow)	Check for low voltage and phase imbalance	Replace defective parts or contact power company, as applicable.
Check valve is stuck (or installed backwards)	Remove the check valve.	Re-install or replace.
Parts or fittings in the pump are worn or Impellers or Inlet Strainer is clogged	Install a pressure gauge near the discharge port, start the pump, and gradually close the discharge valve. Read the pressure at shutoff. (Do not allow the pump to operate for an extended period at shutoff.)	Convert the PSI you read on the gauge to Feet of Head by: PSI x 2.31 (SPGR) = _____ ft. Specific Gravity Add to this number the number of feet (vertically) from the gauge down to the water's pumping level. Refer to the pump curve for the model you are working with to determine the shutoff head is should expect for that model. If that head is close to the figure you came up with (above), the pump is probably OK. If not, remove the pump and inspect impellers, chambers, etc.
The water level in the well may be too low to supply the flow desired or Collapsed well	Check the drawdown in the well while the pump is operating.	If the pumping water level (including drawdown) is not AT LEAST 3 FEET above the pump's inlet strainer, either: 1. Lower the pump further down the well 2. Throttle back the discharge valve to decrease the flow, thereby reducing drawdown.
Broken shaft or coupling	Pull pump and inspect	Replace as necessary.
There are leaks in the fittings or piping	Pull the pump out of the well.	The suction pipe, valves, and fittings must be made tight. Repair any leaks and retighten all loose fittings.

Troubleshooting

Fuses Blow or Heaters Trip

Possible Cause	Check This By . . .	Correct This By . . .
Improper voltage	Check the voltage at the control box or panel.	If the voltage varies by more than 10% (+ or -), contact the power company.
	If the incoming voltage is OK, check the wire size and the distance between the pump motor and the pump control panel.	Replace with correct gauge. Undersized wire and a great distance between the control panel and the pump motor increases resistance and decreases the voltage by the time it reaches the pump motor.
The starter overloads are set too low.	Cycle the pump and measure the amperage.	Increase the heater size or adjust the trip setting. Do not, however, exceed the recommended range.
(3-phase motors only) The three-phase current is imbalanced.	Check the current draw on each lead to the motor.	The current draw on each lead must be within 5% of eachother (+ or -). If they are not, check the wiring.
The wiring or connections are faulty.	Check to make sure the wiring is correct and there are no loose terminals.	Tighten any loose terminals and replace any damaged wire.
(1-phase motors only) Capacitor is defective	Turn off the power and discharge the capacitor. Check the capacitor with an ohmmeter (set at R x 100K). See page 15 for instructions.	When the meter is connected to the capacitor, the needle should jump towards 0 (zero) ohms and then slowly drift back to infinity (∞). Replace the capacitor if it is defective.
Fuse, heater, or starter are the wrong size	Check the fuses and heaters against the motor manufacturer's specification charts.	Replace as necessary.
The control box location is too hot	Touch the box with your bare hand during the hottest part of the day – you should be able to keep your hand on it without burning.	Shade, ventilate, or move the control box so its environment does not exceed 120°F.
(1-phase motors only) Wrong control box	Check requirements for the motor against the control box specifications.	Replace as necessary.
Defective pressure switch	Watch gauges as pressure switch operates	Replace as necessary.
The motor is shorted or grounded.	Turn off the power and disconnect the wiring. Measure the lead-to-lead resistance with an ohmmeter (set to R x 1). Measure the lead-to-ground resistance with an ohmmeter (set to R x 100K) or a megaohmmeter. Compare these measurements to the rated values for your motor.	If you find an open or grounded winding, remove the motor and recheck the leads. If OK, check the leads for continuity and for bad splice.
Poor motor cooling	Find the internal diameter of the well casing (or sleeve, if used). For proper cooling, the flow of water must not be less than the GPM shown across the bottom scale on page ___.	Throttle up the pump flow (GPM) as power cooling is possible or Pull the pump out of the well and add a sleeve with a smaller internal diameter.

Pump Cycles Too Often

Possible Cause	Check This By . . .	Correct This By . . .
The pressure switch is defective or is not properly adjusted.	Check the pressure setting on the switch. Check the voltage across closed contacts.	Readjust the pressure switch or replace it if defective.
The tank is too small	Check the tank size and amount of air in the tank. The tank volume should be approximately 10 gallons for each Gallon-Per-Minute of pump capacity. At the pump cut-in pressure, the tank should be about 2/3 filled with air.	Replace the tank with one that is the correct size.
There is insufficient air charging of the tank or piping is leaking.	Pump air into the tank or diaphragm chamber. Check the diaphragm for leaks. Check the tank and piping for leaks with soapy water. Check the air-to-water ratio in the tank.	Repair as necessary.
Plugged snifter valve or bleed orifice (causing pressure tank to be waterlogged)	Examine them for dirt or erosion.	Repair or replace as necessary.
Leak in the pressure tank or piping.	Apply soapy water to pipes and tank, then watch for bubbles, indicating leaks.	Repair or replace as necessary.
The level control is defective or is not properly set.	Check the setting and operation of the level control.	Readjust the level control setting (according to the manufacturer's instructions) or replace it if defective.
Pump is oversized for the application. It is outpumping the yield of the well and pumping itself dry.	Check the yield of the well (determined by the well-test) against the pump's performance curve	Reduce the flow by throttling back the valve. or Change the pump

LIMITED WARRANTY

Products manufactured by GRUNDFOS are warranted to the original user only to be free of defects in material and workmanship for a period of 18 months from date of installation, but not more than 24 months from date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS factory or authorized service station, any product of GRUNDFOS manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of GRUNDFOS products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact GRUNDFOS or an authorized service station for instructions. Any defective product to be returned to GRUNDFOS or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

MANUFACTURER WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

GRUNDFOS®

"Leaders in Pump Technology"

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Regional Centers: Allentown, PA · Atlanta, GA · Chicago, IL · Seattle, WA · Dallas, TX
Phone: (800) 333-1366 · **Fax:** (800) 333-1363
Canada: Mississauga, Ontario · **Mexico:** Apodaca, N.L.

L-SP-TL-048 | Rev. 4/94
PRINTED IN USA

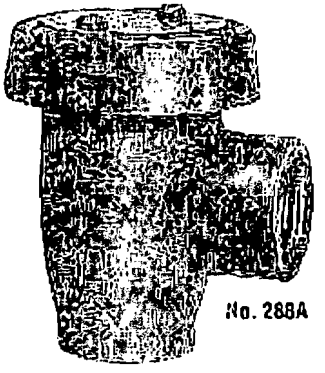
"ATTN. INSTALLER: After installation, please leave this instruction sheet for occupant's information."

IMPORTANT: Inquire with governing authorities for local installation requirements.

Series 288A
Antisiphon Vacuum Breaker

Available Models:

188A - ½" - 2" designed for irrigation systems
288A - ¼" - 3" designed for potable water systems
N388 - ¼" and ⅜" designed for fixture use



No. 288A

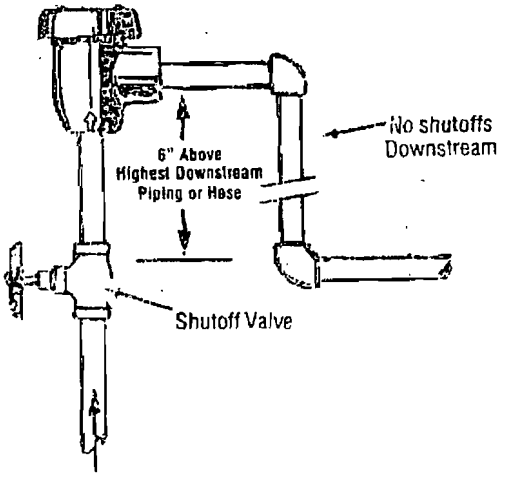
No. N388SC

Options:

Suffix
C - polished chrome finish
SC - satin chrome finish
Max. Temp: 180°F at 125 psi working pressure

Installation:

1. Install six (6) inches above the highest point of downstream piping or hose.
2. Use only with non-continuous pressure (pressurized a maximum of 12 out of 24 hours.)
3. No downstream shutoffs are allowed.
4. Device can spill water, install where spillage is not objectionable.



Repair Kits:

Description	Size	EDP No.
RK 188-288-388 T	¼" - ⅜"	887170
RK 188-288-388 T	½"	887171
RK 188-288-388 T	¾"	887172
RK 188-288-388 T	1" - 1¼"	887173
RK 188-288-388 T	1½"	887174
RK 188-288-388 T	2"	887175
RK 288A T	2½" - 3"	887176

Total Repair kit includes: **Bonnet gasket, Disc & Disc float.**

CONSUMER WARNING

The State of California has enacted a law known as Proposition 65 which requires consumer notification when there is a possibility of exposure to certain chemicals that affect health. Specifically, lead is present in brass and bronze plumbing fittings and in some of the solder used to install copper pipes. You may be exposed to minute quantities of this chemical through the normal use of your plumbing system.

WARNING: This product contains a chemical known to the state of California to cause birth defects or other reproductive harm.

ASSE Standard 1001 | Listed by IAPMO | CSA Certified

A LEADER IN VALVE TECHNOLOGY

WATTS REGULATOR

Since 1874 — Watts Industries, Inc.

Water Products Division • Safety & Control Valves
815 Chestnut Street, North Andover, MA 01845-6098 USA
Tel. (508) 688-1811 Fax: (508) 794-1848
Watts Industries (Canada) Inc.
Tel. (905) 851-8591 Fax: (905) 851-8788
Watts Industries (Europe) BV Fax: +31-8338-54192
Watts Ocean BV Fax: +31-8338-52073

"Quality Pumps Since 1939"

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.

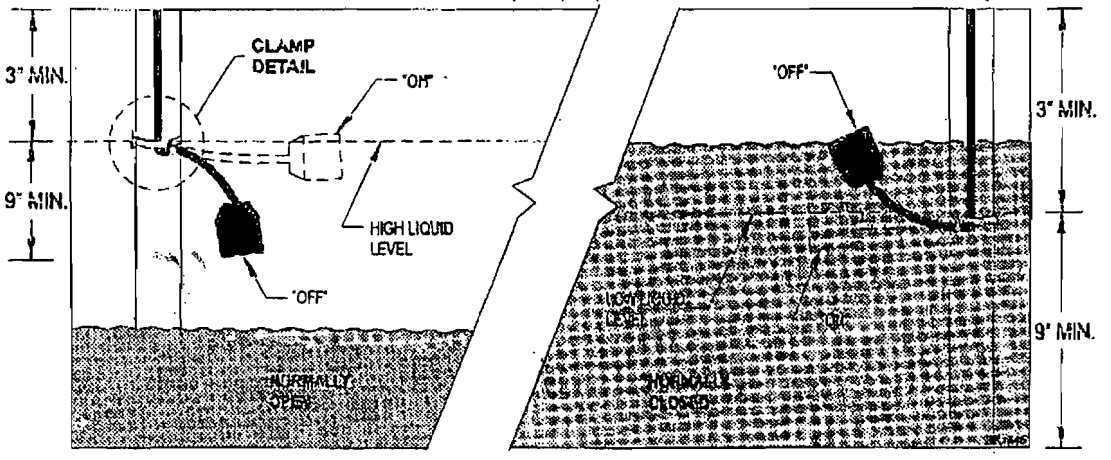
ZOELLER PUMP CO.

MAIL TO: P.O. BOX 16347 • Louisville, KY 40256-0347
SHIP TO: 3649 Cane Run Road • Louisville, KY 40211-1961
(502) 778-2731 • 1 (800) 928-PUMP • FAX (502) 774-3624

SECTION: 6.10.090
FM0419
1295
Supersedes
0995

INSTALLATION INSTRUCTIONS FOR VARIABLE LEVEL CONTROL SWITCHES

NOTE: Switch not for use for direct "on/off" pump operation. Must be used with control panel.



INSTALLATION INSTRUCTIONS

WARNING: To avoid electrical shock always disconnect power supply before handling or making adjustments to the variable control switch.

CAUTION:
All installation of controls, protection devices and wiring should be done by a qualified licensed electrician. All electrical and safety codes should be followed in addition to the most recent National Electric Code and the Occupational Safety and Health Act (OSHA).

1. Determine your "on" level. (See illustration above) For pump down (NORMALLY OPEN) application: The variable level control switch closes (turns on) when the float tips a few degrees above the horizontal position and opens(turns off) when the float drops a few degrees below the horizontal position. This mode is regularly used on pump applications.

   For pump up (NORMALLY CLOSED) application: The variable level control switch closes (turns on) when the float drops a few degrees below the horizontal position and opens (turns off) when the float tips a few degrees above the horizontal position. This mode is used to maintain a specific fluid level in a container when pumping from another source. (i.e. stock watering tank)

2. If cable weights are not being used strap variable level control switch to discharge pipe or similar mounting at determined on-off level. (See sketch #1) NOTE: Be sure float is positioned so that it will not be restricted in its movement by any item in the pit. The strap clamp should be a minimum of 3' from any top restriction (pit cover) or 9" from any bottom restriction (floor, pump, etc.).

3. If cable weights are used, adjust tether as shown in sketch. (See sketch #2)

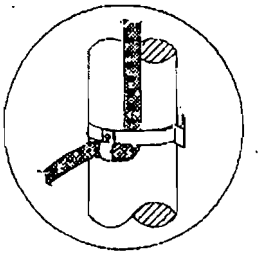
NOTICE: Do not adjust "OFF" level below discharge on pump.
Use Control Switch in panel controlled pump applications only.

CABLE WEIGHT (See Sketch #2)

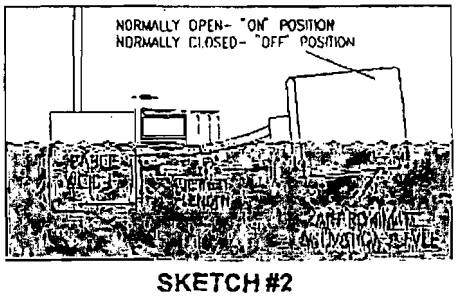
1. Lay cable in weight channel.
2. Align clip with weight groove and slide towards cable.
3. Snap clip snugly up to cable, manually moving clip to the tightest possible position.
4. Wire cable leads directly into control device.
5. Suspend unit at desired activation level.

CLAMP DETAIL

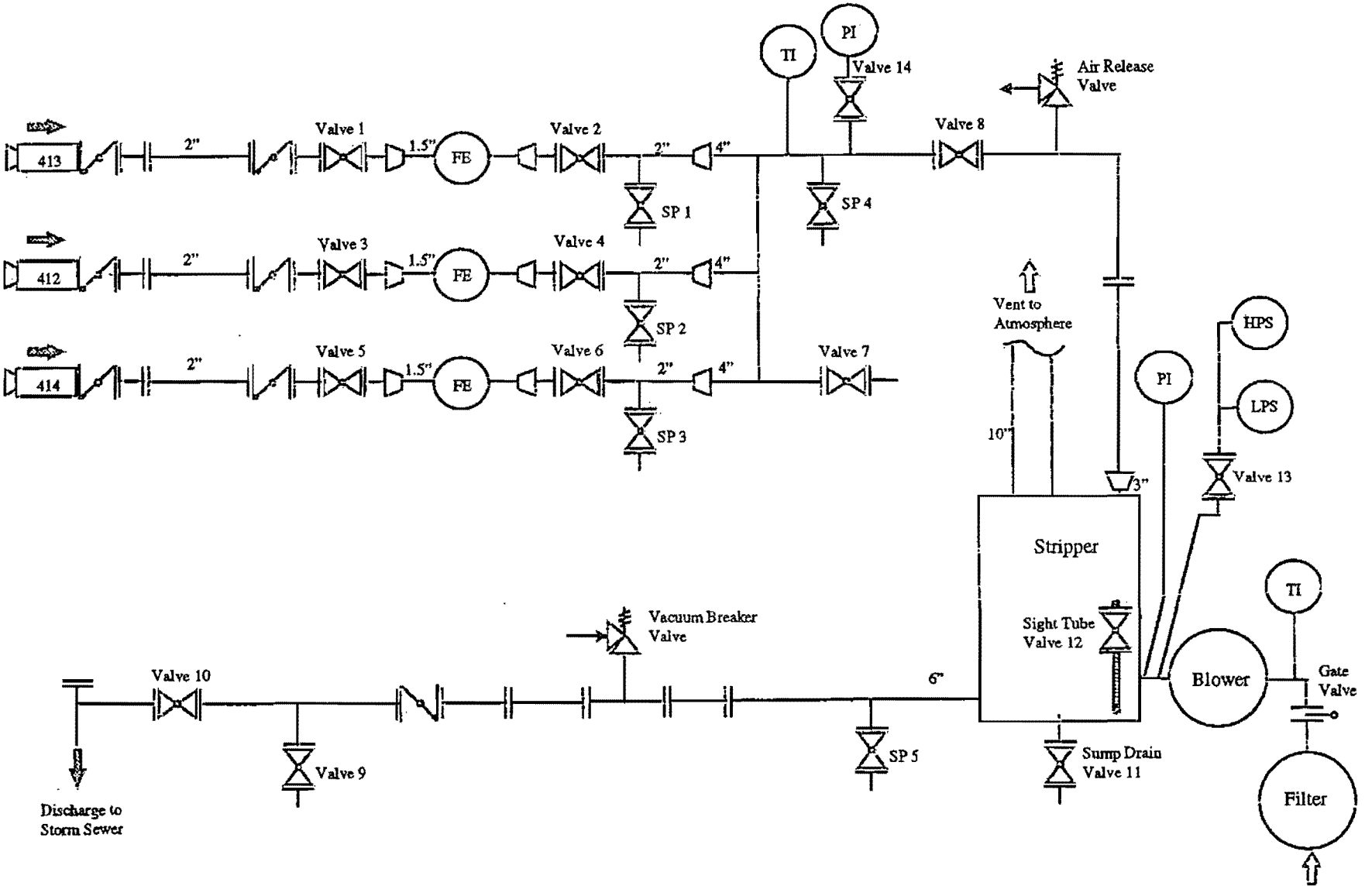
(Tether Length non-adjustable)



SKETCH #1



SKETCH #2


413
412
414
2"
Valve 1
1.5"
FE
Valve 2
4"
TI
PI
Valve 14
Air Release Valve
Valve 8
SP 1
SP 4
Valve 3
Valve 4
SP 2
Valve 5
Valve 6
Valve 7
SP 3
Vent to Atmosphere
HPS
LPS
10"
3"
Valve 13
Stripper
Sight Tube Valve 12
Vacuum Breaker Valve
Valve 10
6"
Blower
Gate Valve
Valve 9
SP 5
Sump Drain Valve 11
Filter
Discharge to Storm Sewer

Appendix B

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APPENDIX C

SAMPLING AND ANALYSIS PLAN

1. OBJECTIVES

The first objective of the Sampling and Analysis Plan (SAP) is to provide evidence during operation of the RA that the groundwater pump-and-treat system is attaining capture of the contaminant plume as intended. This SAP will describe how the capture will be verified. If capture is verified, the operation of the system is deemed a success.

A second objective is to obtain information that will allow fine tuning of the pumping rates throughout the RA so that groundwater extraction is rapid enough to capture the plume, but not so rapid as to waste valuable groundwater.

A third objective is to provide evidence that the stripper protectively removes all contaminants of concern to acceptable levels before discharge.

2. APPROACHES

For short-term assessment of capture, the groundwater analysis relies on hydraulic measurements, namely on the measurement of water levels in the monitoring wells and piezometers. For long-term assessment, the groundwater analysis relies on the measurement of the groundwater's contaminant levels. The hydraulic and chemical measurements are complementary, because the hydraulic measurements are immediate but indirect evidence of capture, while the chemical measurements are delayed but definitive proof of success.

The measurement of hydraulic characteristics will provide timely short-term feedback on the success of the system. By regularly interpreting the feedback, the system's operators will be able to diagnose the functioning of the system. The feedback will be readily

interpreted in real time because the pump-and-treat system is designed to produce a measurable inward gradient across the south and west compliance boundaries. Apparent hydraulic control is necessary, but is not sufficient to prove capture of the plume because contaminant transport might somehow occur despite the apparent hydraulic control.

The measurement of chemical characteristics will provide the definitive long-term feedback on the operation of the system. Downgradient monitoring wells currently exhibiting contamination should gradually exhibit diminished concentrations as the pump-and-treat system's operation progresses, since the system will cut off the plume from its source.

3. METHODS

3.1 Groundwater Hydraulic Measurements

A network of 16 control points (piezometers and monitoring wells) will be established. (See attached Figure C.1, *Groundwater Monitoring Network for Head.*) The points are W415, W416, W417, W418, W419, 0155, 0410, 0305, 0352, P006, 0308, 0306, P005, P003, P001, and 0313. In plan view, the network will straddle the compliance boundary on the west and on the south. In profile view, all the wells and piezometers will be screened in the Buried Valley Aquifer. Figure C.2 illustrates a typical well in profile view. Most of the wells and piezometers composing the network were existing, but five new monitoring wells (designated on Figure C.1 as the W-series) were newly constructed. The network will allow a potentiometric surface to be calculated near the compliance boundaries. The potentiometric surface will be examined to determine whether groundwater flows eastward across the western boundary and northward across the southern boundary.

Two of the existing wells 0155 and 0306 were abandoned during construction of the OU4 - Miami-Erie Canal Drainage Diversion project. Upon completion of the installation of the culvert for this project, these two wells were reinstalled as part of OU-1.

Figure 1. Groundwater Monitoring Network for Head

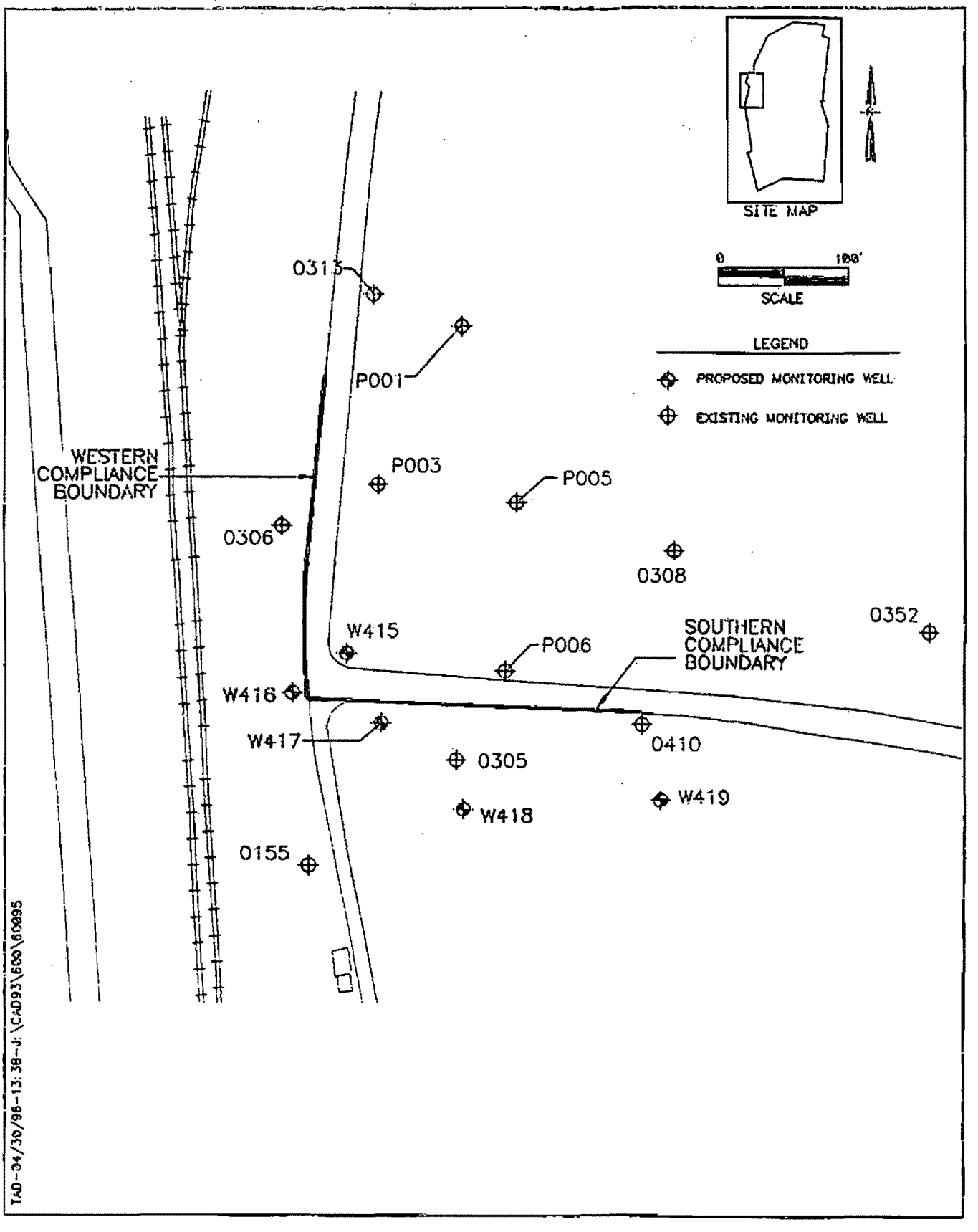


Figure 2. Groundwater Monitoring Network. Profile View

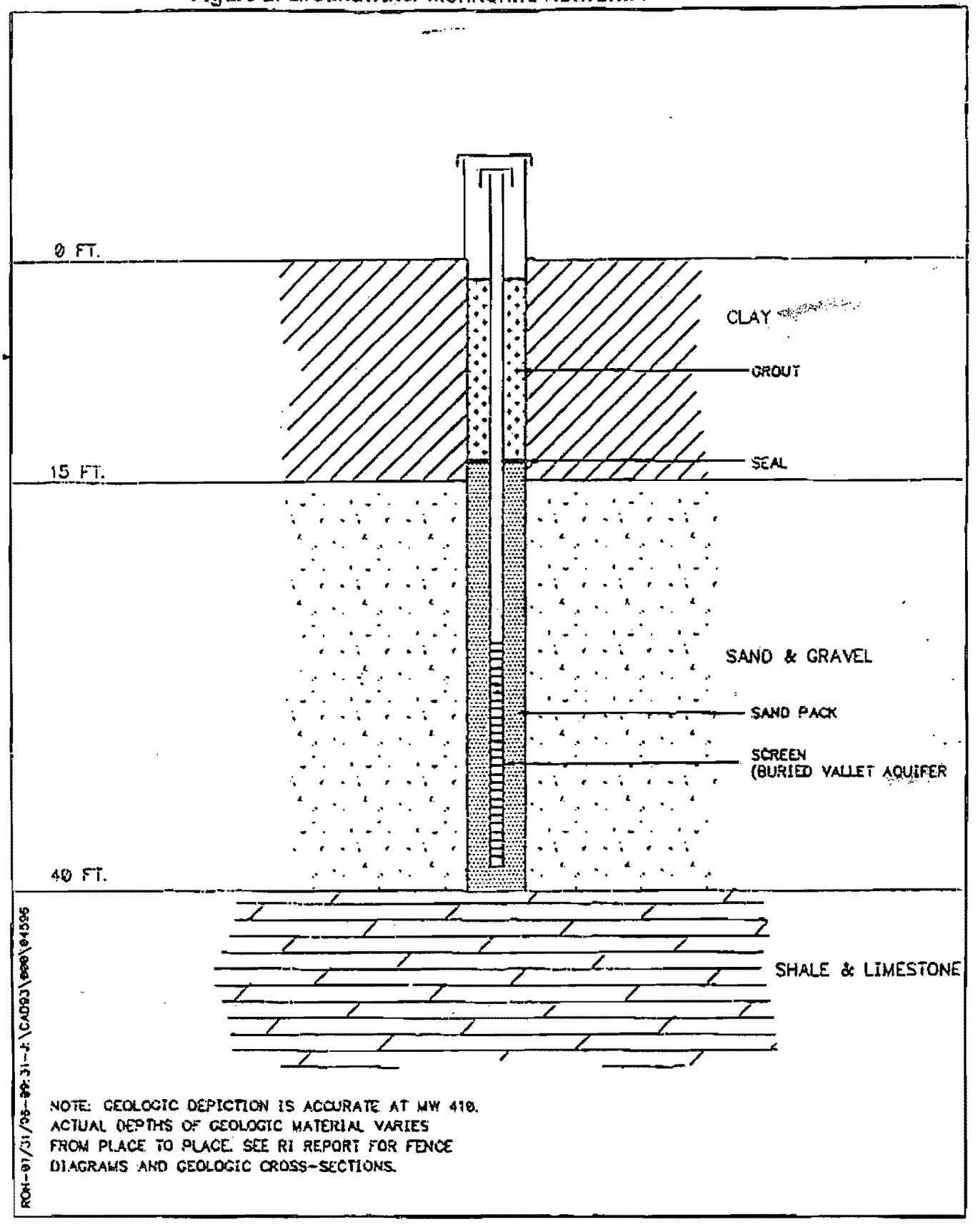
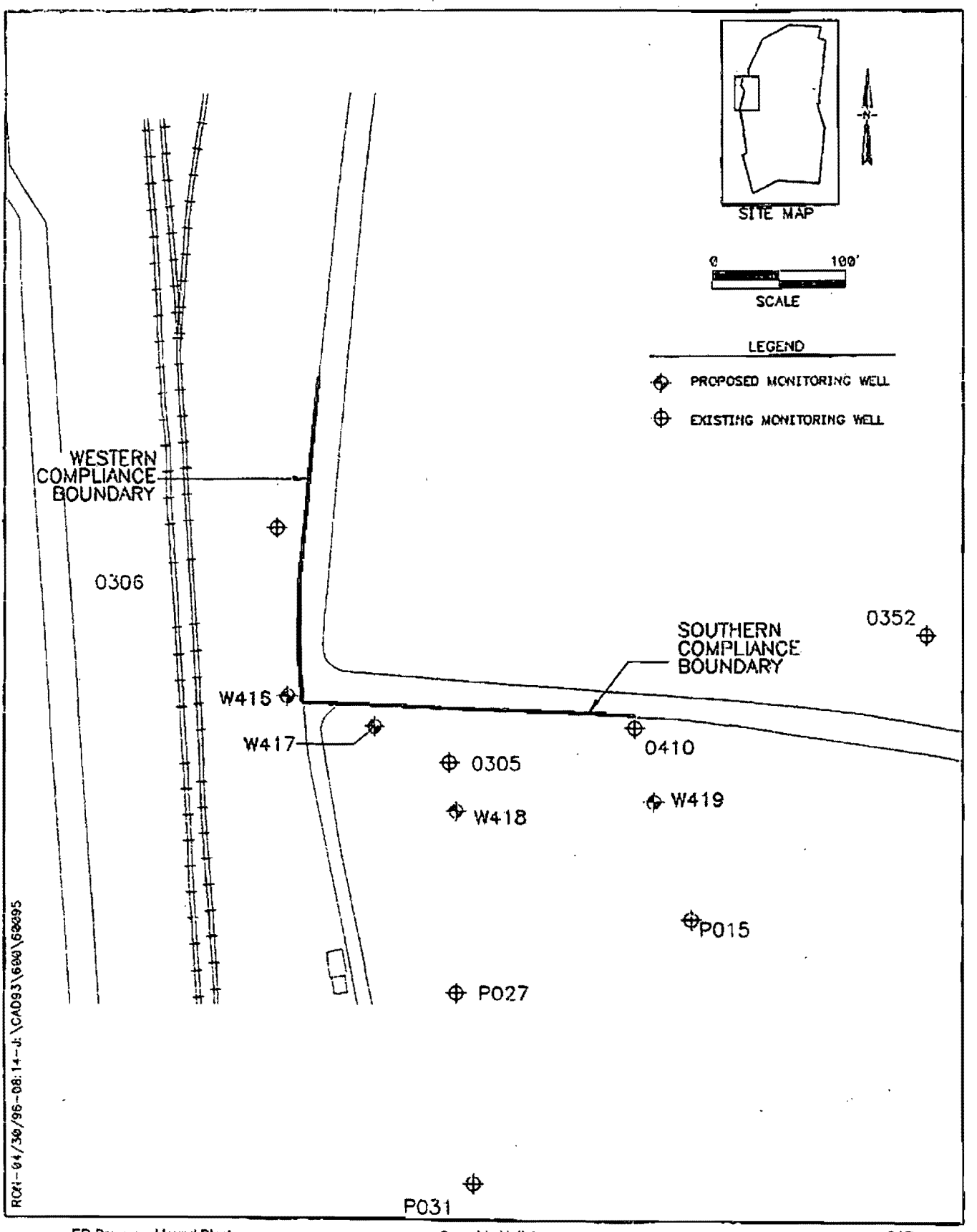


Figure 3. Groundwater Monitoring Network for VOCs



The OU1 groundwater model (Terran Corp., *Operable Unit 1 Pump-and-Treat Well Location and Rate Optimization via Ground Water Flow Modeling and Particle Tracking,* December 1995) developed the working assumption that an artificially induced flow reversal could demonstrate complete hydraulic control by exhibiting a 0.05-foot head difference between adjacent pairs of 25-foot by 25-foot block-centered cells, where one block of each pair lies just inside a compliance boundary, while the other block lies just outside a compliance boundary. Equivalently, in actual field measurements, a 0.002-foot/foot average inward gradient is to be maintained across at least a 25-foot-wide border centered on the compliance boundaries. The 0.002-foot/foot criterion will be used to determine whether hydraulic control is successful. Notifications and reports should be conducted as described in the O&M Plan.

3.2 Groundwater Chemical Measurements

A network of 11 monitoring wells will be established. (See attached Figure C.3, *Groundwater Monitoring Network for VOCs.*) In plan view, all the wells for chemical measurements will lie west of the western compliance boundary and south of the southern compliance boundary. In profile view, as with the hydraulic-measurement network, all the wells will be screened in the Buried Valley Aquifer. Four of the monitoring wells (designated on the figure as W416, W417, W418, and W419) were newly constructed, each of which would also need to be constructed for hydraulic measurements. Seven of the wells already existed: 0352, 0410, 0305, 0306, P015, P027, and P031. The wells will make it possible to observe the plume, which will be expected to be isolated from its source. The wells will be measured quarterly for Volatile Organic Compounds (VOCs) using CLP SOW OLM1.8, beginning within one quarter of the start of operation. Notifications and reports should be conducted as described in the O&M Plan.

Sampling will be incorporated into the next revision or update of the Mound Plant Groundwater Protection Management Program Plan (GWPMPP). Refer to the GWPMPP

for specific requirements, regarding methodologies. Refer to Mound Plant ER QAPP (DOE, 1993) for QA/QC.

3.3 Water Treatment System Measurements

For assessment of the treatment system's performance, paired before-and-after samples shall be collected and analyzed. The "before" sample represents raw influent conditions, and the "after" sample represents treated effluent conditions. Comparison of the before-and-after data points allows calculation of removal efficiencies. Furthermore, comparison of the treated effluent chemistry with Ohio EPA discharge standards allows determination of whether the water is suitable for discharge.

EPA Method 624 shall be used to analyze for VOAs in the treatment system's influent and effluent. Because the samples are only for engineering evaluation purposes, only the paired investigative samples are to be required. No special blanks, duplicates, or spikes are warranted. All samples shall be analyzed on an expedited bases (one-week turnaround) so that timely use can be made of the information revealed by analysis.

Initial Startup

When the system is initially started, immediately after construction or immediately after major overhaul, an intensive sampling effort is required. The initial startup period shall last for 2 hours to allow adequate time for all operational parameters to stabilize. At the start of the initial startup test and at the end of each half hour, paired before-and-after aqueous VOA samples shall be collected immediately before and after treatment in the air stripper. As a result, 5 pairs of water samples will be made available for analysis.

Routine Operation

When the system is routinely running, relatively less sampling is required. During the first year of routine operation after construction or overhaul, one pair of before-and-after samples shall be collected each week. After twelve consecutive months of successful treatment, the frequency of testing shall diminish to a monthly pace. "Successful treatment" means that Ohio EPA discharge standards are met, namely that the daily maximum concentrations of COPCs do not exceed 10 μg/L and the monthly average concentrations of COPCs do not exceed 5 μg/L. If sampling experience indicates that concentrations remain stable from reading to reading, DOE may petition for less frequent monitoring schedule. The Ohio EPA Division of Surface Water may also adjust the frequency of monitoring via its Authorization to Discharge (or substantive equivalent thereof).

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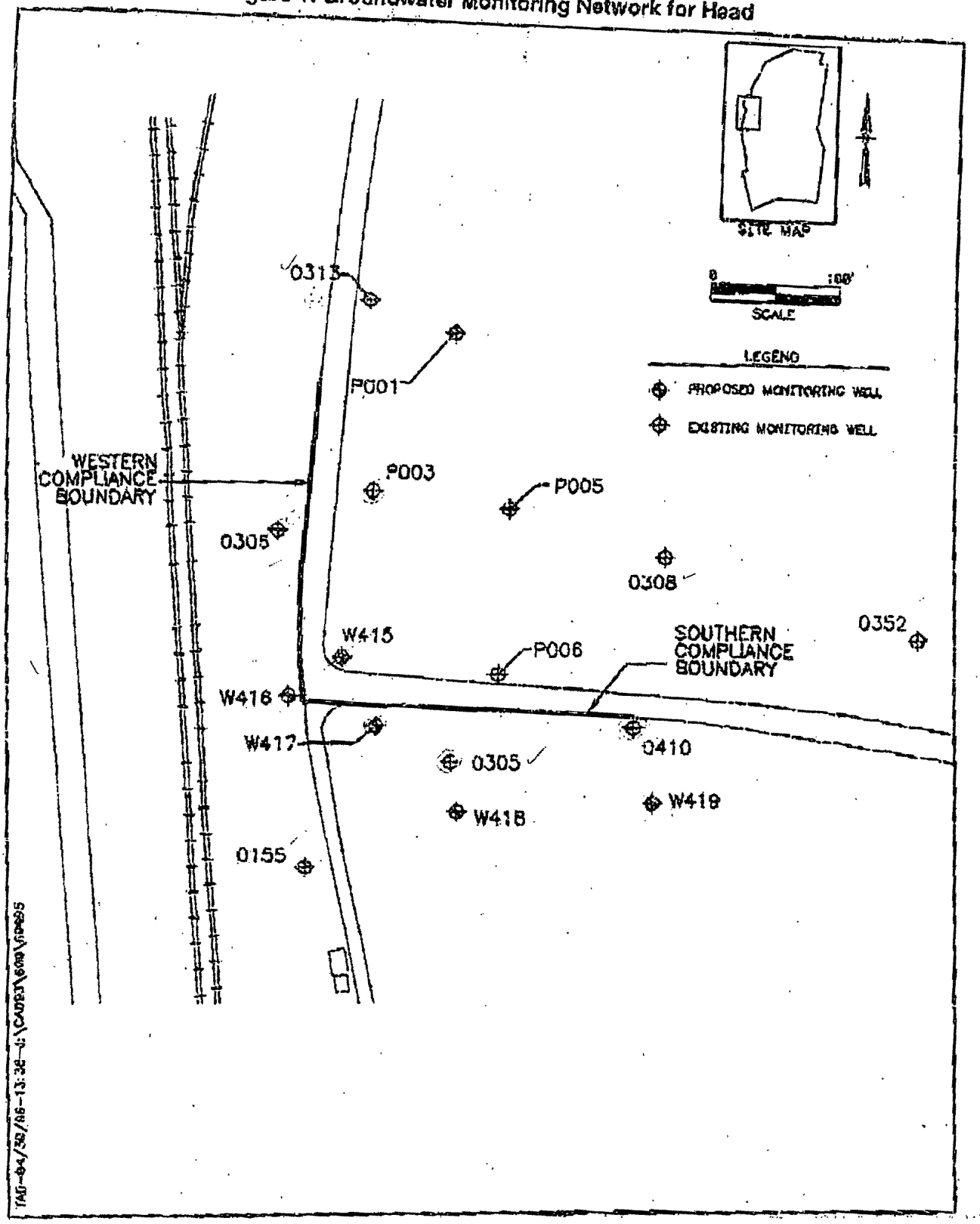
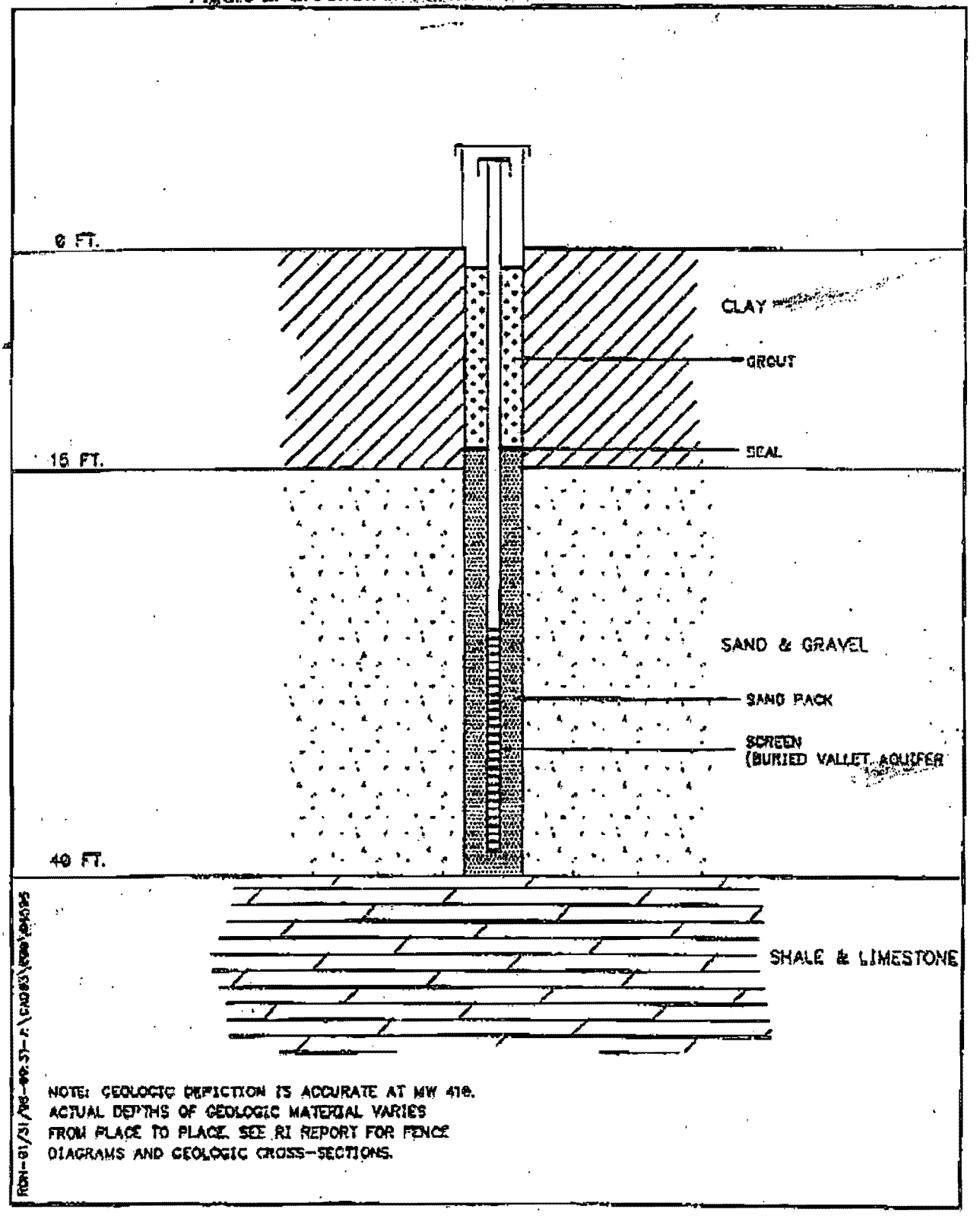


ER Program, Mound Plant
Final (Revision 3)
wrISAP.DOC

Operable Unit 1
February 1997

SAP

Figure 2. Groundwater Monitoring Network. Profile View



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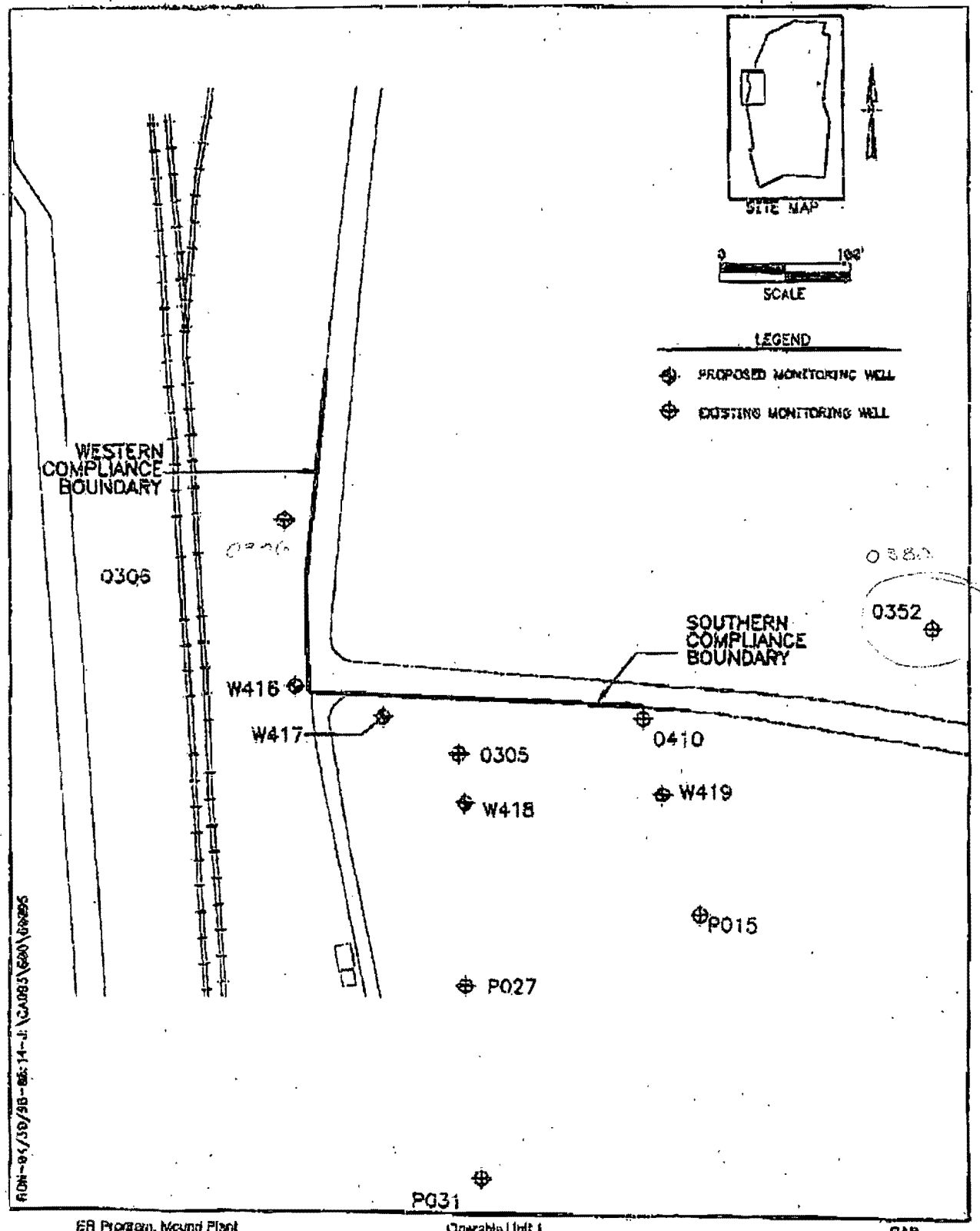

CHANGE SHEET for Site-Specific HASP

Project Name: ~~OU-1 Remedial Action SVE/Air Sparge System Construction~~	
Change Submitted by: Sheila Willis	Date of Change: 04/23/98
Reviewed by: [signature] [signature]	
HAZWOPER Coordinator Approval: [signature]	

Change to HASP due to sampling results in order to address additional chemicals and monitoring methods.

I have been briefed on or read the changes to this SS-HASP and understand them.

NAME	HP/SS Number	NAME	HP/SS Number	NAME	HP/SS Number
[signature]	[redacted]	[signature]	[redacted]		
[signature]	[redacted]				
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[signature]	[redacted]				
[signature]	[redacted]				

6.12 **Chemical Name:** Chloroform	
Route of Exposure: Inhalation, absorption, ingestion, contact	
Symptoms of Exposure: Irritation of eyes & skin, dizziness, mental dullness, nausea	Special Medical Monitoring:
PEL/TLV*: 50 ppm	IDLH: 500 ppm
STEL: 2 ppm	LEL: N/A
Other: Cancer	

6.13 **Chemical Name:** Trichloroethene	
Route of Exposure: Inhalation, absorption, ingestion, contact	
Symptoms of Exposure: Eye & skin irritation, vertigo, visual disturbance, tremor, giddiness	Special Medical Monitoring:
PEL/TLV*: 100 ppm	IDLH: 1000 ppm;
STEL:	LEL: 8%
Other: Cancer	

6.14 **Chemical Name:** Tetrachloroethene	
Route of Exposure: Inhalation, absorption, ingestion, contact	
Symptoms of Exposure: Irritation of eyes, nose & throat; nausea; flushed face & neck; vertigo; dizziness; headache	Special Medical Monitoring:
PEL/TLV*: 100 ppm	IDLH: 150 ppm
STEL:	LEL: N/A
Other: Cancer	

6.15 **Chemical Name:** Ethyl benzene	
Route of Exposure: Inhalation, ingestion, contact	
Symptoms of Exposure: Irritation of eyes, skin & mucus membranes; headache	Special Medical Monitoring:
PEL/TLV*: 100 ppm	IDLH: 800 ppm
STEL: 125 ppm	LEL: 0.8%
Other:	

* OSHA, NIOSH, or ACGIH Standard, whichever is most restrictive

7.0 INDUSTRIAL HYGIENE AIR MONITORING

Chemical Name	Frequency of Monitoring	Instrument Reading Action Level	Action
Toluene	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 50 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Trichlorofluoromethane	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 500 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
1,1,2-Trichloro-1,2,2-trifluoroethane	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 500 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
1,2-Dichloroethene	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 100 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Chloroform	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 25 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Trichloroethene	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 50 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Tetrachloroethene	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 50 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Ethyl benzene	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 50 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Xylenes	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 50 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE

6.16 Chemical Name: Xylenes	
Route of Exposure: Inhalation, absorption, ingestion, contact	
Symptoms of Exposure: Irritation of eyes, nose, throat; dizziness, excitement, drowsiness, staggering	Special Medical Monitoring:
PEL/TLV*: 100 ppm	IDLH: 900 ppm
STEL: 150 ppm	LEL: 0.9%
Other:	

6.17 Chemical Name: Acetone	
Route of Exposure: Inhalation, ingestion, contact	
Symptoms of Exposure: Eyes, nose & throat irritant; dizziness, headache	Special Medical Monitoring:
PEL/TLV*: 250 ppm	IDLH: 2500 ppm
STEL:	LEL:2.5%
Other:	

6.18 Chemical Name: Benzene	
Route of Exposure: Inhalation, absorption, ingestion, contact	
Symptoms of Exposure: Headache, giddiness, irritation of eyes, nose, & respiratory system	Special Medical Monitoring:
PEL/TLV*: 0.1 ppm	IDLH: 500 ppm
STEL: 1 ppm	LEL: 1.2%
Other: Cancer	

6.19 Chemical Name: Methylene chloride	
Route of Exposure: Inhalation, ingestion, contact, absorption	
Symptoms of Exposure: Irritation of eyes & skin; nausea, fatigue, weak, tingling of limbs	Special Medical Monitoring:
PEL/TLV*: 500 ppm	IDLH: 2300 ppm
STEL:	LEL: 13%
Other: Cancer	

* OSHA, NIOSH, or ACGIH Standard, whichever is most restrictive

6.8 Chemical Name: Toluene	
Route of Exposure: Inhalation, absorption, ingestion, contact	
Symptoms of Exposure: Irritation of eyes, nose, fatique, weakness, confusiion, euphoria, dizziness, headache, dilated pupils	Special Medical Monitoring:
PEL/TLV*: 100 ppm	IDLH: 500 ppm
STEL: 150 ppm	LEL: 1.1%
Other:	

6.9 Chemical Name: Trichlorofluoromethane	
Route of Exposure: Inhalation, ingestion, contact	
Symptoms of Exposure: Incoordination, tremor	Special Medical Monitoring:
PEL/TLV*: 1000 ppm	IDLH: 2000 ppm
STEL:	LEL: NA
Other:	

6.10 Chemical Name: 1,1,2 - Trichloro - 1,2,2 - trifluoroethane	
Route of Exposure: Inhalation, ingestion, contact	
Irritation of skin & throat, drowsiness	Special Medical Monitoring:
PEL/TLV*: 1000 ppm	IDLH: 2000 ppm
STEL: 1200ppm	LEL:
Other:	

6.11 Chemical Name: 1,2 - Dichloroethene	
Route of Exposure: Inhalation, ingestion, contact	
Symptoms of Exposure: Irritation of eyes, respiratory system, CNS, depression	Special Medical Monitoring:
PEL/TLV*: 200 ppm	IDLH: 1000 ppm
STEL:	LEL: 5.6%
Other:	

* OSHA, NIOSH, or ACGIH Standard, whichever is most restrictive

Acetone	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 125 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Vinyl Chloride	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump .5 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Benzene	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump .05 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE
Methylene Chloride	Initial IH monitoring in worker breathing zone	Charcoal or draeger tube & low flow pump 250 ppm	Stop activities, contact PM, IH & SHSO for appropriate action & PPE

Standard Operating Procedures (ER Program):

1.12 - Air Particulate Sampling With a Real-Time Aerosol Monitor
6.1 - Health and Safety Monitoring of Combustible Gas Levels
6.2 - Health and Safety Monitoring of Organic Vapors with a Photoionization Detector

FID/PID Monitoring- Air monitoring and Calibration conducted with the TVA-1000 PID/FID shall be conducted in accordance with the Manufacturer Guidelines.

Dragger - Air monitoring using Dragger Detector Tubes shall be conducted according to the Manufacturer Guidelines.

Note: All instruments are calibrated prior to each use. Required calibrations are recorded on the air monitoring data sheet.

SITE SPECIFIC HEALTH AND SAFETY PLAN

FOR

Project Name: OU-1 Remedial Action Pump and Treatment System Startup, Operation and Maintenance

Prepared by: Kenneth R Hacker 1-13-97
Project Manager (Signature) (Date)

Prepared by: Mark Sweeney 1-11-97
Project Engineer (Signature) (Date)

Reviewed by: S Sullivan 1-16-97
Radiological Engineering (Signature) (Date)

Reviewed by: Steven C. Israel 1/16/97
Industrial Hygiene (Signature) (Date)

Reviewed by: Jared Wills 1/16/97
Industrial Safety (Signature) (Date)

Reviewed by: E. J. Arenas MD 1-16-97
Occupational Medicine (Signature) (Date)

Approved by: Jared Wills 1/16/97
HAZWOPER Coordinator (Signature) (Date)

To obtain the latest version of this SS-HASP template, contact Jared Wills, HAZWOPER Coordinator, at 865-4096. This template was current as of May 1996.

1680 4726

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Changing this Site-Specific Health and Safety Plan(SS-HASP)

Any changes to this SS-HASP must be immediately brought to the HAZWOPER Coordinator's (HC) attention. The HC will generate a change sheet that will be included in this SS-HASP. The change sheet will be reviewed by the appropriate ES&H staff members and must be briefed to and acknowledged by all site workers and visitors before further site entry is permissible.

CHANGE SHEET for Site-Specific HASP

Project Name: OU-1 Remedial Action Pump and Treatment System Startup, Operation and Maintenance	
Change Submitted by: Mark Spivey Mark Spivey	Date of Change: 10/23/97
Reviewed by: Sheila K. Wilkins John B. Pan	
HAZWOPER Coordinator Approval: Jared Bullard	

On October 23, 1997 an Integrated Safety Review was performed on the SS-HASP for OU-1 Remedial Action Pump and Treatment System Startup, Operation and Maintenance. The recommended changes to the SS-HASP, from the review, are attached. The changes effect Paragraphs 7 and 13.

The resulting changes from the Integrated Safety Review shall be disseminated to the current and future workers at this site. The dissemination of the changes will be evidenced by the Pre-Job Briefing attendees and/or SS-HASP affirmation signatures (Section 15) dated on or after October 27, 1997. This document shall be included in the SS-HASP until incorporation in the next revision.

I have been briefed on or read the changes to this SS-HASP and understand them.

NAME	HP/SS Number	NAME	HP/SS Number	NAME	HP/SS Number
[redacted]	[redacted]				
Scott E. Hom	[redacted]				

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Changing this Site-Specific Health and Safety Plan(SS-HASP)

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1.0 A. WORK SCOPE

Briefly describe the overall tasks and goals of this project:

This project is for containment and treatment of a groundwater contaminant plume that emanates southward from the OU-1 landfill and traveling toward the Mound Plant water wells. The system will extract the affected groundwater, treat the affected ground water in an air stripper, and discharge the treated effluent to the site drainage pipe from outfall 002 which runs along the west side of OU-1 (OU-4 site drainage reroute).

B. SITE DESCRIPTION

The location of Operable Unit One (OU-1) within the Mound Plant is shown on Figure HS-1. Figure HS-2 provides a clearer view of the area and distinguishing features. The extraction well and treatment facility is depicted in Figure HS-3.

PPE will not be required unless contact with untreated groundwater will be made. The only locations that personnel would require PPE would be in the Building and at each of the extraction wells. If contact with groundwater would be required during the course of startup, operation or maintenance, PPE boundaries would be established at the aforementioned locations. Building 34 provides a safe refuge for workers and has a telephone for use.

2.0 SITE HISTORY

Operable Unit 1, or Area B as it was originally called, occupies approximately 4 acres in the southwestern portion of the Mound Plant. It encompasses the historic landfill, the site sanitary landfill, the overflow pond, and the three plant production wells. The Mound Plant used the historic landfill site from 1948 to 1977. During this time, plant waste materials which included general trash, and liquid wastes, were disposed of, by burning, in Area B. Some of this waste was relocated to and encapsulated in a site sanitary landfill constructed in 1977. An overflow pond was constructed simultaneously, partially covering the historic landfill site. After 1977, waste was no longer disposed of in Area B. Operable Unit 1, was extended recently to include the three plant production wells located along the plant southwestern boundary. An extended discussion of Area B history, including waste disposal and construction activities, is provided in the OU-1 Remedial Investigation Report,, Section 1, March 1994.

The Mound Plant began a periodic water sampling program for VOCs in 1984. Under the Environmental Restoration (ER) Program, a Remedial Investigation (RI) was started in 1987 and focused on groundwater contamination. Since 1986, VOCs have been detected and monitored in the groundwater in Area B.

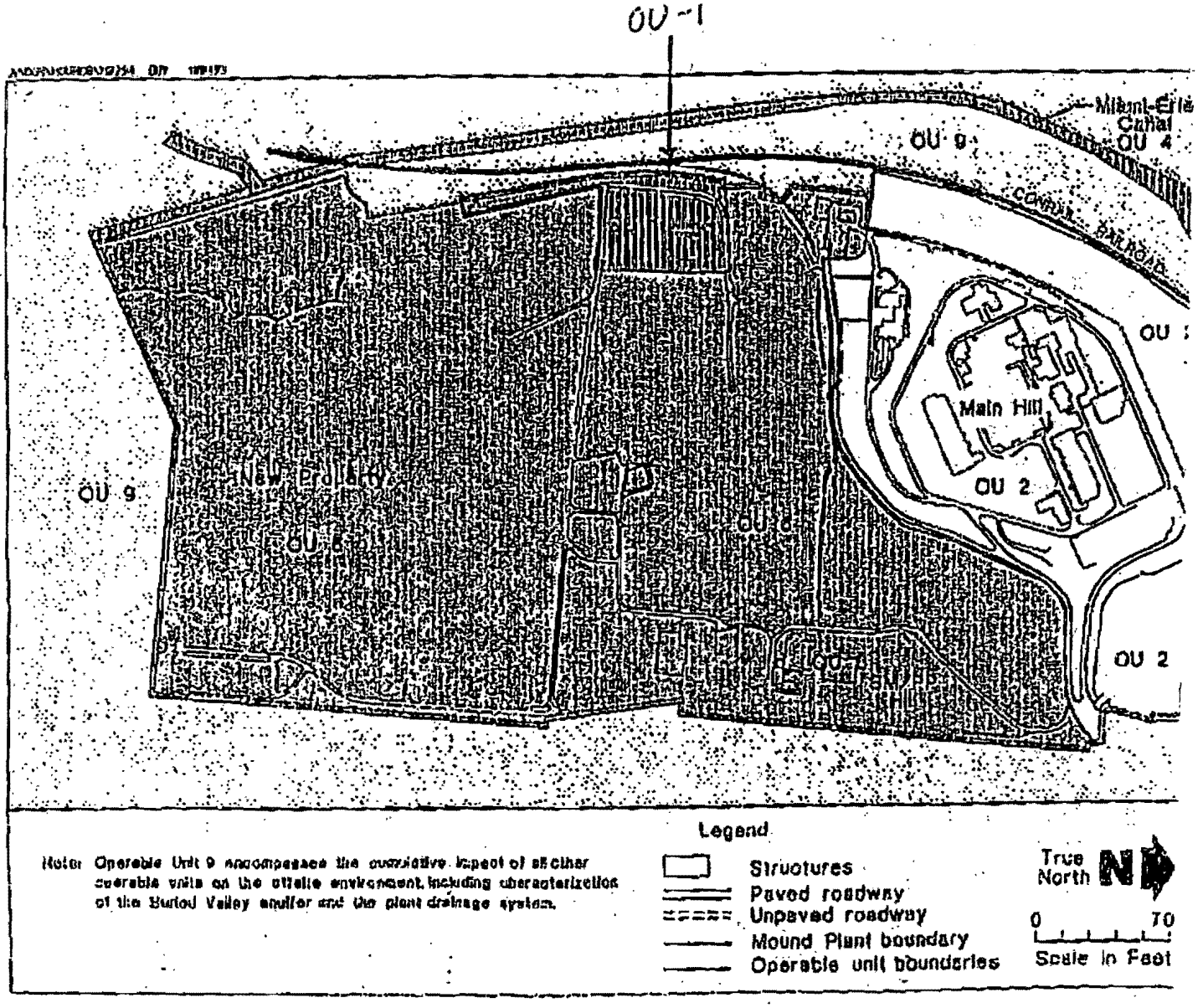

OU-1
Miami-Erie Canal
OU 4
OU 9
CONRAIL RAILROAD
OU 3
Main Hill
OU 2
New Property
OU 9
OU 6
OU 8
OU 7
OU 2
Legend
Note: Operable Unit 9 encompasses the cumulative impact of all other operable units on the offsite environment, including characterization of the Buried Valley aquifer and the plant drainage system.
Structures
Paved roadway
Unpaved roadway
Mound Plant boundary
Operable unit boundaries
True North
N
0
70
Scale in Feet

Figure HS-1

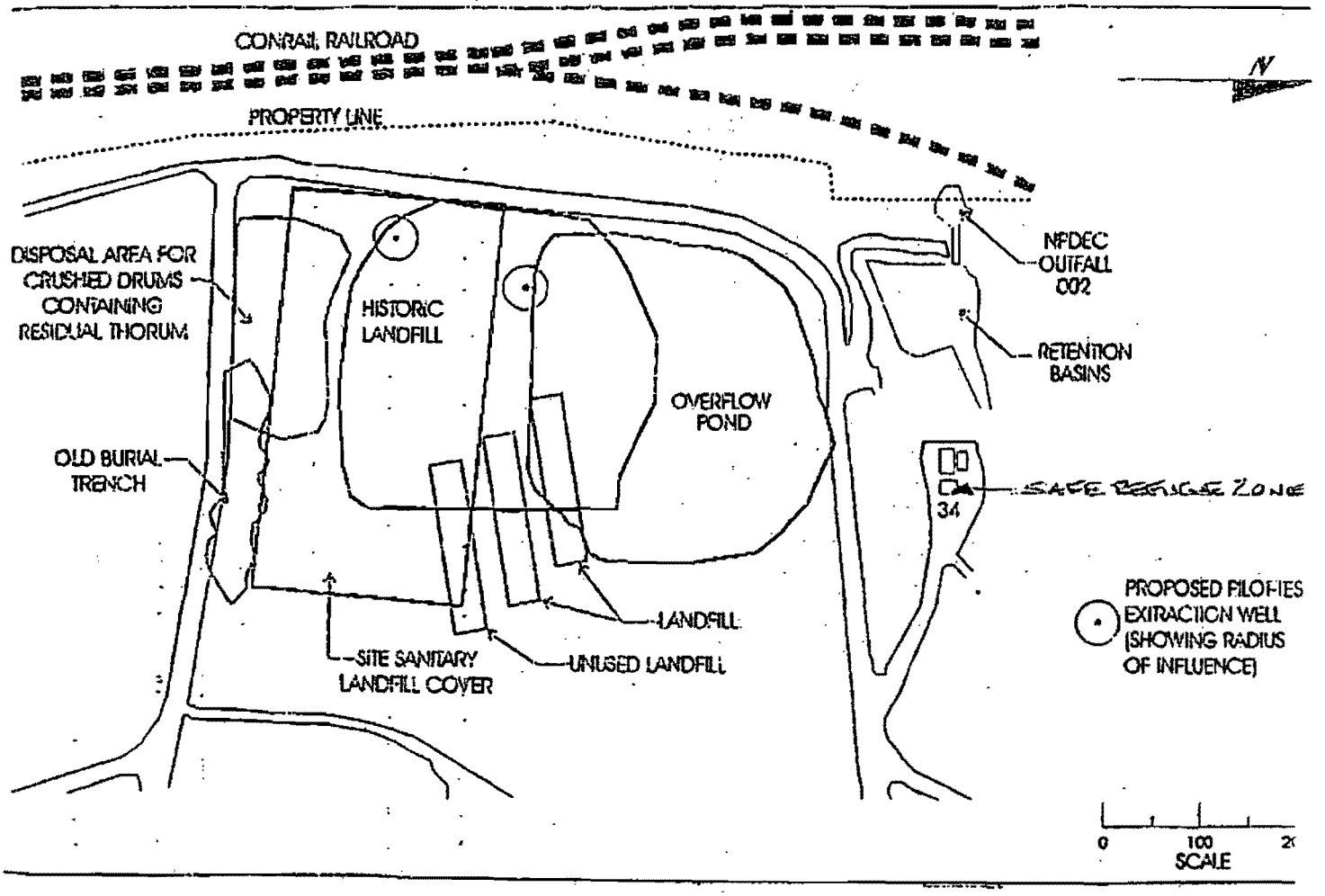

CONRAIL RAILROAD
PROPERTY LINE
N
DISPOSAL AREA FOR CRUSHED DRUMS CONTAINING RESIDUAL THORIUM
HISTORIC LANDFILL
OVERFLOW POND
NPDEC OUTFALL 002
RETENTION BASINS
OLD BURIAL TRENCH
34
SAFE RANGE ZONE
PROPOSED PILOTIES EXTRACTION WELL (SHOWING RADIUS OF INFLUENCE)
LANDFILL
SITE SANITARY LANDFILL COVER
UNUSED LANDFILL
0
100
SCALE

Figure HS-2

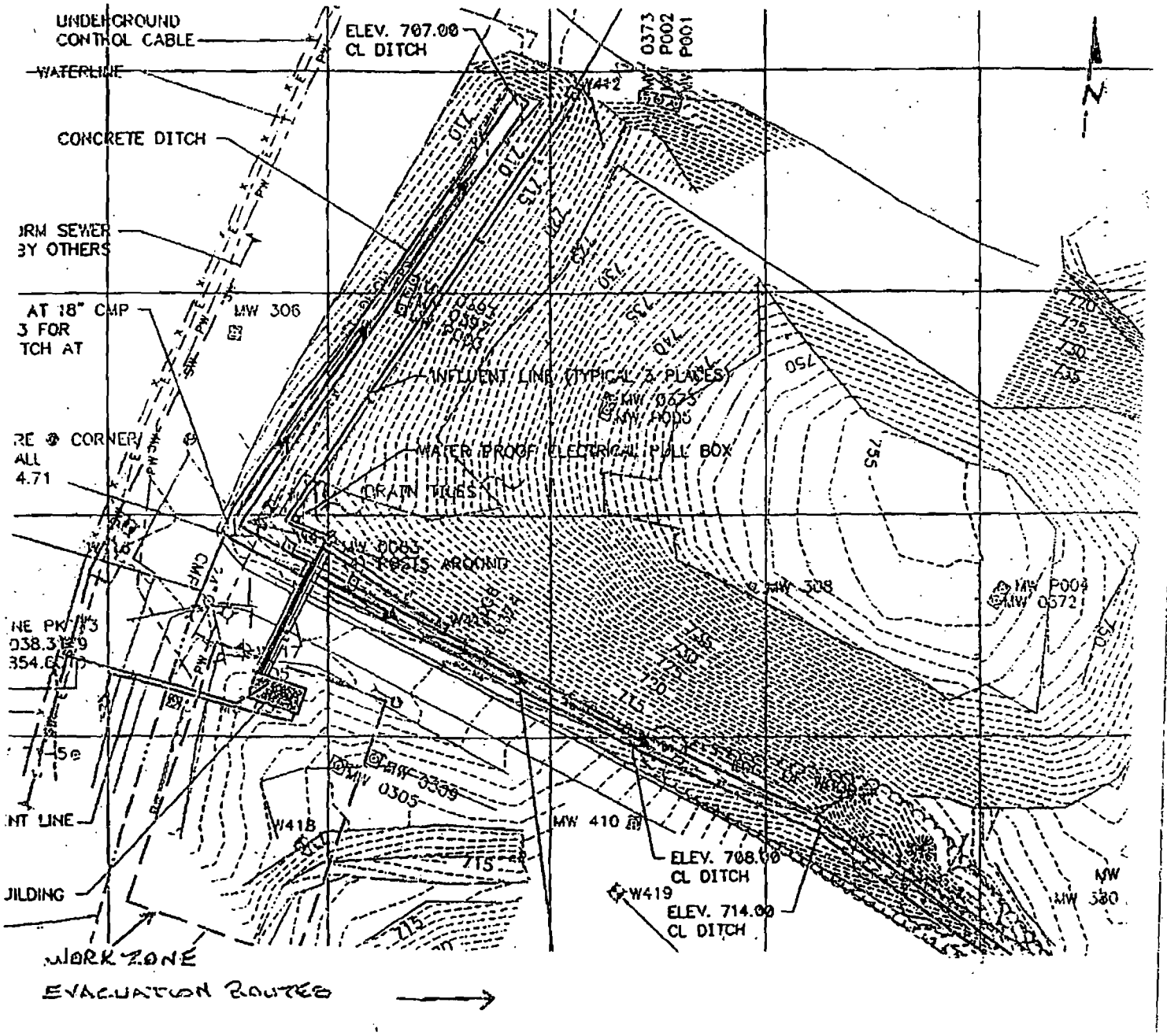

UNDERGROUND CONTROL CABLE
WATERLINE
CONCRETE DITCH
ELEV. 707.00 CL DITCH
MW 306
INFLUENT LINE (TYPICAL 3 PLACES)
WATER PROOF ELECTRICAL PULL BOX
DRAIN TILES
MW P003
POLES AROUND
MW 308
MW P004
MW 0572
MW 0305
MW 410
W418
W419
ELEV. 708.00 CL DITCH
ELEV. 714.00 CL DITCH
MW 580
WORK ZONE
EVACUATION ROUTES
N

Figure HS-3

As a result of the VOC groundwater contamination found in Operable Unit 1, the Mound Plant was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Superfund) National Priority List, in 1989. As part of the Mound CERCLA process, a Federal Facility Agreement was signed between the DOE, and the U.S. EPA and Ohio EPA which required that DOE develop and implement remedial investigations (RIs) and feasibility studies (FSs) and conduct interim remedial actions in order to ensure that environmental impacts associated with past and present activities at the Mound Plant are thoroughly investigated and appropriate action is taken to protect the public health and welfare and the environment.

The FFA agreement also requires DOE to produce an RI/FS report which is based on remedial investigative field work. A remedial investigation report of this type was developed for Operable Unit 1. This report summarizes the result of the remedial investigation, and includes data analysis as well as a baseline risk assessment. As part of this remedial investigation for Operable Unit 1, soil gas surveys, surface and subsurface soil sampling, piezometer and monitoring well installation/development, aquifer testing and groundwater sampling was conducted. As a result of the remedial investigative process, which took approximately 3 years (1992-1995), DOE and the U.S. EPA and Ohio EPA signed a CERCLA Record of Decision (ROD) for a remediation remedy to control groundwater VOC contamination in Operable Unit 1, and in the adjacent buried valley aquifer.

As a result of this regulatory approved ROD, the remedial technology selected for remediating the VOCs from the groundwater in OU-1 was conventional air stripping. A remedial design was developed for the installation of extraction and monitoring wells and construction of the air stripper system. The extraction and monitoring wells for the OU-1 remediation project were installed in 1996, and the installation of the air stripper and associated equipment will be installed and put on line in early 1997.

Quarterly groundwater monitoring for VOC contamination in Operable Unit 1 is ongoing as part of the Mound Plant Environmental Monitoring Program.

3.0 SITE CONTROL

The Field Coordinator or Site Supervisor will strictly enforce the following at all times:

- a two-man Buddy system;
- documented daily pre-job briefs;
- mark and barricade site as HAZWOPER work area;
- brief workers on and maintain effective communication;
- controlled point of access.

Describe Communication Methods:

Internal: Radio and/or Cellular Phone

External: Radio and/or Cellular Phone

4.0 HEALTH AND SAFETY SITE EVALUATION

Place an ✔ in each ( ) to indicate presence of hazard.

4.1 Physical Hazards

(✔) Heat Stress	(✔) Cold Stress	(✔) Noise
( ) Confined Space	(✔) Enclosed Space	(✔) Heavy Lifting
(✔) Tripping/Falling	(✔) High Voltage	( ) High Pressure Water
( ) Oxygen Deficient	( ) Explosive/Flammable	( ) Vibration

4.2 Construction Hazards

( ) Trenching	( ) Excavating	( ) Heavy Equipment Op.
( ) Demolition	( ) High Work	( ) Welding/cutting
(✔) Ladders	( ) _____	( ) _____

4.3 Chemical Hazards

(✔) Organic Chemical	( ) Inorganic Chem	(✔) Carcinogen
( ) Corrosive	( ) Reactive	(✔) OSHA Specific
( ) Mutagen	( ) Teratogen	Substances

4.4 Ionizing Radiological Hazards

( ) Internal Exposure	( ) External Exposure

4.5 Non-Ionizing Radiological Hazards

( ) UV	( ) RF	( ) Microwave
( ) Laser		

4.6 Biological/Vector Hazards

(✔) Wildlife	( ) Plants	( ) Medical Waste
( ) Bacterial	(✔) Parasites	

5.0 PREVIOUS SAMPLING RESULTS

Contaminant	Source(Water, Sediment, Sludge, Soil, Air, etc.)	Quantity or Concentration
Chloroethene	Soil gas	19.6 µg/l avg.
Trichloroethylene	Soil gas	55.8 µg/l avg.
Benzene	Soil gas	9.0 µg/l avg.
Trichloroethylene	Area B well water	ND-210 µg/l
Tetrachloroethylene	Area B well water	ND-270 µg/l
1,2 Dichloroethene	Area B well water	ND-640 µg/l
Carbon tetrachloride	Area B well water	ND-5 µg/l
Trichloromethene	Area B well water	ND-130 µg/l

6.0 CONTAMINANTS (MSDS are a valuable source of information and are available from Industrial Hygiene and should be kept at the job site.)

6.1 Chemical Name: Tetrachloroethylene (Perchloroethylene)	
Route of Exposure: Inhalation, ingestion, contact	
Symptoms of Exposure: Irritation of eyes, nose and throat, nausea, flushed face/neck	Special Medical Monitoring: None
PEL/TLV*: 25 ppm (lowest feasible limit to 25 ppm)	IDLH: 150 ppm; Carcinogen
STEL: 100 ppm	LEL: NA
Other:	

6.2 Chemical Name: Vinyl chloride	
Route of Exposure: Inhalation	
Symptoms of Exposure: Weakness, abdominal pain, gastrointestinal bleeding, hepatomegaly, pallor or cyanosis of extremities	Special Medical Monitoring: None
PEL/TLV*: 1 ppm	IDLH: Carcinogen
STEL: 5 ppm ceiling	LEL: 3.6%
Other:	

6.3 Chemical Name: Trichloroethylene	
Route of Exposure: Inhalation, ingestion, contact	
Symptoms of Exposure: Headache, vertigo, tremors, nausea, vomiting, irritation of eyes, dermatitis, cardiac arrhythmias	Special Medical Monitoring: None
PEL/TLV*: 50 ppm	IDLH: 1,000 ppm; Carcinogen
STEL: 100 ppm	LEL: 8%
Other:	

* OSHA, NIOSH, or ACGIH Standard, whichever is most restrictive

6.4 Chemical Name: 1,2 Dichloroethylene	
Route of Exposure: Inhalation, ingestion, contact	
Symptoms of Exposure: Irritation of eyes, respiratory system. Central nervous system depressant	Special Medical Monitoring: None
PEL/TLV*: 200 ppm	IDLH: 1,000 ppm
STEL: NA	LEL: 5.6%
Other:	

6.5 Chemical Name: Carbon Tetrachloride	
Route of Exposure: Inhalation, ingestion, skin absorption	
Symptoms of Exposure: Central nervous system depressant, nausea, vomiting, liver and kidney damage, skin irritation	Special Medical Monitoring: None
PEL/TLV*: 2 ppm	IDLH: 200 ppm; Carcinogen
STEL: 10 ppm	LEL: NA
Other:	

6.6 Chemical Name: Methyl chloroform	
Route of Exposure: Inhalation, ingestion, contact	
Symptoms of Exposure: Headache, lassitude, central nervous system depressant, irritation of eyes, dermatitis	Special Medical Monitoring: None
PEL/TLV*: 350 ppm	IDLH: 700 ppm
STEL: 450 ppm	LEL: 7.5%
Other:	

6.7 Chemical Name: Benzene	
Route of Exposure: Inhalation, ingestion, skin absorption	
Symptoms of Exposure: Irritation of eyes, nose, respiratory system; headache, nausea, fatigue, dermatitis	Special Medical Monitoring: None
PEL/TLV*: 0.1 ppm	IDLH: 500 ppm
STEL: 1 ppm	LEL: 1.2%
Other:	

* OSHA, NIOSH, or ACGIH Standard, whichever is most restrictive

7.0 INDUSTRIAL HYGIENE AIR MONITORING

Chemical Name	Frequency of Monitoring	Instrument Reading Action Level	Action
Volatile organic compounds	When any part of the closed system is opened monitoring shall be performed, in the headspace, inside stripper and in the breathing zone. In addition, air monitoring may be performed in the breathing zone during actual activities.	FID/PID (11.8 eV Lamp) > 2 ppm - 10 ppm	Conduct detector tube monitoring for vinyl chloride
Vinyl chloride	When PID/FID reading > 2 ppm is sustained in worker's breathing zone	Detector tube reading in breathing zone > 0.5 ppm	Stop work. Contact PM and SHSO.
Benzene	When PID/FID reading >1 ppm is sustained in worker's breathing zone	Detector tube reading in breathing zone ≥ 1 ppm	Stop work. Contact PM and SHSO.
Volatile organic compounds	When any part of the closed system is opened monitoring shall be performed, in the headspace, inside stripper and in the breathing zone. In addition, air monitoring may be performed in the breathing zone during actual activities.	FID/PID (11.8 eV Lamp) > 10 ppm - 100 ppm > 100 ppm	Stop work. Contact PM and SHSO. Evacuate area.
Lower Explosive Limit	When any part of the closed system is opened monitoring shall be performed, in the headspace, inside stripper, inside well and in the breathing zone. In addition, air monitoring may be performed in the breathing zone during actual activities.	≥ 10% LEL	Resume activities when < 10% LEL

Standard Operating Procedures (ER Program):

1.12 - Air Particulate Sampling With a Real-Time Aerosol Monitor
6.1 - Health and Safety Monitoring of Combustible Gas Levels
6.2 - Health and Safety Monitoring of Organic Vapors with a Photoionization Detector

FID/PID Monitoring - Air monitoring and Calibration conducted with the TVA-1000 PID/FID shall be conducted in accordance with the Manufacturer Guidelines.

Draeger - Air monitoring using Draeger Detector Tubes shall be conducted according to the Manufacturer Guidelines.

Note: All instruments (excluding the Draeger Pump) are calibrated prior to each use. Required calibrations are recorded on the air monitoring data sheet.

8.0 TASK BREAKDOWN

8.1 Description of Task: Startup and Checkout of Equipment

Breakdown of Basic Task Steps	Potential Hazards	Proposed Actions or Procedures (Permits, etc.)
Air Stripper	Heavy lifting, noise, slips, trips, falls, cuts, and chemical (organic vapor)	Post building, maintain minimum number of personnel in building, hearing protection as required, PPE as required, and monitor air during sampling
Blower checkout	Electrical, noise, and physical (rotating parts)	Lock out tag out procedures, ensure mechanical guards are in place, avoid rotating equipment parts, and maintain safe distance from working equipment
Well pump checkout	Electrical, chemical (organic), slips, trips, falls, heavy lifting, and exposure to elements	Post area as required, maintain minimum number of personnel in area, hearing protection as required, PPE as required, and monitor air as required

Level of Personal Protective Equipment:	Primary (D)		Contingency ©	
	Primary	(Write type Here⇓:)	Contingency	Write Type Here⇓:)
Respiratory Protection:	Y ( ) N (x)		Y (x) N ( )	Level C full face with organic vapor/HEPA filter cartridge. Not for use with vinyl chloride or benzene. Upgrade PPE as required by monitoring results.
Protective Clothing:	Y ( ) N (x)		Y (x) N ( )	Chemical resistant Tyvek
Head Protection:	Y ( ) N (x)		Y (x) N ( )	Hard hat
Eye Protection:	Y (x) N ( )	Safety Glasses	Y (x) N ( )	Full face respirator
Foot Protection:	Y (x) N ( )	Safety Shoes	Y (x) N ( )	Safety shoes with shoe covers
Hand Protection:	Y ( ) N (x)		Y (x) N ( )	Nitrile gloves
Hearing Protection:	Y (x) N ( )	Ear plugs	Y (x) N ( )	Ear muffs
Tape-up Required:	Y ( ) N (x)		Y (x) N ( )	At sleeves and legs

8.2 Description of Task: Electrical Checkout

Breakdown of Basic Task Steps	Potential Hazards	Proposed Actions or Procedures (Permits, etc.)
Control Panel	Electrical, physical, and noise	Lock out tag out (LOTO), PPE as required, and maintain safe distance from electrical panels
Building Electrical Connections and Lighting	Electrical, inadequate lighting, slips, trips, and falls	Utilize GFCI, maintain proper lighting for tasks, ladder safety, and LOTO as required

Level of Personal Protective Equipment:	Primary (D)		Contingency (D)	
	Primary	(Write type Here⇓:)	Contingency	Write Type Here⇓:)
Respiratory Protection:	Y ( ) N (x)		Y ( ) N ( )	
Protective Clothing:	Y ( ) N (x)		Y ( ) N ( )	
Head Protection:	Y ( ) N (x)		Y (x) N ( )	Hard hat
Eye Protection:	Y (x) N ( )	Safety glasses	Y (x) N ( )	Safety glasses
Foot Protection:	Y (x) N ( )	Safety shoes	Y (x) N ( )	Safety shoes with shoe covers
Hand Protection:	Y ( ) N (x)		Y (x) N ( )	Work gloves
Hearing Protection:	Y (x) N ( )	Ear plugs	Y (x) N ( )	Ear muffs
Tape-up Required:	Y ( ) N (x)		Y ( ) N (x)	

8.3 Description of Task: Water Handling and Sampling

Breakdown of Basic Task Steps	Potential Hazards	Proposed Actions or Procedures (Permits, etc.)
Operate extraction wells	Chemical (organic), electrical, slips, trips, and falls	Post area as required, maintain minimum number of personnel in area, hearing protection as required, PPE as required, monitor air as required, lock out tag out as required
Water management	Noise, chemical (organic), slips, trips, and falls	Post area as required, maintain minimum number of personnel in area, hearing protection as required, PPE as required, and monitor air as required

Level of Personal Protective Equipment:	Primary (D)		Contingency ©	
	Primary	(Write type Here⇓:)	Contingency	Write Type Here⇓:)
Respiratory Protection:	Y ( ) N (x)		Y (x) N ( )	Level C full face with organic vapor/HEPA filter cartridge. Not for use with vinyl chloride or benzene. Upgrade PPE as required by monitoring results.
Protective Clothing:	Y ( ) N (x)		Y (x) N ( )	Chemical resistant Tyvek
Head Protection:	Y ( ) N (x)		Y (x) N ( )	Hard hat
Eye Protection:	Y (x) N ( )	Safety Glasses	Y (x) N ( )	Full face respirator
Foot Protection:	Y (x) N ( )	Safety Shoes	Y (x) N ( )	Safety shoes with shoe covers
Hand Protection:	Y ( ) N (x)		Y (x) N ( )	Nitrile gloves
Hearing Protection:	Y (x) N ( )	Ear plugs	Y (x) N ( )	Ear muffs
Tape-up Required:	Y ( ) N (x)		Y (x) N ( )	At sleeves and legs

9.0 HAZARD ANALYSIS

9.1 Chemicals (Contact Waste Management at ext #4526 or #5117 for disposal instructions.)

Tasks 1, 3

Specific labeling requirements of site-generated waste: Untreated groundwater shall be containerized, labeled, and held for proper disposal. Decontamination and waste sample fluids shall be containerized and held for proper disposal. Waste Management shall be contacted to determine segregation and labeling requirements.

Chemical-specific disposal requirements: Treated groundwater from system may be disposed of via the six inch effluent line to site storm drainage. Untreated groundwater shall be containerized and sampled to determine disposal methodology. Liquid wastes shall be segregated from solid waste. Waste Management will be contacted for disposal requirements.

9.2 Fire/Explosion

Tasks: 1, 2, 3

Are flammable liquids present? No

Description NA
Location NA
Quantity NA
Containment/Storage method NA

For welding, cutting, or brazing a Welding Permit is required.

9.3 Confined/Enclosed Spaces

(see Confined Space Entry Procedures, MD-10286, Operation # M-11)

Tasks: 1, 2, 3

Confined/enclosed space entry required? No

Confined Space Entry Permit issued? No

Hazard Class A _____ B _____ C _____

Reason for Hazard Class selection: NA

9.4 Ionizing Radiation

Task Number(s): 1, 2, 3

Is a Radiation Work Permit (RWP) required? No
(If yes, then attach RWP to this SS-HASP.)

Primary contaminating isotope(s) NA

Location on site OU-1 Building 300 and contents, Well 412, Well 413 and Well 414

Radiation type NA

Contamination NA Bulk/Volume NA Surface

BULK	SURFACE (limits for release of material are in MD-80036, Operation 90014)
_____ pCi/g _____ Isotope	_____ dpm/100cm² alpha removable
_____ pCi/g _____ Isotope	_____ dpm/100cm² alpha total
_____ pCi/g _____ Isotope	_____ dpm/100cm² beta removable
_____ pCi/g _____ Isotope	_____ dpm/100cm² beta removable
☐ To Be Determined	☐ To Be Determined

Airborne contamination concentration NA µCi/ml

Health Physics coverage No (If yes, then specify requirements on RWP.)

Special task operation requirements

NA Soil Disturbance
NA Grinding/chipping
NA Hydraulic/air hammer operation
NA Dusty conditions (sweeping, vacuuming, etc.)
NA Equipment decontamination/free release
NA Welding/cutting/brazing

9.5 Electrical Hazards

Tasks 1, 2, 3

Electrical shock Hazard? Yes

Answer YES if any of the below are checked:

_____ Over head power lines within 10 feet.
_____ Underground electrical lines.
__✔__ Concealed lines in walls, conduits, ceilings, etc.
__✔__ Electrically powered tools being used outdoors or near standing water.
__✔__ Power tools being used near recognized grounding surfaces, such as metal tanks, pipelines, or grounded floors.
_____ Portable generators being used.
_____ High-Voltage (>100 Kv) electrical transmission lines nearby

Location of Hazard: Work site

480 3ph and 120 1ph 60HZ Voltage

Abatement:

__✔__ Have appropriate scans been performed?
__✔__ Are Ground Fault Circuit Interrupters (GFCI) in use with work involving portable hand tools, outdoor work, or with portable generators?
__NA__ Have portable generators been properly grounded?
__NA__ Have procedures been implemented to assure that equipment or materials do not come within 10 feet of overhead power lines?

9.6 Temperature Extremes

A. HEAT STRESS: Upon notification by the Industrial Hygiene department of the current Heat Stress Index for acclimatized workers, the following work regimens will take immediate effect:

Work--Rest Regimen each Hour	Work Load		
	Light	Moderate	Heavy
Continuous work	30.0 (86)	26.7 (80)	25.0 (77)
75% -- 25 %	30.6 (87)	28.0 (82)	25.9 (78)
50% -- 50%	31.4 (89)	29.4 (85)	27.9 (82)
25% -- 75%	32.2 (90)	31.1 (88)	30.0 (86)

Values given in C° (F°) Wet Bulb Globe Temperature

B. COLD STRESS: Threshold Limit Values Work/Warm-up Schedule for a Four-Hour Shift

Air Temp–Sunny Sky		No Noticeable Wind		5 MPH Wind		10 MPH Wind		15 MPH Wind		20 MPH Wind	
°C (approx)	°F (approx)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26 to -28	-15 to -19	Norm	1	Norm	1	75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	Norm	1	75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5		
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5				
-38 to -39	-35 to -39	40 min	4	30 min	5						
-40 to -42	-40 to -44	30 min	5								
-43 & below	-45 & below	NON-EMERGENCY WORK SHALL CEASE									

1. Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods of ten (10) minutes in a warm location and with an extended break (e.g., lunch) at the end of the 4-hour work period in a warm location. For light-to-moderate work (limited physical movement); apply the schedule one step lower. For example, at -35° (-30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available; 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

3. If only the wind chill cooling rate is available, a rough rule-of-thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m2; 2) all non-emergency work should gave ceased at or before a wind chill of 2250 W/m2. In general, the warm-up schedule provided above a slightly under compensates for a wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder range because windy conditions rarely prevail at extremely low temperatures.

4. TLVs apply only for workers in dry clothing.

9.7 Noise

Tasks 1, 2, 3

Noise Extremes? Yes
Sound level TBD by IH dB(A)
Noise source(s): Air Stripper Blower
Hearing protection is required for Noise Levels above 85 dB(A).

Precautions(specify): IH will monitor noise levels. If noise level is ≥ 85 dBA a hearing protection zone will be established. Hearing protection will be required for all personnel entering any hearing protection zone.

9.8 Sanitation

Tasks 1, 2, 3

Potable Water Required?	No
Non-Potable Water Used?	No
Eating, drinking, and smoking permitted?	No
Where?	
Toilet facilities required?	No
Location and number:	
Washing facilities required?	Yes, only when decontamination required.
Location: Work site	Portable equipment will be supplied.
Change rooms required?	No
Specify:	

9.9 Biological Hazards

Evaluate the work site, do any of the following conditions exist?

Poisonous Plants?	No
Insects?	Yes
Snakes?	Yes
Animals?	Yes, Rodents

Workers known to be allergic to any of the above? No

Precautions taken: Workers shall avoid contact with snakes and rodents. Insect repellant can be used as necessary.

Any evidence of Medical Waste present? No

Sewage outlets present? No

Precautions taken to prevent exposure: NA

10.0 MEDICAL SURVEILLANCE

OFF-SITE CONTRACTORS AND PERSONNEL:

Documentation is needed prior to a contractor being assigned work with possible exposure to hazardous material. A written opinion from the contractor's examining physician is required as regards their employee's fitness and include the following:

1. Any medical condition that would place the employee at increased risk.
2. Recommend any limitations upon employee's assigned work.
3. Results of the medical examination and tests.
4. A statement that the employee has been informed by the examining physician of the results of the medical examination signed by the employee and physician.

The written opinion shall not contain any specific finding of a diagnosis unrelated to the occupational exposures.

Are these documents attached as an appendix to this SS-HASP? No

If not state the reasons why? Due to variability in personnel that will be involved, the aforementioned documents will remain separate. However, the documents must be presented and turned into Mound Occupational Medicine Department prior to entering a HAZWOPER site.

Have these documents been turned into Mound's Occupational Medicine Department? Yes

11.0 WORKER TRAINING REQUIREMENTS

All workers at Mound HAZWOPER projects are required, at a minimum, to have the following training:

Rad Worker II (classroom and practical),
Respirator Fit Test and training,
Health Physics orientation of the site, and
HAZWOPER Training:

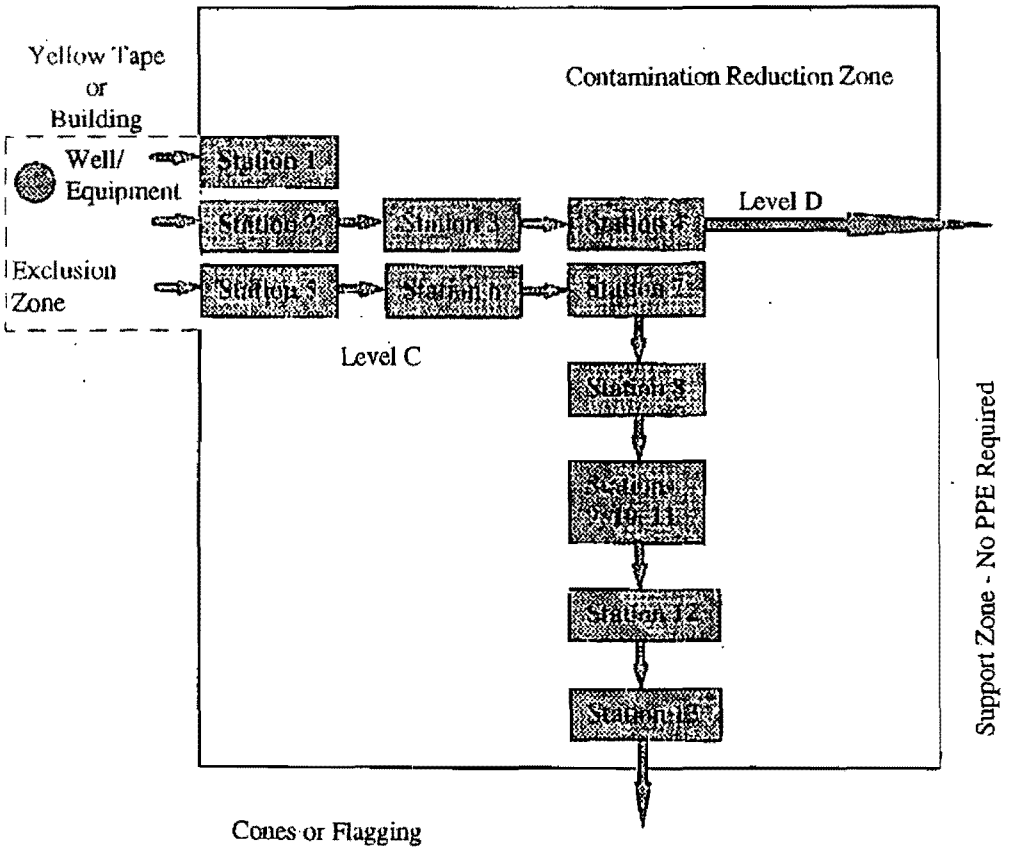
Site Workers: 40 hour plus three day field experience
24 hour plus one day field experience (see HAZWOPER Coordinator.)

Supervisors: Base 40 plus three day field experience and an additional 8 hour Site Supervisor training.

12.0 DECONTAMINATION

12.1 DECONTAMINATION DIAGRAM
(Must be drawn out for easy use.)

This diagram is for use only when Level C PPE is required.



12.2 DECONTAMINATION DESCRIPTION
(Must be written out for easy use.)

Station #	Purpose	Procedures
1	Decontamination of equipment	Place equipment on plastic sheets or in metal or plastic tubs to collect decontamination water.
2	Decontamination of PPE and equipment from a Level D work area (stations 2-4)	Place equipment and sample containers on a plastic sheet.
3	Glove removal	Remove gloves and dispose of in a labeled container.
4	Glove wash	Thoroughly wash hands and face in fresh potable water.
5	Segregate equipment	Deposit equipment used on-site (tools, sampling devices, containers, monitoring instruments, radios, Clipboards, etc.) On plastic drop cloths or in different containers with plastic liners. Segregation At the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
6	Boot cover and glove wash	Scrub outer boot covers and gloves with decon solution or detergent and water.
7	Boot cover and glove rinse	Rinse off decon solution from Station 2 using copious amounts of water.
8	Tape removal	Remove tape around boots and gloves and deposit in container with plastic liner.
9	Boot cover removal	Remove boot covers and deposit in container with plastic liner.
10	Outer glove removal	Remove outer gloves and deposit in container with plastic liner.
11	Suit disposal	Dispose of suit in labeled container.

12	Canister or mask change	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, and joints are taped. Worker returns to duty.
13	Inner glove removal	Wash inner gloves with decon solution.

13.0 EMERGENCY PREPAREDNESS

From the SITE MAP: be familiar with the site work zones, evacuation routes, and safe refuges for workers in case of emergencies.

PERSONAL ROLES AND RESPONSIBILITIES

Name	Role	Phone
Ken Hacker Project Manager	Overall responsibility of Project	Office: (937) 865 - 5132 Cell Phone: (937) 371 - 7293
Mark Spivey Project Field Engineer	Project compliance/coordination Field change orders	Office: (937) 865 - 5132 Cell Phone: (937) 371 - 7293
Jim Fontaine Mound Waste Management		Office: (937) 865 - 3189
Jared Wills Site Health &Safety Coordinator	Verify compliance with SS-HASP	Office: (937) 865 - 4372
Tim Eilers Mound IS&H	Industrial Hygiene Representative	Office: (937) 865 - 5592
Jared Wills Mound IS&H	Industrial Safety Representative HAZWOPER Coordinator	Office: (937) 865 - 4372
Dave Wirkus Mound Radiological Operations	Radiological Control Technician	Office: (937) 865 - 4498 Pager: (937) 341 - 1349

13.0 EMERGENCY PREPAREDNESS

From the SITE MAP: be familiar with the site work zones, evacuation routes, and safe refuges for workers in case of emergencies.

PERSONAL ROLES AND RESPONSIBILITIES

Name	Role	Phone
John Price Project Manager	Overall responsibility of Project	Office: (937) 865 - 3954 Pager: (888) 793 - 1092
Mark Spivey Project Field Engineer	Project compliance/coordination Field change orders	Office: (937) 865 - 3709 Cell Phone: (937) 371 - 7292
Dan Kapsch Mound Waste Management		Office: (937) 865 - 4207
Sheila Willis Site Health &Safety Coordinator	Verify compliance with SS-HASP and JSHA	Office: (937) 865 - 4770 Pager: (937) 341 - 4765
Sheila Willis Mound IS&H	Industrial Hygiene Representative	Office: (937) 865 - 4770 Pager: (937) 341 - 4765
Jared Wills Mound IS&H	Industrial Safety Representative HAZWOPER Coordinator	Office: (937) 865 - 4096 Pager: (937) 341 - 4793
Karen Kent Mound Radiological Operations	Radiological Point of Contact	Office: (937) 865 - 3429 Pager: (937) 341 - 2685

EMERGENCY CONTACTS: All emergency services ON-SITE (Building 34) call **911 or 865-4040**. Other emergency services may be reached at the telephone numbers shown below.

Security Police	865 - 3318
Ambulance/Fire	865 - 3313
Medical Clinic	865 - 3414
Doctor	865 - 3414
Sycamore Hospital	865 - 3791

EMERGENCY CONTACTS: All emergency services ON-SITE (Building 34) call **911 or 865-4040**. Other emergency services may be reached at the telephone numbers shown below.

Security Police	865 - 3318
Ambulance/Fire	865 - 3313
Medical Clinic	865 - 3414
Doctor	865 - 3414

14.0 RECORD KEEPING REQUIREMENTS

(Mark with an X as appropriate)	Required
Hazardous Chemicals	
Area monitoring	X
Personnel monitoring	X
Oxygen Level Measurements	
Flammability Measurements	X
Ionizing Radiation	
Worker dose	
Contamination levels	
Airborne contamination level	
Non-Ionizing Radiation	
UV level measurements	
Microwave level measurements	
Laser power level measurements	
Biological	
Personnel exposure monitoring	
Electrical	
Tag-out records	X
Noise	
Area monitoring	X
Personnel monitoring	X
Illumination	
Area foot-candle measurements	
Personnel Medical Monitoring	
Safety Incidents	
OSHA accident records	
Accident/incident reports	

	Required
Personal Protection Equipment	
Inspection of Clothing	X
Respirators	X
Gloves	X
Boots	
Waste Disposal Manifests	
Spill Incident Reports	X
Training of Employees	X
Emergency Response Training	
Confined Space Permit	
Welding Permit	
Excavation Permits	
Radiation Work Permit	
D&D Work Permit	

15.0 SIGN-IN SHEET AND TRAINING REQUIREMENTS

SIGNATURE AFFIRMS THAT THE WORKER HAS BEEN BRIEFED OR HAS READ THE SS-HASP AND UNDERSTANDS THE HAZARDS AND INFORMATION CONTAINED WITHIN. ALL ON-SITE WORKERS AND VISITORS MUST READ AND SIGN THIS SHEET BEFORE SITE ENTRY CAN BE PERMITTED. THE SITE SUPERVISOR MUST VERIFY THAT THE TRAINING REQUIREMENTS HAVE BEEN MET AS OUTLINED IN SECTION 11.0 OF THIS DOCUMENT!

	NAME	Date	HP # or SS #
1.		1/24	[redacted]
2.		1/24/97	[redacted]
3.		1-24-97	
4.		1-24/97	[redacted]
5.		1/24/96	[redacted]
6.			[redacted]
7.		1/24/97	
8.		1/24/97	[redacted]
9.		1-24-97	[redacted]
10.		2-3-97	[redacted]
11.		3-20-97	[redacted]
12.		3-20-97	[redacted]

	NAME	Date	HP # or SS #
13.		3-7-97	[redacted]
14.		6-9-97	[redacted]
15.		6-9-97	[redacted]
16.		6-9-97	[redacted]
17.		6-9-97	[redacted]
18.		7-21-97	[redacted]
19.		7/21/97	[redacted]
20.		7/21/97 3/23/97	[redacted]
21.		3/25/99	[redacted]
22.		9/1/99	[redacted]
23.		12/00	[redacted]
24.			

RCT Annual Survey