



S140-600 IOM/AUG 96

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INSTALLATION - OPERATION - MAINTENANCE

XL/EFC

EVAPORATIVE COOLING PRODUCTS

NOTE: Installation, operation, maintenance, and repair of this equipment should only be accomplished by qualified personnel. Failure to follow this note may result in improper installation and operation of the equipment and personal injury.

Imeco XL Condensers and EFC Fluid Coolers are designed to ensure energy efficient operation and years of dependable, trouble-free service. To maximize the service life of the evaporative cooling product, it is important to follow the recommended installation, operation, and maintenance procedures outlined in this manual. Be sure to follow the Recommended Maintenance Table and read the detailed instructions of each procedure. Care taken to follow these instructions will directly affect the satisfactory operation and reliability of the system.

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PREFACE

This manual has been prepared to acquaint the owner and service personnel with the recommended **INSTALLATION, OPERATION, AND MAINTENANCE** procedures as recommended by Imeco for XL/EFC Evaporative Cooling Equipment. Read the following instructions completely prior to installation. These instructions provide you with the information needed for safe, proper installation, operation, and maintenance of your new Imeco product. Care taken during the installation will directly affect the satisfactory operation and reliability of the system.

To ensure correct installation and application, the units must be properly selected and connected to an appropriately designed and installed system. The engineering plans, piping layouts, etc. must be detailed in accordance with the best practices and local codes, such as those outlined in ASHRAE literature.

All units should be rigged and installed as outlined in this manual. These procedures should be thoroughly reviewed prior to the actual rigging operation to acquaint all personnel with the procedures to be followed. It is also important that these units be applied to a properly controlled refrigeration system. Your authorized Imeco representative should be consulted for expert guidance on questions pertaining to installation and application.

If at any time during the review of this document or installation/operation you require assistance, please call your local Imeco representative or Imeco at 815-946-2351.

JOB INSPECTION

PLEASE RECORD THE FOLLOWING INFORMATION FOR FUTURE REFERENCE:

Model No. _____

Serial No. _____

Date Received _____

Immediately upon arrival at the job site, the unit should be inspected to ensure all required parts have been received and are free of shipping damage prior to signing the Bill of Lading. Unpack all items and check against shipping lists for any possible shortages. If any part appears to be missing, contact your Imeco representative. The following parts should be inspected:

- Sheaves & Belts
- Bearings
- Bearing Supports
- Fan Motor(s)
- Fan(s) and Shaft(s)
- Coils
- Water Distribution System(s)
- Spray Water Pump(s)
- Strainer(s)
- Float Valve Assembly(ies)
- Eliminators
- Interior and Exterior Surfaces
- Belt Guard(s)
- Motor Hood(s)
- Miscellaneous Items:


If required for field assembly, the following parts will be packaged and usually placed inside the pan section: Mastic, Bolts, Nuts, Washers, and any accessory items.

TRANSIT DAMAGE CLAIMS

All claims must be made by the consignee. This is an ICC requirement. Request immediate inspection by the agent of the carrier and be sure the proper forms are executed.

Contact Parts and Warranty Department - Imeco to report damage or shortage claims.

UNIT IDENTIFICATION

		3820 Highway 26 South Polo, Illinois 61064 PH: (815) 946-2351 FAX: (815) 946-3409	
MODEL		SERIAL	
QTY.	MTR. HP	VOLTAGE	FLA
DATE MANUFACTURED			
QTY.	MTR. HP	VOLTAGE	FLA
PLANT LOCATION			
QTY.	MTR. HP	VOLTAGE	FLA
MAX. PRESS.		REFRIGERANT	BELT SIZE

0025592

IMEC01D

NOTE: When inquiring about the unit or ordering repair parts, provide the **MODEL** and **SERIAL NUMBERS** from the data plates.

INSTALLATION TOOLS

To complete the installation of the XL Evaporative Condensers or EFC Fluid Coolers, the following tools are needed:

- Drift pins
- 8-foot straight edge
- Level
- Assorted open-end wrenches
- Socket set
- Belt tension gage
- Tape measure

GENERAL INFORMATION

All EFC-C, XLC, EFC-P, and XLP models should be anchored directly to concrete pads or concrete piers. These units may also be supported on structural "I" beams as outlined below.

The Centrifugal Fan EFC-C and XLC units are designed to be supported by two structural "I" beams, one located under each end of the unit and running the full width of the unit (See Figure 1a).

The Vane Axial Fan EFC-P and XLP units are designed to be supported by two structural "I" beams, one located under the front and one under the rear of the unit, running the full length of the unit (Figure 1b).

As an alternate, the structural "I" beams may run the full width of the unit. Please refer to the unit foundation drawings furnished by Imeco for each specific sales order for complete details.

Each beam should be sized in accordance with standard engineering practices, 55% of the operating weight of the unit as a uniform load on the beam, allowing for a maximum deflection of $1/360$ of the length, not to exceed $1/2$ inch.

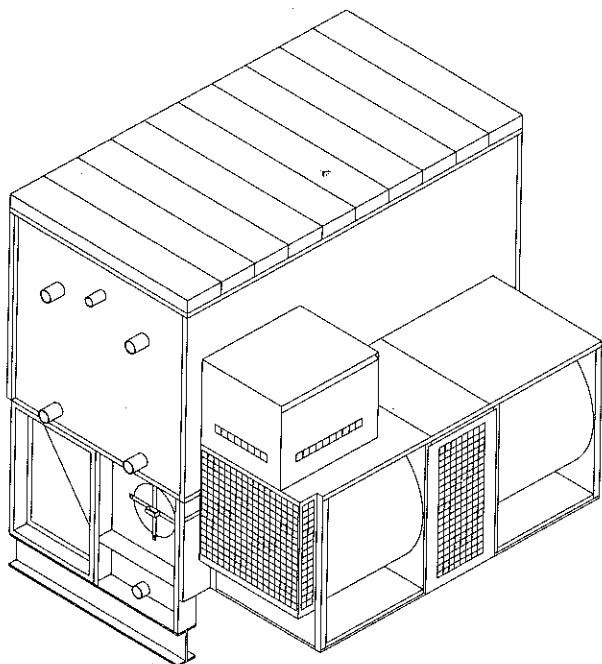


Figure 1a.
XLC/EFC-C I-BEAM LOCATION ON UNIT

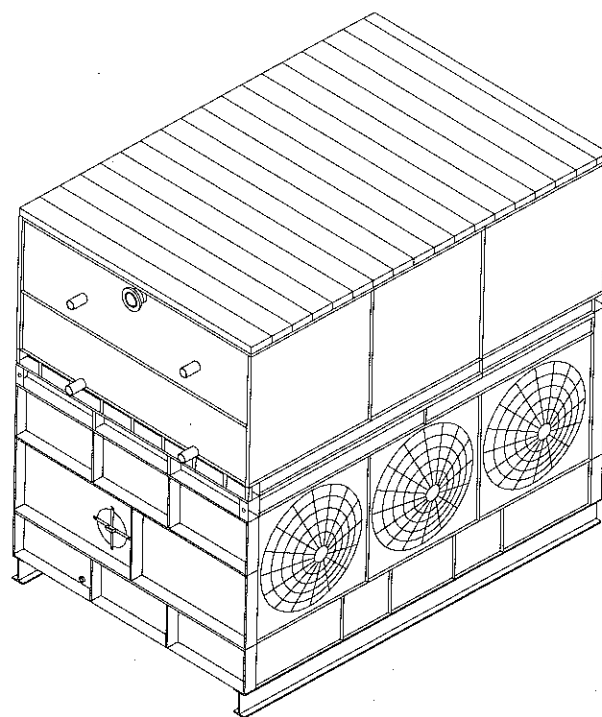


Figure 1b.
XLP/EFC-P I-BEAM LOCATION ON UNIT

All units have $13/16$ inch diameter mounting holes for mounting to the beams. The beams should be supported so that the unit is level. **Shims between the beams and the unit should not be used**, as this will not provide adequate support.

If vibration isolation is required, whether furnished by Imeco or by others, the isolators must always be mounted below the structural "I" beams. Continuous support of unit, as described above, must be provided.

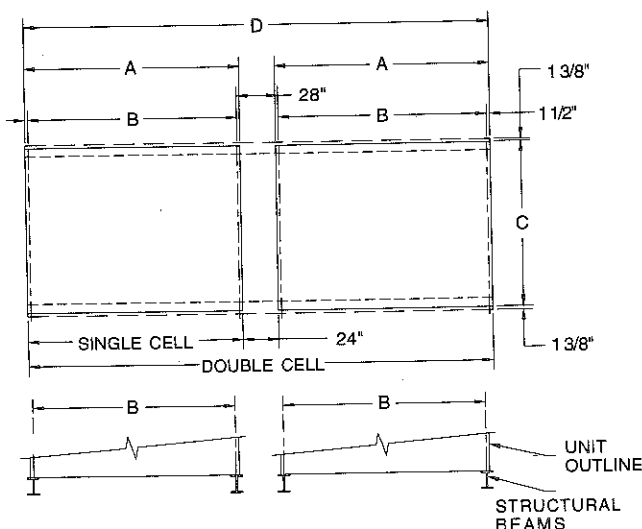
INSTALLATION INSTRUCTIONS

FOUNDATION LAYOUT INFORMATION FOR EFC-C and XLC UNITS

Beams and/or piers should be sized in accordance with standard engineering practices, 55% of the operating weight as a uniform load. Beam deflection should not exceed the larger of $1/360$ of span or $1/2$ inch. In Figure 2, "A" represents the overall length of one cell and "B" represents the center lines of the mounting holes in the unit. The dashed lines show the location of the structural beams to which the unit is mounted.

EFC-C/XLC MODEL	A	B	C	D	MIN. CABLE LENGTH
EFC-C 112-0 through EFC-C 112-4	57	54	27.25	—	6 ft.
EFC-C 113-1 through EFC-C 113-4	57	54	38.75	—	6 ft.
EFC-C 122-1 through EFC-C 122-4	117	114	27.25	—	11 ft.
EFC-C 123-1 through EFC-C 123-4	117	114	38.75	—	11 ft.
EFC-C 222-1 through EFC-C 222-4	117	114	57.25	—	11 ft.
EFC-C 223-1 through EFC-C 223-4	117	114	80.25	—	12 ft.
EFC-C 232-2 through EFC-C 232-4	177	174	57.25	—	16 ft.
EFC-C 233-1 through EFC-C 233-4	177	174	80.25	—	17 ft.
EFC-C 422-1 through EFC-C 422-4	117	114	57.25	258	11 ft.
EFC-C 423-1 through EFC-C 423-4	117	114	80.25	258	12 ft.
EFC-C 432-2 through EFC-C 432-4	177	174	57.25	378	16 ft.
EFC-C 433-1 through EFC-C 433-4	177	174	80.25	378	17 ft.
XLC 25 through XLC 40	57	54	27.25	—	6 ft.
XLC 43 through XLC 55	57	54	38.75	—	6 ft.
XLC 58 through XLC 90	117	114	27.25	—	11 ft.
XLC 95 through XLC 128	117	114	38.75	—	11 ft.
XLC 130 through XLC 185	117	114	57.25	—	11 ft.
XLC 195 through XLC 250	117	114	80.25	—	12 ft.
XLC 285 through XLC 385	177	174	80.25	—	17 ft.
XLC 410-2 through XLC 500-2	117	114	80.25	258	12 ft.
XLC 570-2 through XLC 770-2	177	174	80.25	378	17 ft.

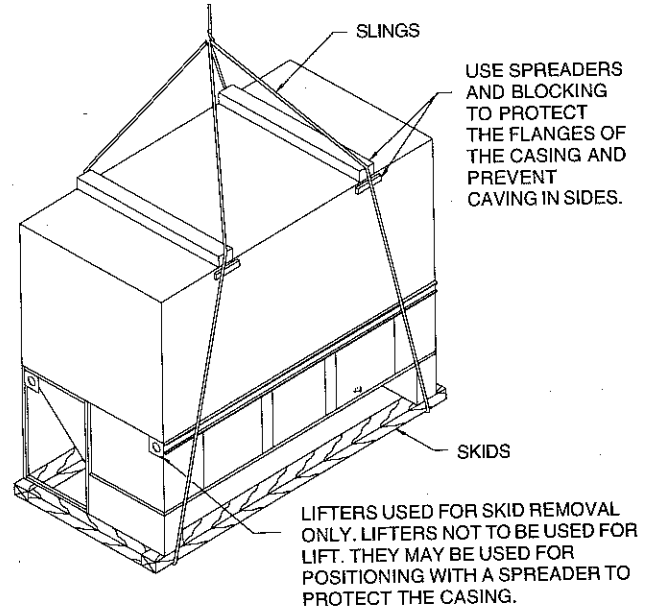
**Table 1.
XLC/EFC-C FOUNDATION LAYOUT DIMENSIONS**



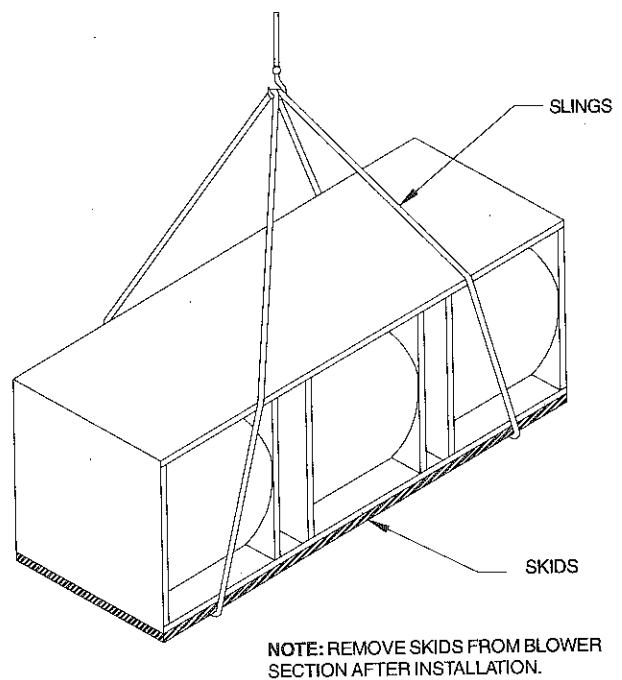
**Figure 2.
PLATFORM LAYOUT**

EFC-C and XLC CENTRIFUGAL FAN UNITS

The EFC-C and XLC units are shipped in two pieces: the pan/coil section and the fan section. The first step of the installation is to mount the pan/coil section on the structural beams and bolt it to the beams. The rigging of the two pieces is shown in Figures 3a and 3b. For minimum cable length, see Table 1.



**Figure 3a.
XLC/EFC-C PAN/COIL SECTION RIGGING**



**Figure 3b.
XLC/EFC-C FAN SECTION RIGGING**

The second step of installation is to mount the fan section to the pan/coil section as follows:

1. Remove guards from both ends and remove the vertical guard between the blowers to provide access to mounting holes. Also, remove the motor housing access panel.
2. Take mastic from parts box and place mastic on coil section unit body as shown in Figure 4a.
3. Lower fan section to pan/coil section unit body so that the blower support on the fan section rests on the flanged edge of the top fan mounting panel on the pan/coil section unit body. Move the fan section to the pan/coil section unit body until all mounting flanges are touching. (Figure 4b)
4. On each blower, install bolts with a flat washer under both the bolt and nut.
5. Tighten all bolts connecting fan and pan/coil Sections together before removing rigging.
6. Align the v-belt drive and check tension in the belts using the procedures in the section labeled "Fan Drives and Belts" in this manual.
7. Replace all guards and the motor hood access panel.

Notes: When provided, mount desuperheater on top of unit using holes provided in the mounting bracket. Note that some units are shipped with the desuperheater factory mounted. Assemble gas piping between desuperheater and condensing coils after final positioning of the desuperheater. Inter-gas piping is to be furnished by others.

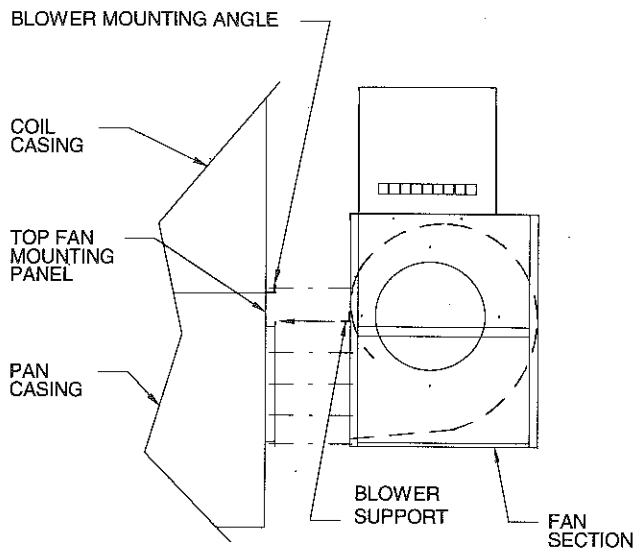


Figure 4b.
BLOWER ASSEMBLY MOUNTING INSTRUCTIONS

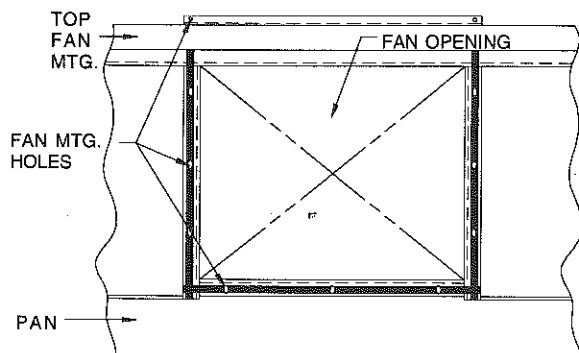


Figure 4a.
MASTIC PLACEMENT FOR BLOWER MOUNTING

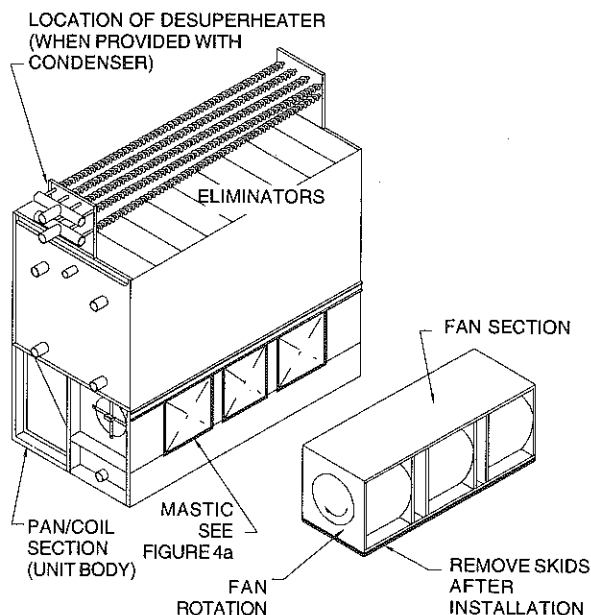


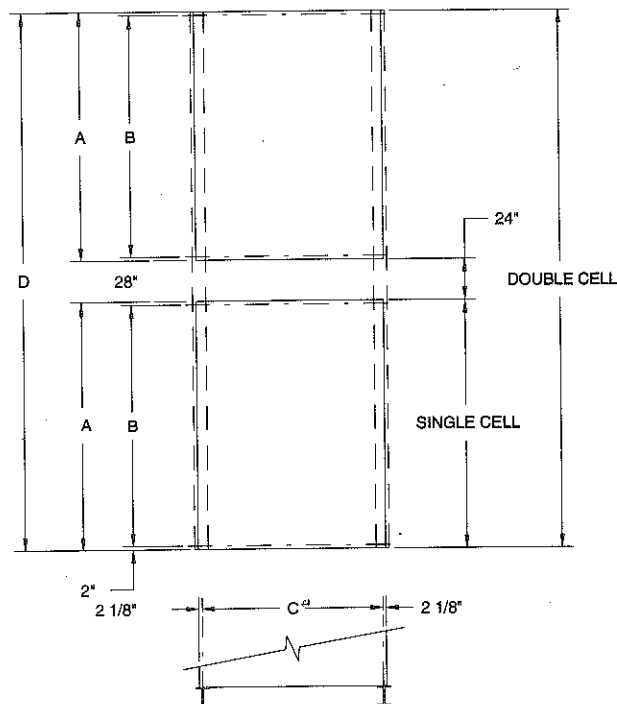
Figure 5.
XLC/EFC-C UNIT ASSEMBLY WITH DESUPERHEATER

**FOUNDATION LAYOUT INFORMATION FOR
EFC-P and XLP UNITS**

Beams and/or piers should be sized in accordance with standard engineering practices, 55% of the operating weight as a uniform load. Beam deflection should not exceed 1/360 of span, or maximum of 1/2 inch. In Figure 6, "A" represents the overall length of one cell and "B" represents the center lines of the mounting holes in the unit. The dashed lines show the location of the structural beams to which the unit is mounted.

XLP/EFC-P MODEL	A	B	C	D
S90 through S175				
S185, S190, S200, S205	145	141	57.5	---
S180, S195				
S210 through S270	145	141	68.5	---
M155 through M280	121.87	117.87	92	---
M285 through M430	177	173	92	---
M810-2 through M960-2	177	173	92	378
ML235 through ML345	145	141	92	---
L350 through ML520	211	207	92	---
ML820-2 through ML1040-2	211	207	92	446
L290 through L415	145	141	112	---
L435 through L635	211	207	112	---
L810-2 through L830-2	145	141	112	314
L870-2 through L1270-2	211	207	112	446
XL355 through XL530	145	141	137	---
XL535 through XL805	211	207	137	---
XL830-2 through XL1060-2	145	141	137	314
XL1070-2 through XL1610-2	211	207	137	446

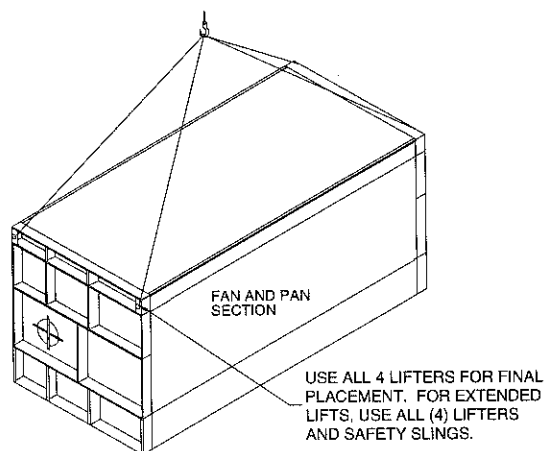
**Table 2.
XLP FOUNDATION LAYOUT DIMENSIONS**



**Figure 6.
PLATFORM LAYOUT**

**INSTALLING EFC-P and XLP SINGLE
LENGTH UNITS**

The EFC-P and XLP units are shipped in two pieces; The pan/fan section and the coil section. The first step of the installation is to mount the fan/pan section on the structural beams with bolts. The rigging of the two pieces is shown below in Figures 7a and 7b. For cable lengths, see Table 3.



**Figure 7a.
XLP/EFC-P FAN SECTION RIGGING**

XL/EFC EVAPORATIVE COOLING PRODUCTS INSTALLATION

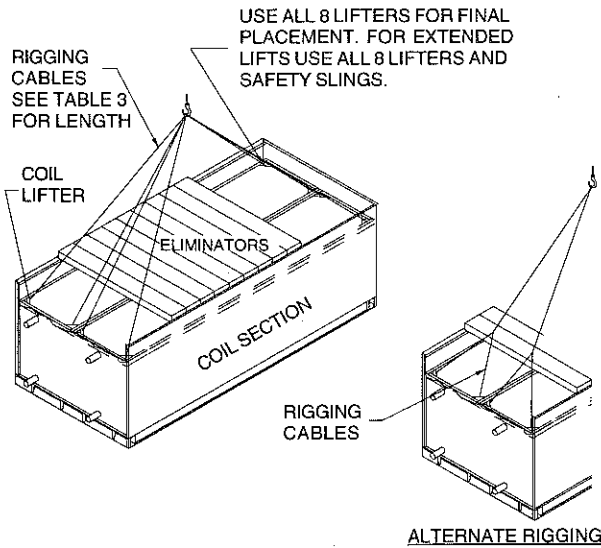
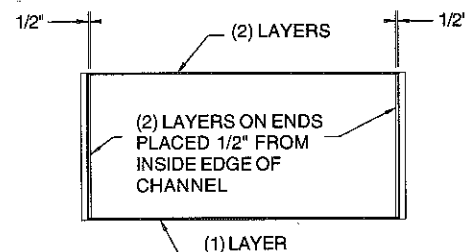
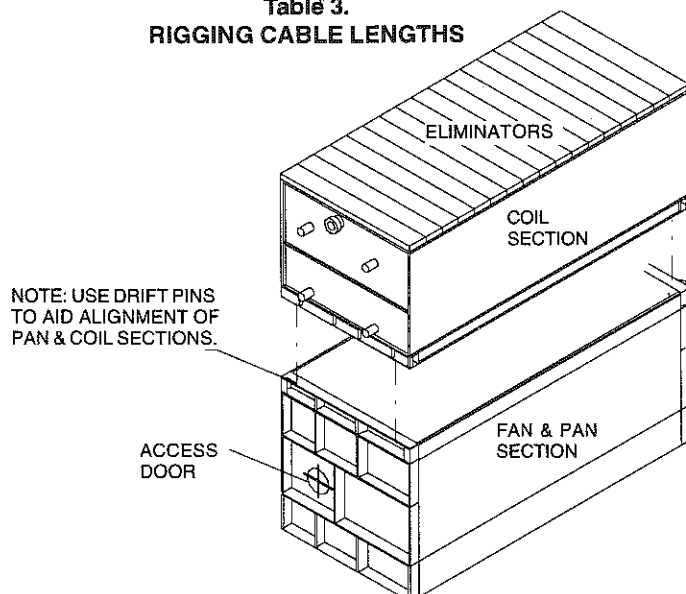


Figure 7b.
XLP/EFC-P COIL SECTION RIGGING

XLP/ EFC-P	
Model	Min. Cable Length
S	14 ft
M - 2 Fan	13 ft
M - 3 Fan	17 ft
ML - 2 Fan	15 ft
ML - 3 Fan	20 ft
L - 2 Fan	16 ft
L - 3 Fan	21 ft
XL - 2 Fan	17 ft
XL - 3 Fan	22 ft

Table 3.
RIGGING CABLE LENGTHS



SHADED AREA INDICATES MASTIC
FIGURE "A"

NOTE: WHEN SEAMS
OCCUR APPLY A
DOUBLE LAYER OF
MASTIC AS SHOWN.

The second step of the installation is to mount the coil section as follows:

1. Some units are shipped with the fan guards in the pan section for shipping purposes. In these cases, remove fan guards from pan section and install on the front of the unit before joining fan and coil sections.

2. Take mastic from parts box and place mastic on the top of the fan & pan section as shown in Figure 8. Be sure to apply two layers of mastic across each end of the unit as shown.

3. Lower the coil section to the fan & pan section with rigging attached to all eight lifters. For extended lifts, use lifters and safety slings (Figure 7b). Use drift pins in bolt holes to ensure proper alignment. See Figure 8.

4. Remove rigging and install four 1/2" bolts with flat washers under both the bolt and nut.

NOTES:

1. Use spreaders and blocking to protect casing from possible damage caused by slings.

2. Remove eliminator tie straps and eliminators as necessary to access lifters.

3. Mount coil connection toward access door unless specified differently on product drawing.

4. When provided, mount desuperheater on top of unit using the holes provided in the mounting bracket. Assemble piping between desuperheater and coil after final positioning of desuperheater.

Figure 8.
XLP/EFC-P MASTIC LOCATION AND UNIT ASSEMBLY

OPTIONAL VIBRATION ISOLATOR - MOUNTING INSTRUCTIONS

Vibration isolators, purchased as an option, are used to minimize transfer of forces due to vibration/dynamic loading to or from unit. To install the isolator feet and rails, refer to Figure 9 and Figure 10 respectively and follow these instructions:

ISOLATOR FEET

1. Refer to the submitted foundation layout drawing for the correct location of each isolator and support beams.
2. Place the isolators in their proper location and attach the bottom plate to the building support steel by means of bolting or welding.
3. Set the unit support beams on top of the isolators and attach them to the top plate by means of bolting or welding.
4. Lower the first section of the unit onto the beams, taking care not to overload any one corner.



WARNING Do not attempt to move the unit laterally with the weight on the isolators. If it is necessary to move the unit, remove the weight from the isolators by raising the unit before moving. Failure to follow this procedure could result in damage to the isolator.

5. Attach the unit to the beam by means of bolting or welding.
6. Continue to attach the remaining unit sections per the instructions on the previous pages and complete piping, wiring, etc.

Note: Ridged connections between the unit and building structure shall not be permitted when vibration isolators are used. Use flexible connections that allow for vibration and noise isolation.

7. Loosen the vertical restraint jam nuts to the end of the restraint bolts.
8. When the unit is completely installed and operating, turn the leveling bolts counterclockwise several complete turns on each isolator until the blocking channel can be removed by hand. It will be necessary to alternate between isolators in order to uniformly raise the unit. Do not attempt to place all the weight on any one isolator, but distribute the load proportionally.
9. After the unit is level, tighten the vertical restraining nuts finger tight, then back off one half turn. Lock each nut with the jam nuts provided.

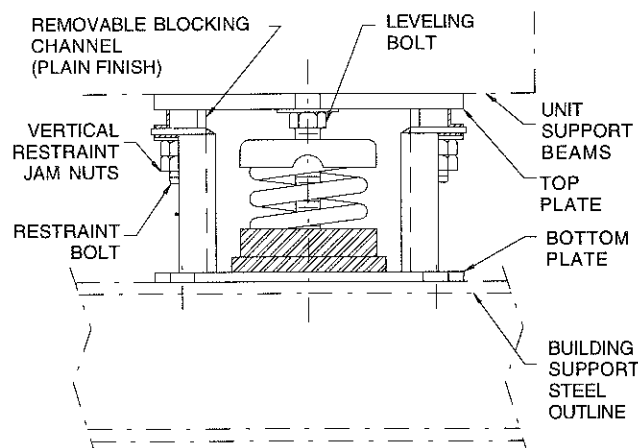


Figure 9.
VIBRATION ISOLATOR FEET

ISOLATOR RAILS

1. Refer to the submitted foundation layout drawing for the correct location of each isolator rail.
2. Place the isolator rail assemblies in their proper location and attach the bottom plate to the building support steel by means of bolting or welding.
3. Lower the first section of the unit onto the rails, taking care not to overload any one corner.



WARNING Do not attempt to move the unit laterally with the weight on the isolators. If it is necessary to move the unit, remove the weight from the isolators by raising the unit before moving. Failure to follow this procedure could result in damage to the isolator.

4. Attach the unit to the isolator rail by means of bolting or welding.
5. Continue to attach the remaining unit sections per the instructions on the following pages and complete piping, wiring, etc.

Note: Ridged connections between the unit and building structure shall not be permitted when vibration isolators are used. Use flexible connections that allow for vibration and noise isolation.

6. Temporarily remove all vertical locknuts from hold-down bolt.
7. When the unit is completely installed and operating, turn the leveling nuts clockwise several complete turns on each isolator until the shim can be removed by hand. It will be necessary to alternate on each isolator in order to uniformly raise the unit. Do not attempt to place all the weight on any one isolator, but distribute the load proportionally.
8. After the unit is level, replace all vertical locknuts on hold-down bolts and fasten finger tight.

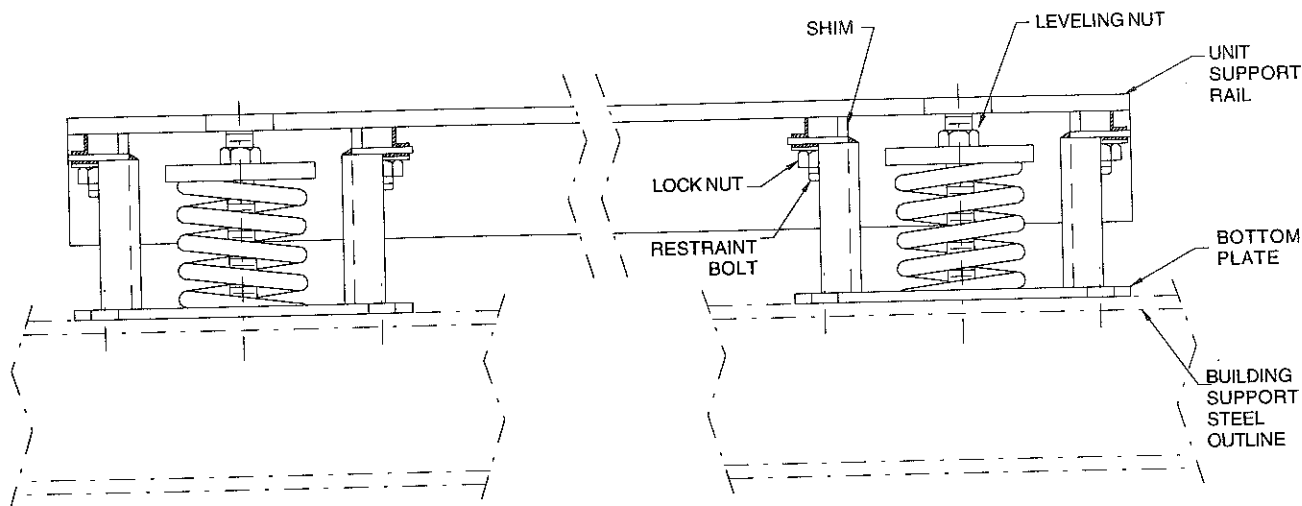


Figure 10.
VIBRATION ISOLATOR RAILS

FINAL ASSEMBLY DETAILS

1. ELIMINATOR PLACEMENT

Check the placement of the eliminator sections on the top of the unit to ensure that all eliminator sections are properly interlocked and that there are no openings present which will allow the escape of water droplets. Eliminator tie-down straps can be removed after assembly is complete. Check the orientation of the eliminator sections to ensure "RIGHT SIDE UP" as shown in Figure 11.

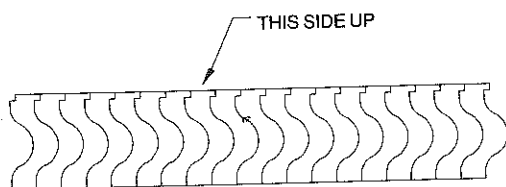


Figure 11.
ELIMINATOR

2. INSPECTION *

Prior to start-up, the following services, which are described in detail in the operating and maintenance manual, must be performed:

- A) Inspect general condition of unit.
- B) Inspect fan, motors, bearings, drives, and locking collars for condition and alignment.
- C) Check belt tension and condition per the maintenance manual instructions.
- D) Lubricate all bearings.
- E) Inspect spray headers and heat transfer section.
- F) Check makeup valve and sump water level.
- G) Check fans and guards for obstructions.
- H) Clean and flush pan and strainer

- I) Rotate fan(s) by hand to ensure rotation without obstruction.
- J) Check fans and pumps for correct rotation and electrical hook-up.
- K) See the Operation and Maintenance Manual for new belt run-in procedures.

3. BREAKING IN THE GALVANIZED SURFACES

A proper break-in procedure should be followed for water treatment to allow the galvanized surfaces to break in or passivate. This allows the galvanized surfaces to form a self-protecting zinc carbonate layer. A qualified water treatment specialist can provide specific details, but following are some guidelines.

- Clean all wetted surfaces.
- Touch up scratches in the galvanizing with cold galvanized paint.
- Keep the water moderately hard.
- Avoid cleaning chemicals in pH ranges above 8.0 and below 6.0. Particularly anything which will raise the pH level to 8.3 or above.
- After a break-in period, typically 30-45 days, begin regular water treatment procedures.

Again, local water treatment professionals will be best equipped to create a water treatment program designed to meet the specific needs of the installation.

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



DO NOT ATTEMPT ANY INSPECTION AND/OR MAINTENANCE UNLESS THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED AND LOCKED OUT.

OPERATING INSTRUCTIONS

Evaporative Fluid Coolers and Evaporative Condensers remove heat from the fluid circulating in the coil by recirculating water over the outside of the coil and blowing air up through the wetted coil. The water that is recirculated over the outside of the coil is stored in the pan section at the bottom of the unit, and is pumped over the coil through spray nozzles by the spray pump mounted on the end of the unit. The fans are located on the side of the EFC-C and XLC Centrifugal Fan Units in the dry entering air stream and are driven by a motor that is mounted on top of the fan section. The fans on the EFC-P and XLP Vane Axial Fan Units are located above the pan in the pan/fan section in the dry entering air stream and are driven by motors that are located below the fans.

The coolers and condensers are designed to provide maximum capacity when both the spray system and the fans are running, and only partial capacity when either the spray system or the fans are running alone. A practical method of capacity control is to cycle the fan and spray pump motors with a thermostat or pressure switch that senses the fluid leaving the unit. Care must be taken, however, to cycle the fans off first, then the spray pump. This enables the solids left behind to be washed into the pan, by the spray water, where they can be bled off to the drain.

When provided, capacity control dampers are mounted in the discharge throat of the fans on the EFC-C and XLC units or on the air discharge of the EFC-P and XLP units for closer control of fluid temperature or pressure. These dampers are controlled by a modulating damper actuator and a remote bulb-type temperature or pressure controller. The sensing bulb of the controller should be installed in the fluid piping leaving the unit, and the controller should be wired to the damper actuator as shown on the appropriate wiring diagram. The damper actuator contains an end switch that should be used to turn off the fan motor when the dampers are fully closed.

Units provided with positive closure discharge dampers are designed to reduce heat loss from the unit when it is not in operation by eliminating the chimney effect. The dampers are operated by an "On-Off" damper actuator, and are positioned closed when the spray pump motor is off, and open when the spray pump motor is on. The actuator should be wired as shown on the appropriate wiring diagram.

COLD WEATHER OPERATION

Evaporative Coolers and Condensers are suitable for most cold weather applications when supplied with proper capacity control and freeze protection.

A common application for Vane Axial units is to cycle the operating fans to achieve capacity control. Typically, the fans are cycled off as capacity drops and finally, the pump is shut off. In cold weather operation, Imeco recommends that the pump should be the first item shut off to achieve capacity control. By running the unit dry in cold applications, the unit's drive is protected from ice formation. Ice forms when the spray water causes moist air to migrate out of idle fans where it condenses and freezes on cold metal surfaces.

As long as the Evaporative Coolers and Condensers are in operation with a load, with capacity control dampers, the recirculating pan water will not freeze. However, the pan

water must be protected when Evaporative Coolers and Condensers are under a "no load" condition with fans and spray pumps off. An indoor remote sump and pump is the best means of avoiding pan water freezing in an idle Evaporative Cooler or Condenser. With this remote sump system, the pan water is always drained to the indoor remote sump whenever the recirculating water pump is stopped.

Because of the Evaporative Cooler/Condenser location or space limitations, a remote sump installation may be impractical. In such cases, supplementary heat must be supplied to the pan water. The Evaporative Cooler or Condenser will then need to be furnished with an electric pan heater. This heater will provide sufficient heat to keep the spray water in the pan from freezing when the unit is not running. The heater is controlled by a thermostat that senses the pan water temperature, and is factory set at 42°F. The heater is protected by a low water cutout switch that prevents the heater from operating if the pan water level is below the heater element. In addition to protecting the pan water, all exposed water piping, including the pump suction line, pump, pump discharge piping (up to the overflow connection), and the make-up water lines, should be traced with electrical heat tape and insulated. Some Evaporative Cooler and Condenser installations will permit all spray water to be drained from the pan during cold weather operation. This permits dry operation of the Evaporative Cooler or Condenser when the load and ambient temperatures are low.

Units that require year-round operation in a freezing climate should be equipped with an electric pan water level control package. This package ensures a constant water level without adjustment and also maintains very close control of the pan water level. The system consists of a weather-protected electric float switch with stilling chamber mounted on the pan section and a weather-protected solenoid valve mounted on the water makeup connection. When this system is used, it replaces the standard mechanical water makeup valve.

EVAPORATIVE FLUID COOLERS

Evaporative Fluid Cooler installations, where the unit is mounted outdoors, must account for protection of the water in the coil from freezing when the cooler is not in operation. The safest method is to add glycol to the water at a percentage high enough to prevent freezing.

Ethylene Glycol is the most commonly used antifreeze. The freeze protection levels are charted in the table below.

ETHYLENE GLYCOL PERCENTAGE BY VOLUME					
	10%	20%	30%	40%	50%
FREEZE POINT °F	+26	+14	+2	-15	-38

If glycol cannot be used in the system, another method of freeze protection for the water in the coil is an automatic coil drain system. It utilizes automatic solenoid valves that will allow the coil to drain if the water in the coil becomes too cold, or in the event of a power failure. These valves should be sized to drain the coil in approximately fifteen minutes. This method should only be used if the water in the coil is in danger of freezing. Draining the coil is only recommended in an emergency, as frequent draining will promote corrosion inside the coil.

NOTE: Some protection against "water-hammering", which may be created by the sudden closing of the solenoid valve, may be required.

A third method of freeze protection is to design the system so that the water is always flowing in the coil, even when the cooler is not in operation. However, this alone may not prevent freezing and the temperature of the water in the coil should never fall below 50°F. To accomplish this, a standby heating system can be used to replace the heat lost from the idle cooler, or an unvarying water temperature source, such as city water, can be used as the water that circulates in the coil during shutdown periods.

MAINTENANCE INSTRUCTIONS

Evaporative Coolers and Condensers accomplish cooling (or condensing) by evaporating water from the spray water system at the rate of two gallons per minute per one million BTU's per hour of heat removed, or three GPM per 100 tons of refrigeration. When this water evaporates, however, the solid impurities remain and must be flushed from the system to prevent a scale build up on the coil and casing. This is accomplished by a bleed-off valve located on the spray pump discharge line which bleeds off an equal amount of water to that which is evaporated.

For conditions where the original water hardness is very high or a large number of airborne contaminants may enter the spray water, a higher bleed-off rate or chemical treatment may be required to prevent scale buildup on the coil. Consult your local water treatment company for recommendations.

CHEMICAL TREATMENT

If the condition of the water is such that constant bleed-off will not control scale or corrosion, chemical treatment may be necessary. If a water treatment program is used it must meet the following requirements:

1. The chemicals must be compatible with zinc.
2. The pH of the circulating water must be maintained between 6.5 and 10.
3. Chemicals should be fed into the recirculated water, but not into the cold water sump, on a continuous metered basis to avoid localized high concentrations which may cause corrosion. These chemicals are normally fed into the pump discharge line. Batch feeding of chemicals does not provide adequate control or water quality and is not recommended.
4. Acid water treatment is not recommended.
5. The use of simple bleed-off or chemical treatment for control of scale or corrosion does not preclude the need to control biological contamination. Treatment with biocides is a necessary portion of required water treatment!

For specific recommendations on water treatment, contact a competent water treatment supplier.

SUGGESTED MAINTENANCE INTERVALS

BLEED-OFF VALVE

The bleed-off valve should be checked monthly to ensure that it is not blocked and that water is flowing as required. The valve should be set so that the bleed-off rate is two GPM per one million BTU's/hour of heat removed (or per 83 tons of refrigeration). The bleed valve should always be open, unless the unit is controlled by a water treatment system.

STRAINER

The pan water strainer is located at the bottom of the pan section at the suction connection of the spray pump. The strainer should be cleaned monthly, or as conditions require, to keep it clean. The strainer is easily accessible through the access door. **Do not operate the unit without the strainer.**

MAKEUP VALVE

The pan water level is controlled by a float-actuated valve that is accessible through the access door. This valve should be checked monthly for proper operation and water level. The pan water level should be even with the centerline of the overflow when the unit is not running. This will prevent the pump from cavitating when the spray system is in operation. The water level is easily adjusted by loosening the wing nut on the valve and raising or lowering the ball to maintain the proper level. The recommended operating pressure for the water makeup valve is 15 to 20 PSI.

MOISTURE ELIMINATORS

The moisture eliminators are located on top of the unit and prevent losses of the spray water due to water being entrained in the air stream as it passes through the unit. The eliminators should be checked monthly to remove any obstructions that may be trapped between the blades and to ensure proper positioning.

WATER DISTRIBUTION SYSTEM

The spray nozzles are accessible by moving the eliminators in sections from the top of the unit (DO NOT OPERATE UNIT WITHOUT ELIMINATORS). The spray nozzles are large orifice, cleanable type. The nozzles should be checked monthly to see that the spray pattern is complete and even. Figure 12 shows the nozzle orientation in the spray headers and the spray direction.

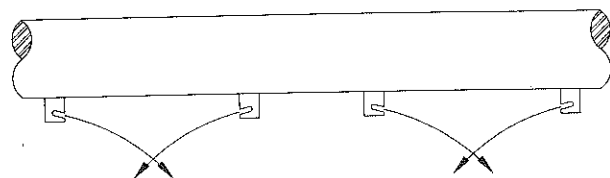


Figure 12

If the nozzles are not operating properly, check that the strainer in the pan or that the water distribution pipes do not have accumulated dirt or debris. Also, check the nozzles by removing them and clean any that may need cleaning. The nozzles are virtually nonclogging and should seldom require cleaning or attention.

NOTE: When cleaning the nozzles and distribution system, always ensure that the initial orientation of the nozzles is maintained.

HEAT TRANSFER SECTION

The coil should be examined monthly for signs of scale buildup, and any obstructions between the tubes should be removed. If there is evidence of scale buildup on the coil, check the bleed valve for adequate bleed-off. If the bleed-off valve is functioning properly, contact your local water treatment company for recommendations.

FAN MOTOR AND SPRAY PUMP MOTOR

The motors should be checked and/or lubricated every six months according to the motor manufacturers recommendations.

FAN BEARINGS

The fan bearings should be checked monthly and relubricated. The bearings should be lubricated while in operation, and the grease should be pumped in slowly until a slight bead forms around the seals. The grease will increase in temperature approximately 30°F during the relubrication. If the relubrication must be done while the bearings are not in operation, the grease capacity of each bearing on the EFC-C and XLC units is 7/8 ounce. The capacity on the EFC-P and XLP units is 3/8 ounce. The grease should conform to NLGI Grade Two consistency and should be free of any chemical impurities such as free acid or free alkali, dust, rust, metal particles or abrasives. **Bearings should be lubricated with hand grease guns only.**

FAN DRIVE AND BELTS

The fan and motor sheaves and belt tension should be checked every month using the procedure outlined below. The sheaves should be tight on the shafts and should be aligned properly to minimize belt wear. The belts should be checked for wear along the edges as any irregularity will cause vibration. If the belts are not wearing evenly, the cause could be improper sheave alignment. Use the sheave alignment procedure below to check the sheave alignment. If any belt requires replacement, replace all the belts with a matched set, never one at a time.

Sheave Inspection

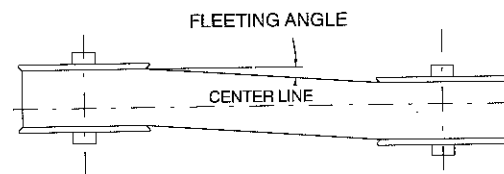
Check the sheaves for proper alignment, excessive corrosion, and wear or damage. Also, check the belt for excessive heat. If the belt is too hot to touch, then the sheaves may be damaged or need aligning.

If the sheaves have excessive corrosion or are worn or damaged, they should be replaced. Check for sharp edges from wear or pitting of the grooves from corrosion. Either condition will promote belt wear and increase turnover. Groove gauges are also available to make it easy to see if the grooves are worn. If more than 1/32" of wear can be seen, the sheave should be replaced.

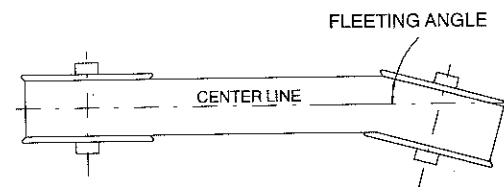
Alignment of sheaves is extremely important for proper belt installation. The sheaves are aligned at the factory, but should be rechecked when new belts are installed. Use a straight edge to check alignment. Misalignment will show up as a gap between the outside face and the straight edge. Two conditions for misalignment exist, angular and parallel. To check both parallel and angular alignment, refer to the figure below and follow these instructions:

1. While placing a straight edge across the top of both motor and fan sheaves, check for four points of contact.
2. If a four-point contact is achieved, skip to the belt tensioning section.
3. To adjust for parallel misalignment, adjust the motor or fan shaft sheave.
4. To adjust for angular misalignment, adjust the motor mount adjustment nuts. This should also be done when tensioning the belt.

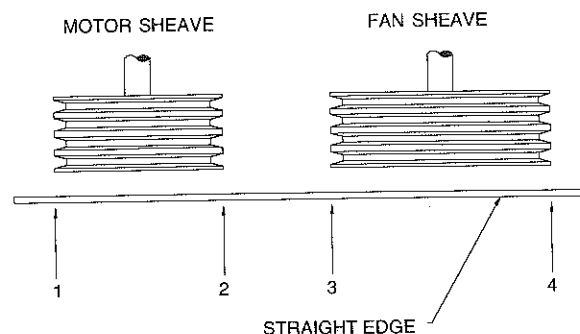
PARALLEL MISALIGNMENT



ANGULAR MISALIGNMENT



SHEAVE ALIGNMENT



Belt Replacement

When the decision is made to replace the belt, follow these steps:

1. Lock and tag out the starter.
2. After the power has been turned off and the motor guard removed, loosen the motor mount adjustment nuts.
3. Move the motor until there is enough slack in the belt so it can be removed without prying.
4. Remove the old belts and inspect for unusual wear. Excessive wear may indicate problems with alignment or sheave damage.
5. Order replacement belts from the factory to ensure a proper belt equivalent.
6. Inspect other drive components such as bearings and sheaves for alignment, wear, lubrication, etc.
7. Clean the sheaves of debris before installing the new belt.
8. Install the new belts, align the drive, and tension the belts according to the procedures outlined here.

Belt Tensioning

Proper tension of a belt is very important to ensure maximum belt life. If too little tension is applied, the belt will slip. Too much tension can reduce belt and bearing life. It is not recommended that belt dressing is used when belt slippage occurs as this will damage the belt and cause premature failure.

1. Decrease the center distance between the sheaves so that the sheaves are somewhat loose.
2. Arrange the belts so the top and bottom spans have the same amount of sag. On vertical drives, arrange the belts so that each side has about the same amount of slack.
3. Apply tension to the belts by increasing the center distance between the sheaves until the belts are snug.
4. Operate the drive a few minutes to seat the belts in the sheave grooves. Observe the operation of the drive during start-up. A slight bowing of the slack side of the drive indicates proper tension. If the slack side remains taut during the peak load, the drive is too tight. Excessive bowing or slippage indicates insufficient tension. If the belts squeal as the motor comes on, they are not tight enough. The drive should be stopped and the belts tightened.

Note: Do not overtighten the drive. If the above procedure still results in the belts squealing, but the belts are still taut on the slack side, a more precise method of testing the belt tension must be used. In this case, use a belt tensioning gage available from V-belt drive manufacturers or from Imeco.

New Belt Run-In

During initial startup of new belts, a belt run-in procedure is recommended. During start-up, follow these instructions:

1. During start-up, look and listen for unusual noise or vibration.
2. After shutting down and locking out the starter, check the bearings and motor. If they feel hot, the belt tension may be too tight.

3. Run the drive under full load for 24 hours of continuous operation. Running the belts under full load allows them to seat themselves into the grooves.

4. After running the drive, check the tension of the belts. Retension to the recommended values.

This run-in procedure will reduce the future need for re-tensioning and will help extend the life of the belts.

FANS

The fans should be checked monthly for any debris caught in the blades. Any foreign material that has accumulated between the blades should be removed to prevent air capacity reduction or an imbalance, resulting in excessive vibration.

CASING FINISH

The casing finish should be checked annually for corrosion that may have occurred due to the alternating wet and dry conditions. Any area that has corroded should be thoroughly cleaned and retouched with a zinc rich compound.

DISCHARGE CLOSURE DAMPERS/CAPACITY CONTROL DAMPERS/LINKAGES

Under normal operating conditions, all bearings and other working joints must be lubricated every three months with a water-resistant grease which is rated for satisfactory performance at an ambient temperature range of -65°F to 250°F. All linkages should also be inspected monthly to ensure proper adjustment and flexibility. All linkage ball joints should be lubricated every three months with the same grease mentioned above.

ELECTRIC PAN WATER LEVEL CONTROL PACKAGES

Inspect Stilling Chamber for obstructions every three months.

OPERATION AND MAINTENANCE

INITIAL AND SEASONAL START-UP

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

1. Clean any debris from guards, fans, eliminators, heat transfer sections, and cold water sump.
2. Flush the cold water sump (WITH STRAINERS IN PLACE) and drain to remove accumulated dirt.
3. Remove, clean, and replace sump strainers.
4. Turn the fan(s) by hand to ensure rotation without obstruction.
5. Check and, if necessary, adjust the fan belt tension.
6. 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.
7. On units furnished with discharge closure dampers and/or capacity control dampers, lubricate all bearings and other working joints and ensure proper linkage operation.

8. Check float-operated makeup valve to be sure it is operating freely.
9. Fill cold water sump with fresh water to the overflow level.
10. Adjust the float on the makeup valve to shut off the valve when the float is approximately 1.0" to 1.5" below the centerline of the overflow.
11. Start spray pump and check for the proper rotation as indicated by sticker on pump motor. On "Remote" 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. Check the locking collar on each fan shaft bearing and tighten if necessary.
14. Start the fan(s) and check for proper rotation as indicated by sticker on unit.
15. Check the voltage and current of all three legs of the fan and pump motors. The current should not exceed the rated service factor. After prolonged shutdowns, the motor insulation should be checked with a Megger Insulation Tester prior to restarting the motors.
16. Open the bleed line valve and adjust bleed to the recommended rate.
17. On units furnished with electric water level control packages, ensure that the stilling chamber is free of obstructions.

AFTER 24 HOURS

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

1. Check unit for any unusual noise or vibration.
2. Check the operating water level in the cold water sump. Adjust if necessary.
3. Readjust fan belt tension if required.
4. Inspect spray nozzles and heat transfer section.

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 the Operation and Maintenance Schedule in this manual.

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 sump strainer 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 screws.
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.
7. On units furnished with discharge closure dampers and/or capacity control dampers, lubricate all bearings and other working joints.
8. For EFC fluid coolers only, follow the coil freeze protection guidelines explained previously in this manual.
9. On units equipped with electric water level control packages, inspect stilling chamber to ensure it is free of any obstructions.

OPERATION AND MAINTENANCE SCHEDULE

TYPE OF SERVICE	START-UP	MONTHLY	EVERY 3 MONTHS	EVERY 6 MONTHS	SHUTDOWN	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 current	X			X		
Lubricate fan shaft bearings	X	X			X	
Lubricate motor base adjusting screws	X			X	X	
Lubricate the fan and pump motors				X		
Check fan for rotation without obstruction	X	X				
Check fan and pump motor for proper rotation	X					
Drain sump and piping					X	
Inspect protective finish					X	X
Lubricate capacity control and/or discharge closure damper bearings and working joints	X		X		X	
Inspect/adjust damper linkage	X	X			X	
Inspect electric pan water level control "stilling chamber"	X		X		X	



Before performing any maintenance or inspection, make certain that all power has been disconnected.

SAFETY

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

FREEZE PROTECTION

These products must be protected against damage and/or reduced effectiveness due to possible freeze-up by mechanical and operating methods. Please refer to the Cold Weather Operation guidelines

SPARE PARTS

Imeco recommends that the customer maintain the following spare parts "in stock" for the Evaporative Fluid Cooler and/or Condenser. By maintaining this inventory of spare parts, continuous unit operation will be ensured.

Contact your local Imeco representative for pricing.

The type and recommended stock level for each part is listed below.

MODEL _____ SERIAL NUMBER _____

PART NUMBER	RECOMMENDED STOCK LEVEL
*FAN BELTS - _____	One Set
*FAN BEARINGS - _____	One Set
FAN BUSHING - _____	One Set
MOTOR BUSHING - _____	One Set
FAN SHEAVE - _____	One Set
MOTOR SHEAVE - _____	One Set
FLOAT VALVE ASSEMBLY - _____	One
SPRAY NOZZLES - _____	One Set
*FAN MOTOR - _____	One Set
*SPRAY PUMP - _____	One
FAN SHAFT - _____	One

* Parts noted to be considered as critical components to be stocked by customers to ensure continuous unit operation.



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