INSTRUCTION MANUAL

VILTER®

Since 1867

Manufacturers of Industrial Refrigeration
and Gas Compression Equipment

Evaporative Condenser

VSA & VSC Models

Part # 35391W
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Replaces10-98

VILTER MANUFACTURING CORPORATION

VSA & VSC Evaporative Condenser

OPERATING AND MAINTENANCE INSTRUCTIONS

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VILTER MANUFACTURING CORPORATION

VSA & VSC Evaporative Condenser

VILTER VSA and VSC equipment has been designed to give long, trouble-free service when properly installed, operated and maintained. To obtain optimum performance and maximum service life, it is important that a program of regular inspection and maintenance be developed and carried out. This bulletin is published as a guide to establishing such a program.

Included in this bulletin are the recommended services for start-up, operation, and the approximate frequency for each.

NOTE:
The recommendations on frequency of services are minimum. When operating conditions are severe, the services should be performed more often.

For each required service, follow the procedures outlined under the "Maintenance Procedures" section of this bulletin. A copy of the unit certified drawing should be available for reference. If you do not have a copy of this drawing, or if you need additional information about operation or maintenance not covered in this bulletin, contact the local Vilter Sales Office.

TABLE 1. RECOMMENDED MAINTENANCE SERVICES FOR VSA & VSC SERIES EQUIPMENT

TYPE SERVICE	START-UP	MONTHLY	EVERY 6 MONTHS	SHUT DOWN	ANNUALLY
Inspect General Condition of Unit	X	X			
Clean Debris from Unit	X	X		X	
Clean and Flush Sump	X	X		X	
Clean Sump Strainer	X	X		X	
Check and Adjust Sump Water Level	X	X			
Inspect Heat Transfer Section	X	X			
Inspect Spray Nozzles	X	X			
Check and Adjust Fan Belt Tension	X	X			
Check and Adjust Bleed Rate	X	X			
Check Operation of Make-Up Valve	X	X			
Check Unit for Unusual Noise or Vibration	X	X			
Check Fan Bearing Locking Collars	X		X		
Check Motor Voltage and Current	X		X		
Lubricate Fan Shaft Bearings	X		X	X	
Lubricate Fan Motor Bearings	X				
Lubricate Motor Base Adjusting Screw	X		X	X	
Check Fan for Rotation Without Obstruction	X				
Check Fan and Pump Motor for Proper Rotation	X				
Drain Sump and Piping				X	
Inspect Protective Finish					X

! ! ! WARNING ! ! !

The recirculating water system may contain chemicals or biological contaminants, which could be harmful if inhaled or ingested. Accordingly, personnel who may be exposed directly to:

1) discharge airstream and the associated drift mists generated during operation of the water distribution system and/or fans,
2) mists generated by high pressure jets or compressed air (should these be used to clean portions or components of the recirculating water system),

should wear respiratory protection equipment approved for use by OSHA and/or local occupational safety health authorities.

Please refer to Section V-A for further information on Biological Control.

I. OPERATION AND MAINTENANCE

CAUTION
Before performing any maintenance or inspection, make certain that all power has been disconnected and locked in the off position.

A. Safety

All electrical, mechanical, and rotating machinery constitute a potential hazard, particularly for those not familiar with its design, construction, and operation. Accordingly, adequate safeguards (including use of protective enclosures where necessary) should be taken with this equipment. This is necessary to protect the public from injury and to prevent damage to the equipment, its associated system, and the premises.

Depending upon site conditions, it may be necessary to install bottom air inlet screens, ladders, safety cages, stairways, access platforms, and handrails/toeboards for the safety and convenience of authorized service and maintenance personnel.

At no time should this equipment be operated without all fan screens, access panels, and access doors in place.

The operation, maintenance, and repair of this equipment should be undertaken only by personnel qualified to do so. All such personnel should be thoroughly familiar with the equipment, the associated system and controls, and the procedures set forth in this manual. Proper care, procedures, and tools must be used in handling, lifting, installing, operating, maintaining, and repairing this equipment to prevent personal injury and/or property damage.

For the protection of authorized service and maintenance personnel, each fan and pump motor associated with this equipment should be installed with a lockable disconnect switch located within sight of the evaporative condenser. No service work should be performed on or near the fans, motors, and drives or inside the unit without first ensuring the fan and pump motors have been disconnected and locked out.

CAUTION

The PVC eliminators used are NOT designed to support the weight of a person, or to be used as a storage or work surface for any equipment or tools. Misuse of these plastic eliminators as a walking, working, or storage surface may result in injury to personnel or damage to equipment.

B. Warranties

Please refer to the Limitation of Warranties applicable to and in effect at the time of sale/purchase of these products.

C. Freeze Protection

These products must be protected by mechanical and operational methods against damage and/or reduced effectiveness due to possible freeze-up. Refer to the Cold Weather Operation guidelines (page 10) or contact the local Vilter Sales Office for recommended protection alternatives.

II. INITIAL AND SEASONAL START-UP

Before initial start-up or after a shutdown period, the unit should be thoroughly inspected and cleaned.

1. Clean any debris from inlet air screens, fans, eliminators, heat transfer sections, and cold water basin.

2. Drain the cold water sump (with sump strainers in place) and flush to remove accumulated dirt.

3. Remove, clean, and replace sump strainers.

4. Turn the fan by hand to ensure rotation without obstruction.

5. Check the locking collar on each fan bearing assembly and tighten as required.

6. Check and, if necessary, adjust the fan belt tension.

7. Prior to seasonal start-up, lubricate the fan shaft and motor bearings. The ball bearings are factory lubricated, but should be relubricated if the unit has been sitting on site for more than a year before start up.

8. Check float operated make-up valve to be sure it is operating freely.

9. Fill the cold water sump with fresh water to the overflow level.
   a) At the initial start up or before restart up where the sump was completely drained, the initial biocide treatment should be applied at this time.
   b) Following a shutdown period where the sump was not completely drained; it is recommended that an initial shock treatment of appropriate biocides be administered at restart to eliminate accumulated biological contaminants.

10. Set the float on the make-up valve to shut off the valve when the float is approximately ½" (12.7 mm) below the overflow level.

11. Start the pump and check for the proper rotation as indicated by the arrow on the pump cover. On installations where the unit pump was not furnished by the factory, a globe valve should be installed in the pump discharge line and the pump flow rate adjusted to the correct water flow.

12. Inspect spray nozzles and heat transfer section.

13. Start the fan and check for the proper rotation as indicated by the arrow on the fan housing.

14. Check the voltage and current of all three legs of the fan pump motors. The current should not exceed the nameplate rating. After prolonged shutdowns, the motor insulation should be checked with a meger insulation tester prior to restarting the motor. To prevent motor overload, do not operate fan motor without design water flow over unit.

15. Check the bleed system to be sure it is fully functional and the bleed rate has been properly adjusted prior to putting the unit into operation.

A. After 24 hours

After 24 hours of operation under load, the following services should be performed.

1. Check the unit for any unusual noise or vibration.

2. Check the operating water level in the cold water sump.

3. Readjust the fan belt tension.

4. Inspect spray nozzles and heat transfer section.

B. Operation

During operation, the unit should be inspected, cleaned, and lubricated on a regular basis. The required services and recommended frequency for each are summarized in Table 1 on page 2 of this manual.

C. Seasonal Shutdown

The following services should be performed when the unit is to be shutdown for a prolonged period:

1. Drain the cold water sump and all piping that will be exposed to freezing temperatures.

2. Clean and flush the cold water sump with the sump strainers in place. Leave the drain open so rain and melting snow will drain from the unit.

3. Clean the sump strainers and reinstall.

4. Lubricate the fan shaft and motor bearings, motor base, and motor base adjusting screw.

5. Close shut-off valve in water make-up line and drain all exposed make-up piping.

6. Inspect the protective finish on the unit. Clean and refinish as required.

III. MAINTENANCE PROCEDURES

A. Cold Water Sump

The cold water sump should be inspected regularly. Any trash or debris, which may have accumulated in the sump or on the strainer, should be removed.

Each month, the entire cold water sump should be drained, cleaned, and flushed with fresh water to remove the silt and sediment which

normally collects in the sump during operation. If not removed periodically, this sediment can become corrosive and cause deterioration of the protective finish. When flushing the sump, the strainers should be left in place to prevent the sediment from re-entering the system. After the sump has been flushed, the strainers should be removed, cleaned, and replaced before refilling the sump with fresh water.

CAUTION
Do not use acid to clean the strainers.

The operating water level in the cold water sump will vary with system thermal load (evaporation rate), the bleed rate employed and the make-up water supply pressure. Because the typical winter load is less than the summer load, the winter evaporation rate is frequently less than the summer evaporation rate. With this reduced evaporation rate in winter, the water level in the cold water sump will increase unless the float is readjusted. The operating water level should be checked monthly and the float readjusted as necessary to maintain the recommended operating level. The water level in the sump of equipment designed for remote sump operation is a function of the circulating water flow rate, water outlet connection size, quantity and location, and outlet piping size and configuration. The remote sump is supplied without a water make-up assembly, and the sump operating level during remote sump operation is not adjustable.

B. Make-Up Valve

A float operated water make-up assembly is furnished as standard equipment on all VSA & VSC Series equipment unless the unit has been ordered with the optional electric water level control package or for remote sump application.

The make-up assembly should be inspected monthly and adjusted as necessary. The valve itself should be inspected for leakage and the valve set replaced, if necessary.

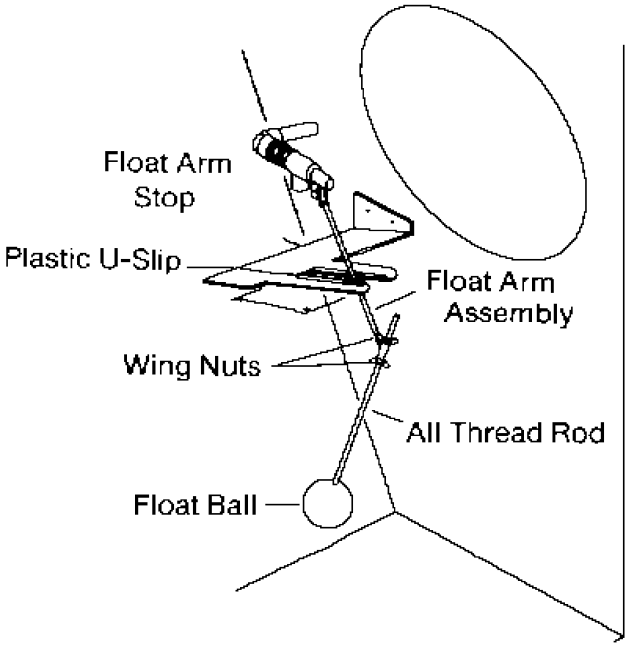


FIGURE 1. WATER MAKE-UP VALVE ASSEMBLY

The make-up water supply pressure should be maintained between 15 and 20 psig (103.42 and 344.74 kPa) for proper operation of the valve. To make the initial sump water level setting, adjust the wing nuts so the make-up valve is completely closed when the cold water level is ½" (12.7 mm) below the overflow connection. Under design thermal load and with average water pressure of approximately 15 to 50 psig (103.42 to 344.74 kPa) at the valve, this setting should produce the desired operating water levels. Refer to Table 2. It should be noted that if the thermal load is less than the design load at the time of start-up, this procedure may produce operating levels greater than desired. It may be necessary to readjust the float in order to attain the desired operating level. The unit sump should be closely monitored and water level adjusted as necessary during the first 24 hours of operation.

As an option, an electric water level control package is available in lieu of the above described mechanical make-up assembly. The

package consists of a probe-type liquid level control assembly and a slow closing solenoid valve. Stainless steel electrodes, factory set at predetermined lengths, extend from a NEMA 4 electrode holder into the cold water sump.

TABLE 2. OPERATING WATER LEVEL

MODEL NO.	OPERATING HEIGHT (measured from pan bottom)
AXIAL FANS	
VSA-142 thru VSA-288	16" (40.64 cm)
VSA-261 thru VSA-323	18" (45.72 cm)
VSA-315 thru VSA-491	20" (50.8 cm)
CENTRIFUGAL FANS	
VSC-30 thru VSC-65	13" (33.02 cm)
VSC-72 thru VSC-135	14" (35.56 cm)
VSC-150 thru VSC-470	18" (45.72 cm)

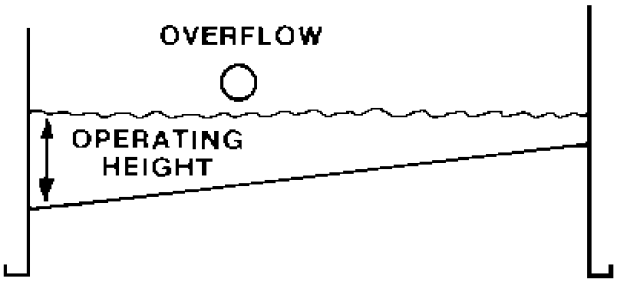


FIGURE 2. OPERATING WATER LEVEL

These electrodes should be periodically wiped clean to prevent accumulations of scale, corrosion, sludge or biological growth from interfering with the electrical circuit. The water level is maintained at the recommended operating level regardless of the system thermal load. It is not necessary, nor is it recommended, that the operating level be adjusted. During initial and seasonal start-up, the probe-type level control assembly should be bypassed to fill the cold water sump to approximately ½" (12.7 mm) below the overflow connection.

Unit operation at the recommended water level will ensure the unit sump contains sufficient water volume to prevent air entrainment in the circulating pump during system start-up. This will also provide sufficient excess sump capacity to accept the total system pull down volume. The total system pull down volume is the quantity of water suspended in the condenser during pump operation plus that contained in the water distribution system, external piping and any heat exchangers which could drain to the sump when the circulating pump is shut down.

C. Fan Shaft Bearings

The fan shaft is supported at each end by ball bearings, each equipped with a lubricating fitting and locking collar. The VSC Models also have a sleeve bearing (see Figure 3) located midway on the shaft.

1. Ball Bearings

   Under normal operating conditions, the bearing should be greased every 2000 operating hours, or at least every six months. The bearings should also be greased at seasonal start-up and shutdown. Lubricate the bearings with one of the following water resistant inhibited greases which are good for ambient temperatures ranging from -65°F (-53.9°C) to +250°F (121.1°C).

TABLE 3. WATER RESISTANT INHIBITED GREASES

American	- Rycon Premium #3
Exxon	- Beacon #325
Shell	- Aeroshell #7
Mobil	- Mobilgrease #28
Chevron	- SRI #3
Keystone	- 84EP Light

   The bearings should be lubricated with a hand grease gun. Do not use high pressure grease guns as they may rupture the bearing seals. When lubricating, purge old grease from the bearing by gradually adding grease until a bead of new grease appears at the seal.

   The axial fan condensers have extended lube lines, which extend from the bearing to the fan cylinder.

2. Sleeve Bearing – Centrifugal Fans Only

Prior to start-up and during the first week of operation, the bearing oil cup must be refilled several times with an industrial type mineral oil (see Table 3) to saturate the felt wick in the bearing reservoir. After the initial start-up, fill the bearing oil cup every 1,000 operating hours or at least every six months. When ambient temperatures below 0°F (-17.8°C) are expected, a light oil must be used. With such light oils, the bearing oil cup should be checked and refilled several times during the first several hours of operation until the bearings reach operating temperature.

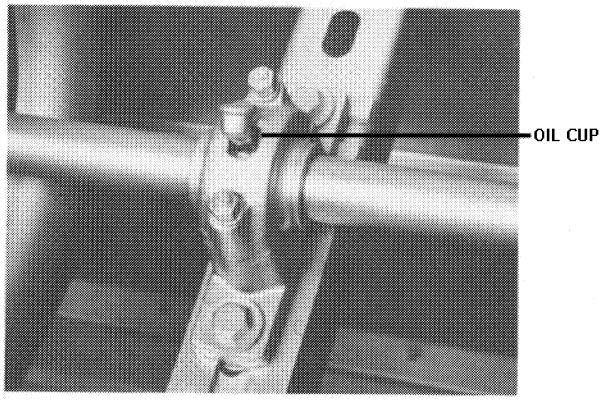


FIGURE 3. SLEEVE BEARINGS

TABLE 4. SLEEVE BEARING LUBRICANTS

TEMP AMBIENT	TEXACO	EXXON
70° to 110°F (21.1° to 43.3°C)	Regal R&O 320	Teresstic 220
30° to 70°F (-1.1° to 21.1°C)	Regal R&O	Teresstic 100
5° to 30°F (-15° to -1.1°C)	Regal R&O	Teresstic 32
-25° to +5°F (-31.7° to -15°C)	Capella 32	

CAUTION

Do not use oils containing detergents for bearing lubrication. Detergent oils will remove the graphite in the bearing sleeve and cause bearing failure. Also, do not disturb bearing alignment by tightening bearing cap adjustment on a new unit, as they are torque adjusted at the factory.

3. Fan Motor Bearings

All ODP and TEFC fan motors have re-greasable bearings. The motor bearings should be lubricated as recommended in the motor manufacturer's operating instructions.

4. Locking Collars

Each eccentric locking collar should be checked every six months to ensure that the inner bearing race is secured to the fan shaft. The locking collar can be set using the following procedure (see Figure 4).

a) Loosen the set screw.
b) Using the drift pin or center punch, tap the collar (in the hole provided) tangentially in the direction of rotation while holding the shaft.
c) Retighten the set screw.

5. Adjustable Motor Base

The motor base hangers, hinges and adjusting screw (see Figure 5a & 5b) should be coated twice a year using a good quality corrosion inhibiting grease, such as one of those recommended for lubricating the fan shaft bearings (see Table 3).

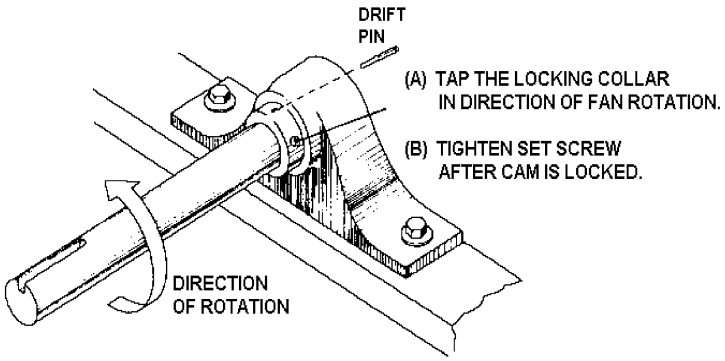


FIGURE 4. LOCKING COLLAR ASSEMBLY

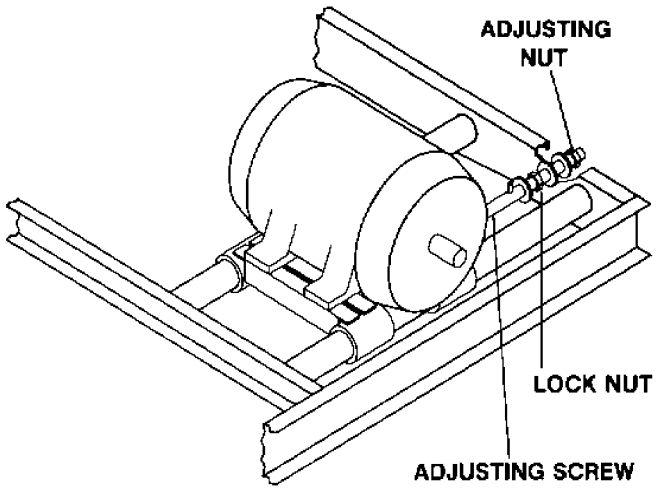


FIGURE 5a. ADJUSTABLE MOTOR BASE (CENTRIFUGAL FAN)

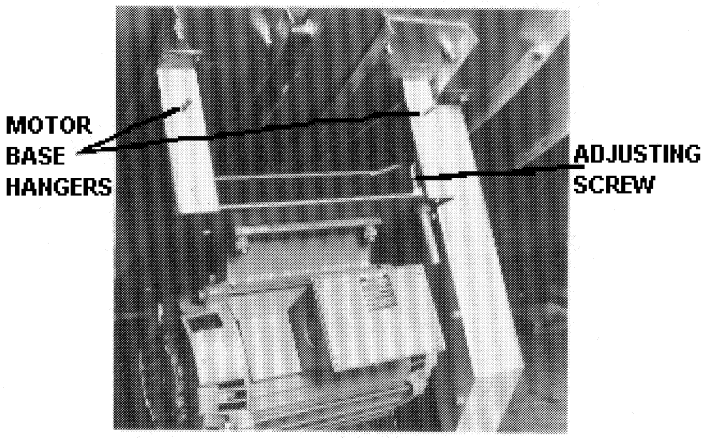


FIGURE 5b. ADJUSTABLE MOTOR BASE (AXIAL FAN)

6. Fan Belt Adjust

The fan belt should be checked and adjusted every month. To properly adjust the belt tension, position the fan motor so that a single belt will deflect ½" (12.7 mm) when moderate pressure of one finger is applied midway between the sheaves. To change position of the fan motor:

a) Loosen locking nut (see Figure 5a).
b) Rotate adjusting nut:
   ① clockwise to loosen belt tension
   ② counterclockwise to tighten belt tension
c) Tighten locking nut. Failure to do so may result in the motor base vibrating free, loosening the belt tension.

NOTE:
There should be no "chirp" or "squeal" when the fan motor is started.

The drive alignment should be checked annually to ensure maximum belt life. This can be done by placing a straight edge across both sheaves as shown in Figure 6.

When the drive is properly aligned, the straightedge will contact all four points as indicated. If realignment is necessary, loosen the motor sheave and align it with the fan sheave. Allow approximately ¼" (6.35 mm) for draw-up as the motor sheave is pulled tight on the bushing, then retighten the bushing screw.

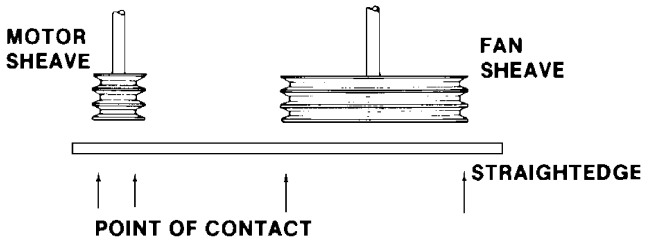


FIGURE 6. CHECKING SHEAVE ALIGNMENT

7. Spray Nozzles and Heat Transfer

The spray nozzles and heat transfer section should be inspected and cleaned each month. The inspection procedure is as follows:

a) Shut off the fan, but leave the pump running.
b) Remove the eliminators.

c) Check to see if the nozzles are producing the spray pattern shown in Figure 7.
d) Check any nozzles that are clogged. If necessary, the nozzle and rubber grommet may be removed for cleaning.
e) Inspect the coil or wet deck surface. Any corrosion, damage or obstructions must be corrected.
f) Some units are provided with an extended surface coil. In the winter season when ambient temperature is well below design, units with this coil can operate with the spray pump off. The coil is designed for seasonal dry operation followed by seasonal wet operation, and NOT for frequent cycling of the spray pump. Frequent spray pump cycling may lead to excessive scale buildup.

NOTE:
Do not use steam or high pressure water to clean Condenser surfaces, other than steel.

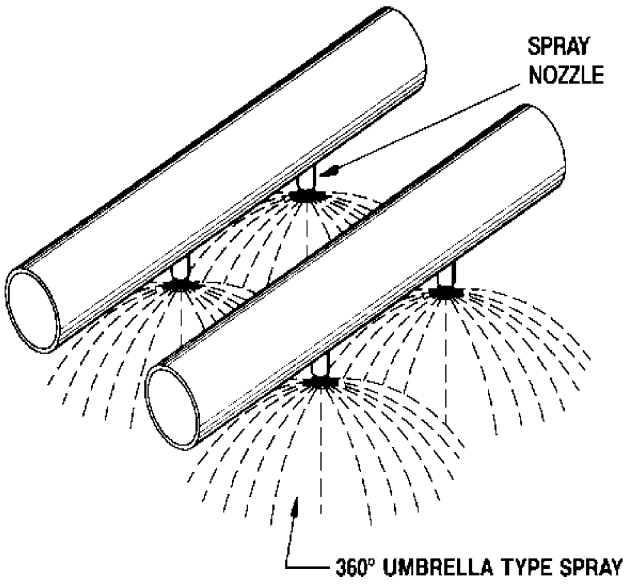


FIGURE 7. NOZZLE SPRAY DISTRIBUTION

IV. CORROSION PROTECTION

VSA & VSC Series units are constructed entirely of corrosion resistant materials. The eliminators are made of polyvinyl chloride (PVC) which requires no protection against rot, decay, rust, or biological attack. The coil of the VSA & VSC Series Evaporative Condenser is constructed of all prime surface steel and hot-dip galvanized after fabrication. The balance of the construction in all units is heavy gauge galvanized.

A. Galvanized Steel Construction

The standard VSA & VSC Series Evaporative Condensers are constructed of hot-dip galvanized steel. These units should be inspected annually.

Inspect the inside of the condenser for blemishes or corrosion on the galvanized steel. Affected areas should be thoroughly wire brushed and recoated with ZRC (zinc-rich compound).

B. Cold Weather Operation

VSA & VSC Series Evaporative Condensers can be operated in sub-freezing conditions provided the proper measures are taken:

1. Protection against pan water freezing when the unit is idle.

2. Capacity control to prevent ice formation in heat transfer section during operation.

3. Protection against coil freezing when used as a fluid cooler section.

Cold weather applications should be reviewed with the Vilter representative in your area to ensure that the unit selection, location, control, and accessories are adequate for reliable operation. Listed below are general guidelines that should be followed to minimize the possibility of freeze-up.

C. Protection Against Pan Water Freezing

When the unit is shut down and exposed to sub-freezing ambient temperatures, the pan water may freeze. A remote sump located in a heated indoor area is a desirable method of freeze protection. Pan heaters (electric immersion heaters, steam coil, or hot water coil) can also be used to maintain the pan water at a minimum temperature of 40°F (4.4°C). In addition to protecting the cold water basin, all exposed water piping, including pump piping below the overflow level and make-up water lines should be traced with electrical heater tape and insulated.

1. Capacity Control

   It is necessary to prevent the circulating water from approaching freezing conditions when the unit is operating under load. Capacity control on the fan units may be achieved through fan cycling, capacity control dampers, or variable frequency drive motors. Variable frequency speed control offers the greatest protection and should be used for energy savings and close temperature control.

CAUTION

Rapid on-off cycling can cause the fan motor to overheat. It is recommended that controls be set to allow a maximum of six on-off cycles per hour.

Multiple fan motors serving a single coil, fill section, or fan section must be cycled simultaneously.

When two-speed motors are used, a 15 second time delay during switch down from high to low speed is required. This will avoid overloads on the low speed windings.

NOTE:

Variable frequency drives allow the unit to operate longer and with closer control than two-speed motors, and/or fan cycling.

V. CORROSION AND SCALE CONTROL

In evaporative condensers, cooling is accomplished by evaporation of a portion of the process water as it flows across the coils. As this water evaporates, the impurities originally present remain in the recirculating water. The concentration of the dissolved solids increase and can reach unacceptable levels. In addition, airborne impurities are often introduced into the recirculating water, intensifying the problem. If these impurities and contaminants are not effectively controlled, they can cause scaling, corrosion and sludge which reduce heat transfer efficiency and increase system operating costs.

The degree to which dissolved solids and other impurities build up in the recirculating water may be defined as the cycles of concentration. Specifically, cycles of concentration is the ratio of dissolved solids in the recirculating water to dissolved solids in the make-up water. For optimal heat transfer efficiency and maximum equipment life, the cycles of concentration should be controlled so the recirculating water is maintained within the guidelines listed below:

TABLE 5. CIRCULATED WATER QUALITY GUIDELINES FOR GALVANIZED STEEL

pH	7.90 to 9.0
Hardness as $CaCO_3$	30 to 500 ppm
Alkalinity as $CaCO_3$	500 ppm max.
Total Dissolved Solids	1000 ppm max.
Chlorides	125 ppm max.
Sulfates	125 ppm max.

In order to control the cycles of concentration so the above quantities are maintained, it will be necessary to "bleed" or "blowdown" a small amount of recirculating water from the system. The "bleed" water is replenished with fresh make-up water, limiting the build-up of impurities.

Typically, the bleed is accomplished automatically through a solenoid valve controlled by a conductivity meter. The conductivity meter set point is the water conductivity at the desired cycles of concentration and should be determined by a competent water treatment expert. The solenoid valve and conductivity meter must be supplied by others. In this arrangement, the rate of bleed can be adjusted using the valve in the bleed line and measured by filling a container of known volume while noting the time period. The bleed rate and water quality should be periodically checked to ensure that adequate control the water quality is being maintained.

The required continuous bleed rate may be calculated by the formula:

$$\text{Bleed Rate} = \frac{\text{Evaporation Rate}}{\text{Number of cycles of concentration - 1}}$$

Units having a galvanized steel construction and a circulating water pH of 8.3 and higher will require periodic passivization of the galvanized steel to prevent "white rust", the accumulation of white, waxy, non-protective zinc corrosion products on galvanized steel surfaces.

The evaporation rate can be determined by one of the following:

1. The evaporation rate is approximately 2 GPM (6.75 l/sec) per 1 million BTU/HR of heat rejection.
2. The evaporation rate is approximately 3 GPM (10.32 l/sec) per 100 tons of refrigeration.
3. Evaporation Rage = Water Flow Rate x Range x .001

EXAMPLE:
At a flow rate of 900 GPM (3039.12 l/sec) and a cooling range of 10°F (-12.2°C), the evaporation rate is 9 GPM (30.39 l/sec) (900 GPM x 10°F x .001 = 9 GPM).

NOTE:
For separate fluid cooling circuits, the flow rate to be used in this calculation is the flow through the coil.

If the site conditions are such that constant bleed-off will not control scale or corrosion and maintain the water quality within the guidelines, chemical treatment may be necessary. If a chemical water treatment program is used, it must meet the following requirements:

1. The chemicals must be compatible with galvanized (zinc coated) steel as well as all other materials used in the system (pipe, heat exchanger, etc.).
2. Chemicals to inhibit scale and corrosion should be added to the recirculating water by an automatic feed system on a continuously metered basis. This will prevent localized high concentrations of chemicals which may cause corrosion. It is recommended the chemicals be fed into the system at the discharge of the recirculating pump. They should not be batch fed directly into the cold water sump.
3. Acid water treatment is not recommended unless the unit(s) is constructed of stainless steel. Acid treatment can be used for stainless steel provided the requirements of paragraphs 1 and 2 above are maintained.

A. Biological Control

Bleed-off with or without chemical treatment for scale and corrosion control is *NOT* adequate for control of biological contamination. The growth of algae, slime, and other micro-organisms, if unchecked, will reduce system efficiency and may contribute to the growth of potentially harmful micro-organisms, including Legionella, in the recirculating water system.

Accordingly, a biocide treatment program specifically designed to address biological control should be initiated when the system is first filled with water and administered on a regular basis thereafter in accordance with the supplier's instructions. Liquid biocides may be added to the sump of the condenser in dilute form. If a solid form of biocide is used, it should be added to the system via a pot feeder. If ozone water treatment is used, ozone concentrations should not exceed 3-4 ppm in order to ensure maximum equipment life.

1. Start-Up Following a Shutdown Period

   To minimize the risk from biological contamination following a shutdown period, it is recommended that the entire system (condenser, system piping, heat exchangers, etc.) be drained when the system is to be shut down for more than 3 days. To resume operation of a drained system, clean out all debris (such as leaves and dirt), and refill the system with fresh water while operating the circulating pumps. Before operating the fans, execute one of the following alternative programs:

   a) Resume treatment with the biocide used before shutdown. Maintain the maximum recommended biocide residual (of the specified biocide) for a sufficient period of time, as recommended by the water treatment supplier, to bring the system under good biological control.

   b) Check the pH of the circulating water and, if necessary, adjust it 7.0 to 7.6. Then treat the system with sodium hypochiorite to maintain the level of 4 to 5 mg/i (ppm) free chlorine over a six (6) hour period. Test kits that can be used to measure the free residual chlorine are commercially available.

When it is not practical to drain the system often during shutdown periods, a bypass line with shut-off valves should be installed to permit the cooling water to be circulated through the system while bypassing the condenser coil. After each shut down of three (3) days or more, the system should be treated prior to restarting the condenser using one of the methods described above.

While circulating the treated cooling water through the entire system, the condenser coil should be bypassed and the fans kept inoperative. After the biocide residual has been maintained at the required level for at least (6) hours, the water can be directed over the coil and the condenser returned to service. The standard water treatment program (including the biological treatment) should be resumed at this time.

For specific recommendations on treatment for scale, corrosion, or biological control, consult a qualified water treatment consultant.

VI. RECOMMENDED SPARE PARTS

To order factory authorized parts, contact your local Vilter Sales Representative. Be sure to include the unit model and serial number when ordering any parts.

To facilitate servicing the unit, it is suggested that the following parts be carried on hand:

- ✓ Make-Up Float Ball
- ✓ Valve Seat for Make-Up Valve
- ✓ Fan Shaft Bearings
- ✓ Fan Wheel (Centrifugal models)
- ✓ Fan Belt(s)
- ✓ Fan Shaft
- ✓ Spray Nozzles and Grommets
- ✓ Spray Distribution Branch Grommets
- ✓ Access Door Gasket

VILTER MANUFACTURING CORPORATION

VSA & VSC Evaporative Condenser

RIGGING AND INSTALLATION INSTRUCTIONS

Table of Contents

I. INTRODUCTION

Series VSA & VSC Evaporative Condenser units should be rigged and installed as outlined in these instructions. These procedures should be thoroughly reviewed prior to the actual rigging operation to acquaint all personnel with the procedures to be followed and to assure that all necessary equipment will be available at the jobsite.

Locate the unit nameplate on the connection end of the unit and record the model number for reference.

Be sure to have a copy of the unit certified drawing available for reference. If you do not have a copy of this drawing, or if you need additional information about the unit, contact your local Vilter Sales Office.

A. Check Unit Before Rigging

When the unit is delivered to the jobsite, it should be checked thoroughly to ensure all required items have been received and are free of any shipping damage prior to signing the bill of lading. The following parts should be inspected:

- ⌘ Sheaves & Belts
- ⌘ Bearings
- ⌘ Bearing Supports
- ⌘ Fan Motors
- ⌘ Fan Wheels & Shafts
- ⌘ Wet Deck Surface
- ⌘ Coils
- ⌘ Water Distribution System
- ⌘ Strainers
- ⌘ Float Valve Assembly
- ⌘ Eliminators
- ⌘ Interior & Exterior Surfaces
- ⌘ Miscellaneous:

  If required for field assembly, the following parts will be packaged and usually placed inside the pan-fan section: Sealer, Self-Tapping Screws, and Accessory items. A checklist inside the envelope attached to one of the access doors and marked "For Rigger" indicates what miscellaneous parts were included and where they were packed. Be sure to remove all accessory items from the pan before the unit is assembled.

B. Unit Weights

Before rigging any Evaporative Condenser units, the weight of each section should be verified from the unit certified drawings.

CAUTION

These weights are approximate and should be confirmed by weighing before lifting when available hoisting capacity provides little margin for safety. In preparing a lift, individual responsible for rigging the units must inspect the equipment before the lift to make certain that all water or other liquids have been drained from the unit.

During cold weather, the pre-lift procedure must include a check for, and removal of, accumulations of ice and snow which will not naturally drain from the equipment and would add substantially to the equipment" lifting weight.

C. Anchoring

CAUTION

Unit must be properly anchored in place before operation begins.

Seven-eighths inch ($^{7}/_{8}$") (22.23 mm) diameter bolt holes are provided in the bottom flange of the pan section for bolting the unit to the support beams. Refer to the suggested support details on the certified drawing for locations of the mounting holes. Anchor bolts must be supplied by others.

D. Leveling

The unit must be level for proper operation. Support beams must also be level as shims should not be used between the pan and support beams to level the unit.

NOTE:

Operation, maintenance and repair of this equipment should be undertaken only by personnel qualified to do so. Proper care, procedures and tools must be used in handling, lifting, installing, operating, maintaining and repairing this equipment to prevent personal injury and/or property damage.

SAFETY: Adequate precautions, appropriate for the installation and location of these products should be taken to safeguard the public from possible injury, and the equipment and premises from damage.

Air inlet bottom screens or solid bottom panels may be desirable or necessary for safety and other reasons, depending on location and conditions at the installation site.

CAUTION

Units with PVC eliminators should not be covered with a clear plastic tarpaulin.

FREEZE PROTECTION: ***These products must be protected by mechanical and operational methods against damage and/or reduced effectiveness due to possible freeze-up.***

E. Rigging

To simplify rigging and installation, most units are shipped in sections consisting of the pan-fan assembly and one or more casing sections. Some smaller units ship fully assembled.

The unit table on page 10 gives the preferred method for rigging each section of the Evaporative Condenser unit. With the information from the table and the additional instructions on pages 4 through 7, rigging a unit can be quickly accomplished as follows:

CAUTION

Unless unit ships fully assembled, pan-fan and casing components must be rigged separately. Never assemble the unit before lifting, as the lifting devices provided are not designed to support the weight of the entire assembled unit.

The proper rigging sequence for the Series VSA & VSC units is to lift the pan-fan section into place, apply sealer to the pan where the casing(s) will be located, and then lift the casing(s) into place. For a fully assembled unit, only one lift is required. Lifting devices have been provided on all sections.

Spreader bars the full width of the section must be used between the lifting cables to prevent damage to the section. The use of safety slings is recommended whenever hazards exist.

- ❑ Refer to the unit table and locate the model number of the unit to be rigged. Following the model numbers are the type and number of sections to be rigged; pan rigging method with required spreader bar length and minimum allowable vertical distance “H” from the lifting devices to the rigging hook, sealing method, casing rigging method with spreader bar length and minimum “H”, and the correct eliminator placement.

- ❑ Rig the pan-fan section by the method shown in the unit table.

CAUTION

Before proceeding to the next operation, bolt the section securely to the supporting steel.

❑ Apply sealer to the flanges where the casing is to be located. Again, refer to the unit tables for proper method.

❑ Rig the casing section(s) by the method in the unit tables, ensuring correct mounting hole alignment with the pan-fan section.

❑ Complete the final assembly details outlined on page 7. For correct placement of the eliminators, refer to the unit table.

II. SEALING METHODS

1. Rig pan-fan section. Bolt section securely to the supporting steel before proceeding to the next step.

2. Remove any protective wood from the top horizontal flanges of pan-fan section. Wipe down the flanges to remove dust, dirt, or moisture that may have accumulated during shipment and storage.

3. Apply the 2" (25.4 mm) flat (trapezoidal cross section) tape sealer around the periphery of the top flange of the pan-fan section as shown in Figure 1. This tape sealer must be centered directly over the centerline of the end flanges where there are no tapper holes.

NOTE:
Tape Sealer is trapezoidal in shape and must be installed wide side down (see Figure 2).

4. Sealer applied to the end flanges of a single cell section unit and to the end and center flanges of two cell units must be continuous. The sealer is to be spliced only along the flanges with tapper holes. When it is necessary to splice sealer, miter and press the two ends together to form a smooth, continuous bead.

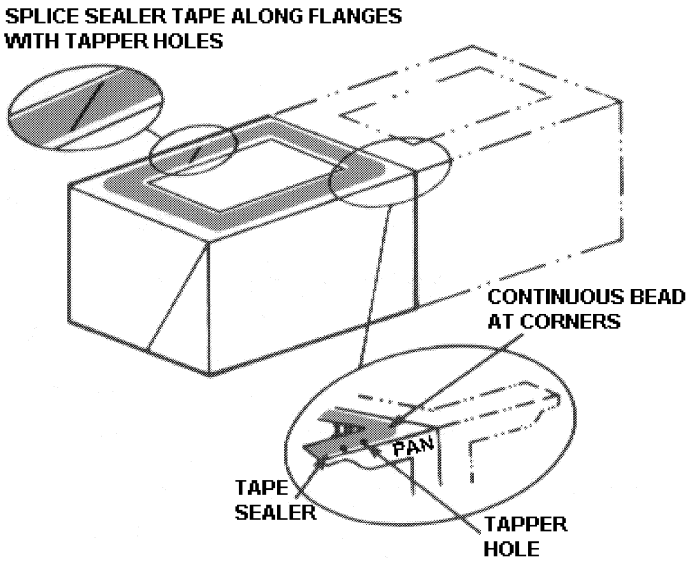


FIGURE 1. TAPE SEALER

5. Lower the flexible connection on the pump discharge piping below the elevation of the pan-fan section top flange before rigging casing section.

6. After applying sealer to the pan-fan flanges, remove the casing skid. Lift the casing section and position it over the pan-fan section so the casing flanges are about 2" (5.08 cm) above the pan-fan section. Do not permit the casing to swing and damage the sealer.

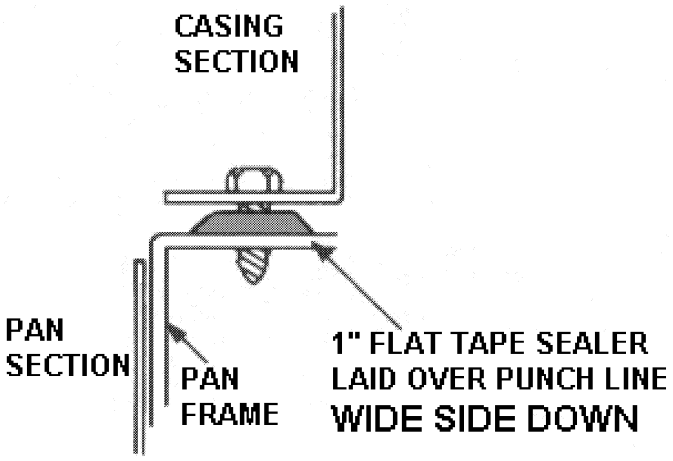
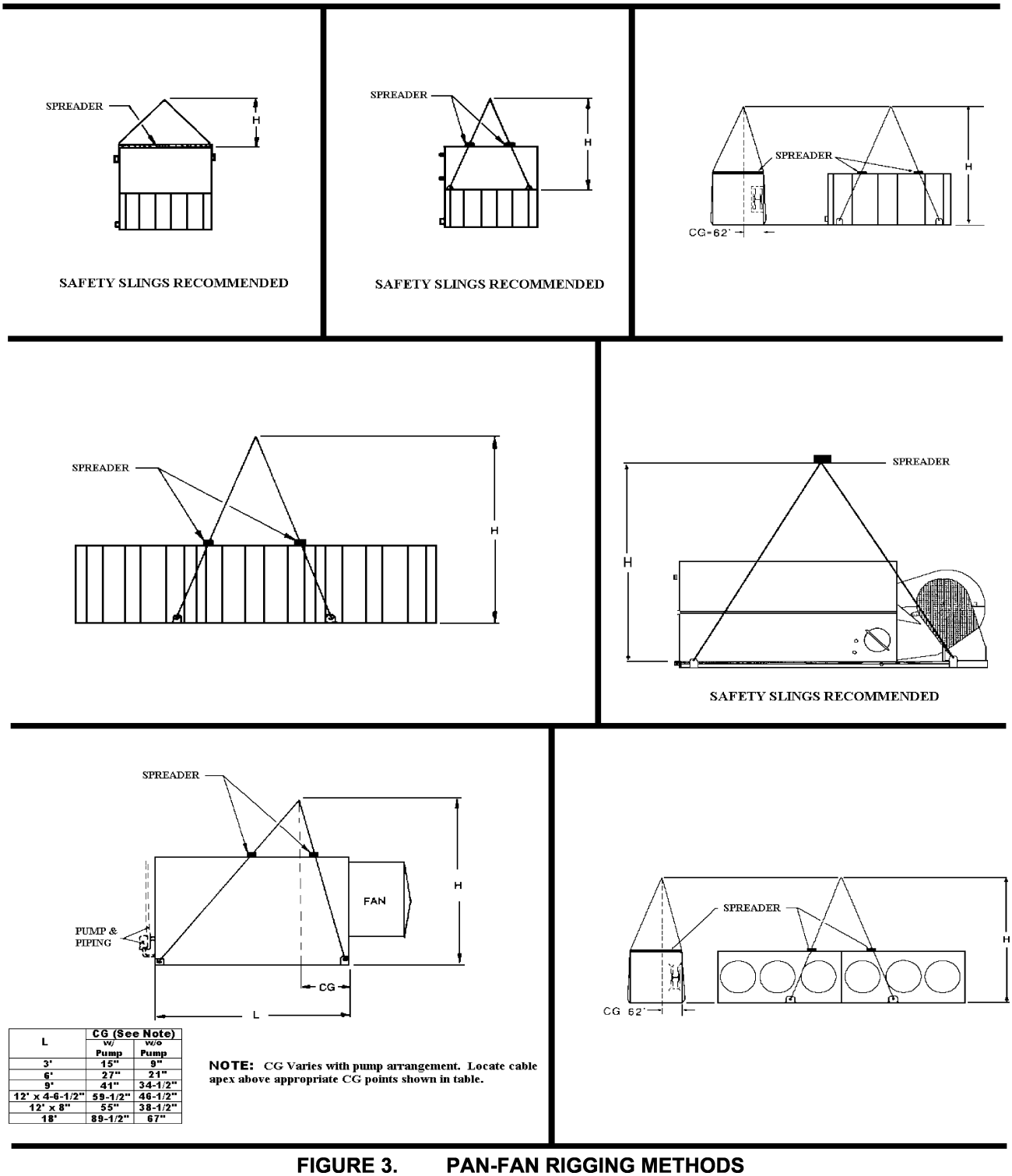


FIGURE 2. TAPE SEALER PLACEMENT



L	CG (See Note) w/ Pump	CG (See Note) w/o Pump
3'	15"	9"
6'	27"	21"
9'	41"	34-1/2"
12' x 4-6-1/2"	59-1/2"	46-1/2"
12' x 8"	55"	38-1/2"
18'	89-1/2"	67"

NOTE: CG Varies with pump arrangement. Locate cable apex above appropriate CG points shown in table.

FIGURE 3. PAN-FAN RIGGING METHODS

7. Insert drift pins downward through the four corner screw holes in the casing section. Continue to lower the casing section slowly, maintaining alignment with the drift pins until it rests on the pan-fan section.

8. Using the $^{5}/_{16}$" (7.94 mm) self-tapping screws, drive the corner screws down through the casing section and into the pan-fan section. Working from the corners toward the center, continue to install the screws using the drift pin to align the screw holes.

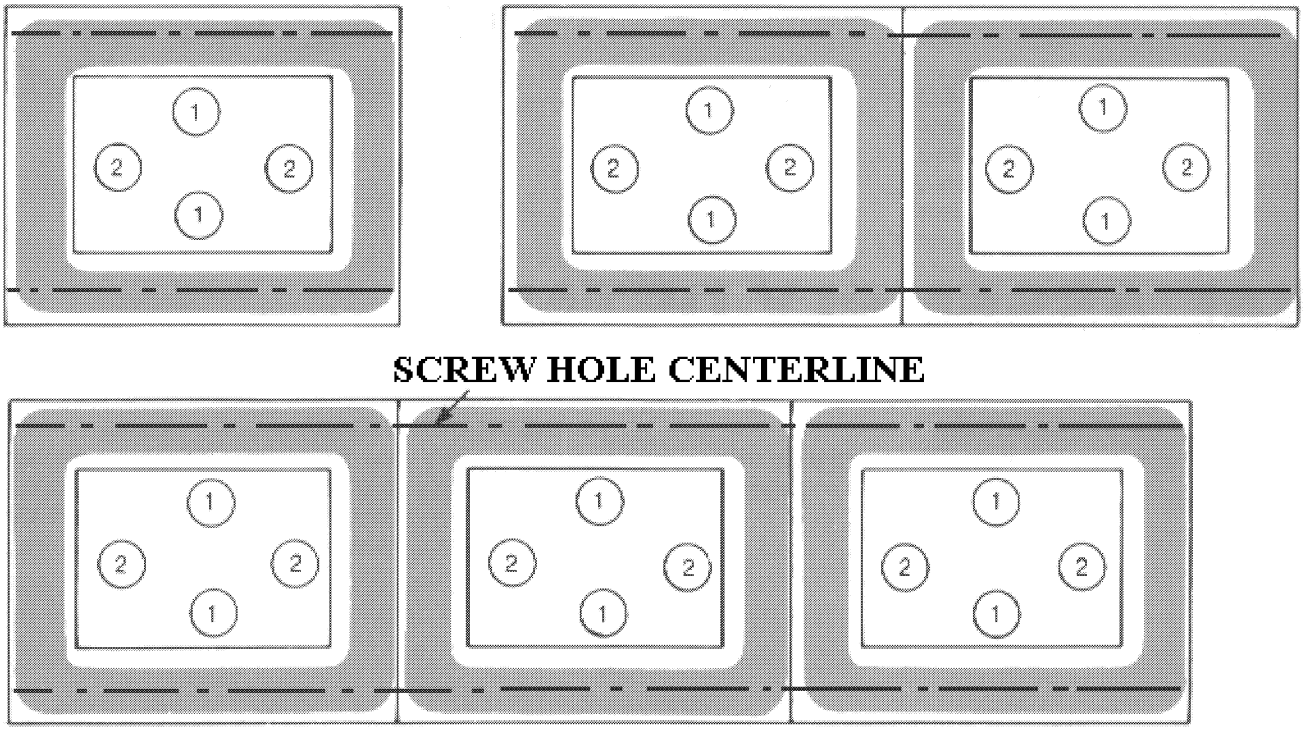
   Secure the flexible hose that connects the upper and lower sections of the pump discharge pipe using the hose clamps provided.

9. Remove any wooden bracing from around the eliminators or casing(s).

III. FINAL ASSEMBLY DETAILS

A. Placement Of the Eliminators

Check the placement of the eliminator sections on top of the unit against the placement listed in the unit table.



① Apply 1" flat tape sealer over centerline of screw hole.
② Apply 1" flat tape sealer over centerline of cross flanges.

FIGURE 4. TAPE SEALER INSTALLATION

B. Discharge Hoods

The sealing method for discharge hoods is the same as in the casing sealing instructions. See Figures 6 and 7.

C. Inspection

Prior to start-up, the following services, which are described in Operating and Maintenance section, must be performed.

✓ Inspect general condition of unit.

✓ Inspect fans, motors, bearings, drives, locking collars, and belts for condition and alignment.

✓ Lubricate all bearings and purge them of old grease.

✓ Inspect spray nozzles and heat transfer section.

✓ Check make-up valve and sump water level.

✓ Check fans and air inlet screens for obstructions.

✓ Clean and flush sump and strainer.

Proper start-up procedures and schedule periodic maintenance will prolong the life of the equipment and ensure trouble-free performance for which the unit is designed.

D. Bleed Line Installation

Install a bleed line with valve between the system circulating pump discharge riser and a convenient drain. Locate the bleed line in a portion of the riser piping when the pump is off.

CAUTION

The bleed valve should always be open when the unit is in operation, unless the bleed rate is automatically controlled by a water treatment system.

Recommended bleed rates may be found in the Operating and Maintenance manual.

E. Freezer Protection

These products must be protected by mechanical and operation methods, against damage and/or reduced effectiveness due to possible freeze-up. Please contact the local Vilter Sales Representative for recommended protection alternatives.

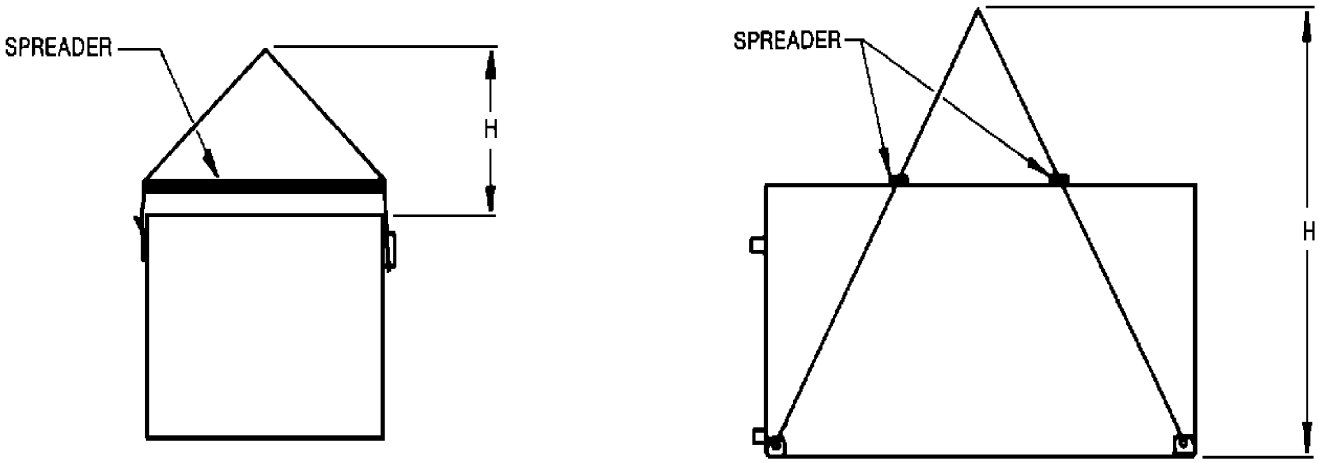


FIGURE 5. SPREADER BARS

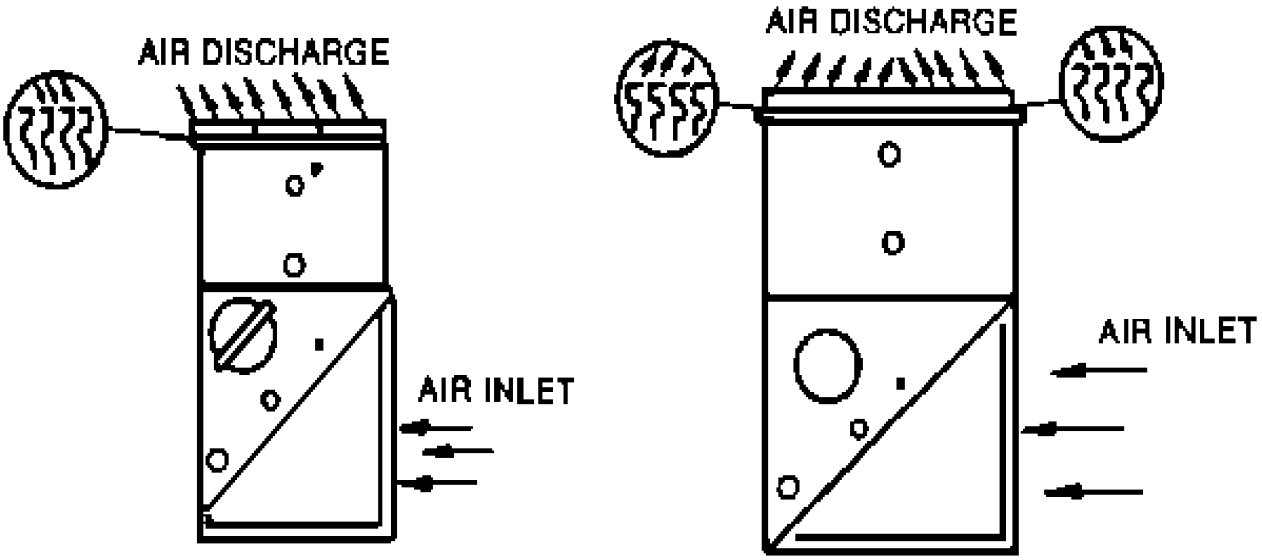


FIGURE 6. ELIMINATOR PLACEMENT

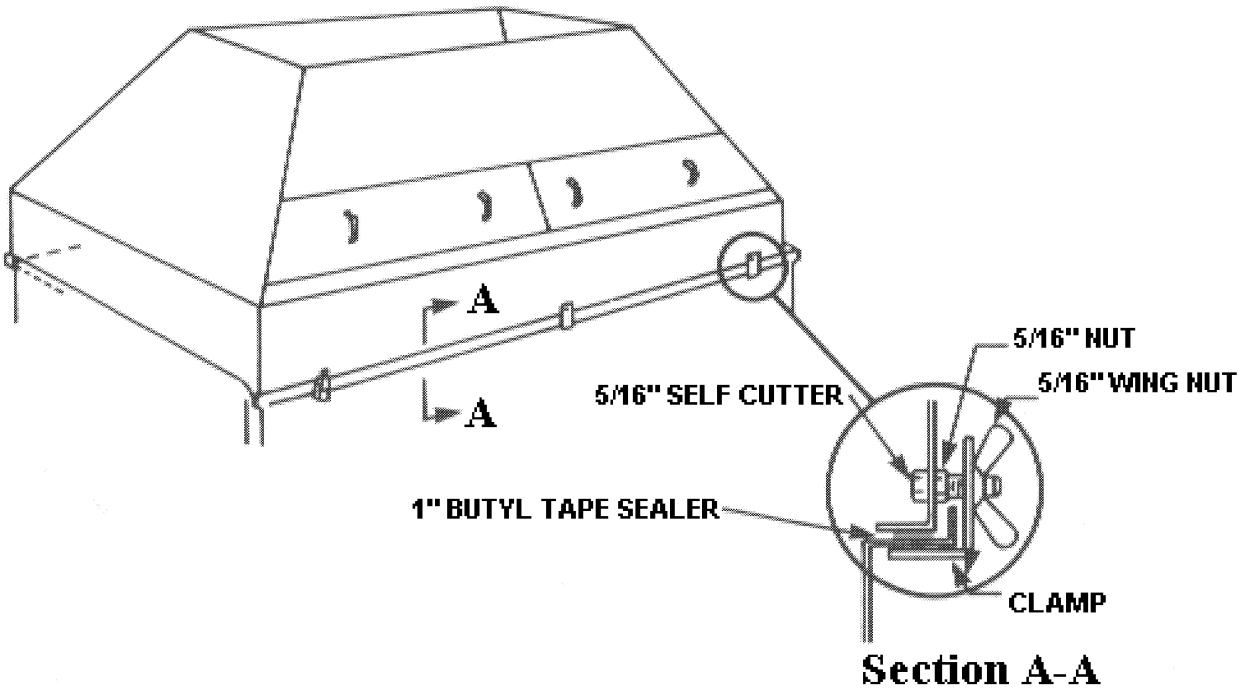


FIGURE 7. ALTERNATE DISCHARGE HOOD SEALING METHOD

❶ Apply a continuous strip of 1” (25.4 mm) butyl tape sealer around top horizontal flange of casing.
❷ Eliminators are shipped inside hood. Be sure eliminators are resting on side flanges of hood section.
❸ Lower hood onto casing as shown.
❹ Using clamps and wing nuts provided, attach hood to casing. Use all clamps provided.

TABLE 1. EVAPORATIVE CONDENSER UNITS

MODEL NO.	NO OF PANS	NO. OF CASINGS	PAN-FAN SECTION			SEALING METHOD	CASING SECTION			ELIM. PLACEMENT	
			Rigging Method	Spreader Bar Length	Minimum "H"		Casing Method	Spreader Bar Length	Minimum "H"	PVC Elim.	Opt. Steel
VSC MODELS											
30 thru 52	Fully Assembled		B	3' – 7"	8'	- -	- -	- -	- -	S	S
58 thru 65	1	1	C	4'	12'	I	N	3' – 7"	12'	S	S
72 thru 80	Fully Assembled		B	3' – 7"	8'	- -	- -	- -	- -	S	S
90	1	1	C	4'	12'	I	N	3' – 7"	12'	S	S
100 thru 110	Fully Assembled		B	3' – 7"	8'	- -	- -	- -	- -	S	S
125 thru 135	1	1	C	4'	12'	I	M	3' – 7"	12'	S	S
150 thru 205	1	1	C	4' – 10"	12'	I	N	4' – 10"	12'	S	U
243 thru 315	1	1	C	8'	12'	I	N	8'	14'	S	U
338 thru 470	1	1	C	8'	16'	I	N	8'	18'	S	U
VSA MODELS											
142 thru 211	1	1	F	5'	16'	I	N	5'	12'	S	S
183 thru 288	1	1	F	5'	18'	I	N	5'	12'	S	S
261 thru 323	1	2	F	8'	18'	I	N	8'	14'	S	U
315 thru 491	1	1	F	8'	22'	I	N	8'	18'	S	U
522 thru 646	2	2	F	8'	18'	I	N	8'	14'	S	U
1044 thru 1292	4	4	F	8'	18'	I	N	8'	14'	S	U
630 thru 982	2	2	F	8'	22'	I	N	8'	18'	S	U
1260 thru 1964	4	4	F	8'	22'	I	N	8'	18'	S	U

Vilter Manufacturing Corporation
5555 South Packard Ave.
PO Box 8904
Cudahy, WI 53110-8904
Telephone: 414-744-0111
Fax: 414-744-1769
e-mail: service@vilter.com