CUSTOM AIR HANDLERS

IMPORTANT SAFETY INSTRUCTIONS
READ AND SAVE THIS MANUAL

For future reference, record Tag, Model & Serial numbers of your unit here:

Tag No. _____ Model No. _____ Serial No. _____

To obtain a printed copy of these instructions please email service@unitedmetal.com

ABOUT THIS MANUAL

This document is intended for use by owner-authorized personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned task properly and safely. It is essential that, prior to performing any task on this equipment, these individuals shall have read and understood this document and any referenced materials. These individuals shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

Custom Air Handling equipment design can be complex and the internal components diverse. This manual is not intended to provide installation, operation and maintenance information for all components but rather a general knowledge of the air handler itself. This manual must be used in conjunction with the individual components IOM's for a more comprehensive understanding of the unit.

SAFETY SYMBOLS



DANGER *indicates a hazardous situation that, if not avoided, will result in death or serious injury.*

WARNING *indicates a hazardous situation that, if not avoided, could result in death or serious injury.*

CAUTION *indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.*

NOTICE *is used for practices not related to personal injury, such as equipment or property damage.*

NOTE: *highlights additional information that may be helpful to you.*

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WARNINGS

⚠ WARNING *RISK OF ELECTRIC SHOCK. CAN CAUSE INJURY OR DEATH: DISCONNECT ALL REMOTE ELECTRIC POWER SUPPLIES BEFORE SERVICING. If the unit is thermostatically controlled, the thermostat is not to be used as a disconnect as it may reset and start the unit unexpectedly.*

⚠ DANGER *HAZARDOUS VOLTAGES! Disconnect all electrical power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lock out / tag out procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate meter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.*

⚠ WARNING *GROUNDING REQUIRED! All field installed wiring must be completed by qualified personnel. All field installed wiring must comply with NEC and applicable local codes. Failure to follow these instructions could result in death or serious injuries.*

⚠ WARNING *ULTRAVIOLET (UV) LIGHTS! High intensity C-band ultraviolet light can damage eyes and skin. Do not look at operating UV lights. Turn the UV lights off before entering the section, or wear personal protective equipment that protects against UV light.*

NOTICE *UV light also severely damages polymer (plastic) materials such as insulation on wiring, fan belts, fasteners and bushings, which can result in serious damage to the equipment.*

⚠ WARNING *REFRIGERANT WARNING! Systems that contain oil and refrigerant are under high pressure. See unit nameplate for refrigerant type. All technicians who handle refrigerant must be certified and appropriately trained to handle them. All technicians must comply with the requirements set forth in Section 608 of the Federal Clean Air Act. Some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.*

⚠ WARNING *FAN GUARDS! Fan guards should be installed when the blower is within seven feet (7') of working level or when deemed advisable for safety.*

⚠ WARNING *ELECTRICAL CLEARANCES! Electrical wiring must be installed a safe distance away from any sharp or moving parts (blower wheels, pulleys, sheaves, belts, etc.)*

⚠ WARNING *SAFETY DEVICES! All safety devices and panels of unit must be reinstalled and remounted as previously mounted before start-up, servicing or cleaning.*

RECEIVING THE UNITS

Based on customer requirements, units can ship as complete units or as individual sections to be field assembled. Items that cannot be factory mounted should ship inside the control enclosures or should be packaged inside the fan or mixing section.

Inspect the complete unit for shipping damage. If damage is present, you have the right to either accept or reject the shipment. If the receiving contractor or the receiving agent for the contractor elects to receive the equipment in a damage condition, it then becomes the contractor's responsibility to note the extent of the damage on the delivering freight bill of lading in the presence of the delivering agent (driver) of the delivering freight carrier in accordance with the ICC regulations. It also then becomes the responsibility of the receiving contractor to work with the delivering carrier to have the equipment repaired to the satisfaction of United Metal Products, Inc., so the warranty may remain valid. United Metal Products must also be notified of shipping damage immediately. Be sure to read warranty for further information. United Metal Products will in no way be responsible for any unauthorized back charges due to events or circumstances out of their control which may cause shipping delays. The equipment type and arrangement should be verified as ordered when it arrives at the jobsite. When a discrepancy is found, the local United Metal Products Sales Representative must be notified immediately so that corrective action may be investigated, also verify electrical conformance to specifications. Unauthorized alterations and unauthorized back charges will not be recognized by United Metal Products, Inc.

LONG TERM STORAGE

There is a time limit of one year from start-up or 18 months from date of shipment , whichever is sooner, that any unit may be kept in long-term storage. At the end of this period, the unit must be in operation. During the storage period, any component containing bearings must be rotated every 30 days.

Select a well drained area, preferably concrete or a blacktop surface. Place the unit on a dry surface or raised off the ground to ensure adequate air circulation beneath the unit and to ensure no portion of the unit will contact standing water at any time. Unit must be stored on a flat and level surface. Any plastic shipping material provided with the unit for shipping protection must be removed within 24hrs. Use Canvas tarps to weather protect equipment prior to installation.

NOTE: *Failure to perform the long-term storage requirements past 30 days from shipment and properly log these required procedures will void the warranty.*

NOTICE *USE ONLY CANVAS TARPS TO COVER AIR HANDLERS. Plastic tarps can cause condensation to form in and on the equipment, which could result in corrosion, wet storage stains or other damage.*

NOTE: *WARRANTY: The warranty does not cover damage to the unit or controls due to negligence during storage.*

PRE-INSTALLATION

1. Verify jobsite electrical power & phase match units nameplate.

2. Verify electrical and plumbing connections are oriented correctly to jobsite plan's, spec's, schedule and approved submittal.

3. Verify mounting surface is dimensionally correct, square, flat and level.

4. Prepare unit for lifting & rigging. Remove any shipping material that might interfere with the joining of demounted sections.

5. If the unit has demounted sections, prepare mating surfaces ***prior*** to rigging. Follow demount instructions provided in this manual (Fig. 3) or shipped loose with the gasket material. Gasket material will be supplied in a box, shipped loose with the unit.

LIFTING & RIGGING

Use only trained, professional riggers when moving equipment. Avoid unnecessary jarring or rough handling. Spreader bars must be used to prevent damage to the unit casing and other external components. Care must be taken to keep the unit in the upright position during rigging. Units will have lifting lugs welded and/or bolted to the base frame when specified. When more than two lifting lugs are supplied on each side of the unit adjustable turnbuckles, pulleys or other industry approved methods must be used on each side to even the hoisting load on each hoisting strap. This is MANDATORY to prevent damage to the unit. Care must be taken not to damage the watertight seams in the unit casing. Avoid damage to the curb and curb gasket when rigging onto a curb. Proper handling of the equipment is required during unloading and setting the unit into position.

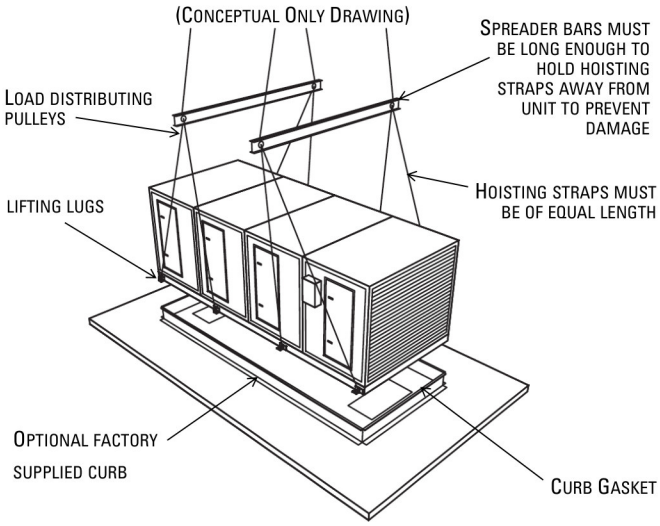
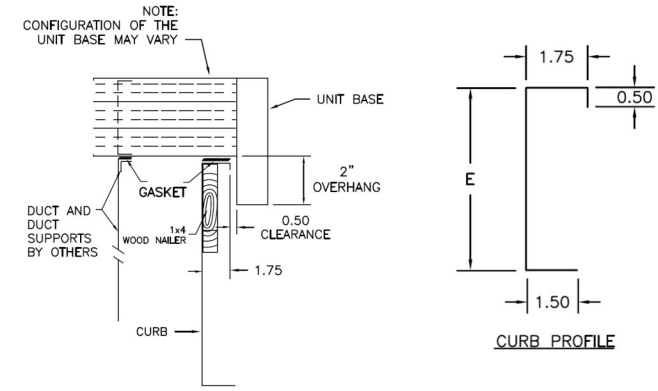
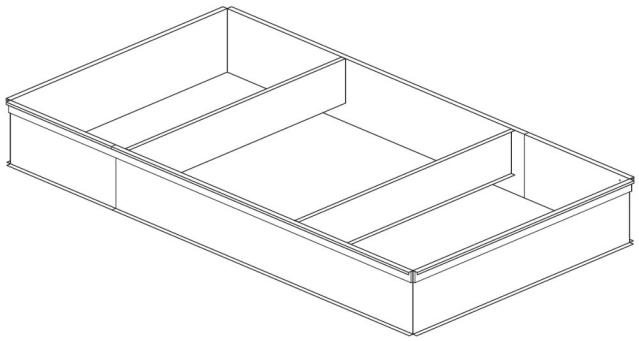


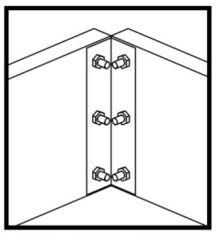
FIGURE 1 *- LIFTING THE UNIT*

⚠ WARNING *It is mandatory that the proper spreader bars and hoisting straps be used when rigging. It is also mandatory that an experienced and reliable rigger be selected to handle unloading and final placement of the equipment. Your rigger must be advised that the unit contains precision components and that it be handled in an upright position. Care must be exercised to avoid twisting the structure.*

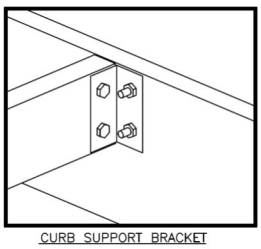




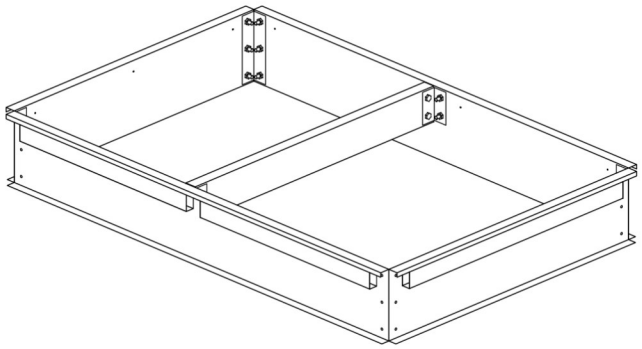
BUILT-UP CURB



CURB CORNER BRACKET



CURB SUPPORT BRACKET



KNOCK DOWN CURB

FIGURE 2 - ROOF CURB TYPES

ROOF CURBS

The curb, which supports the unit, may be shipped "built up" or "knocked down". (Fig. 2) It may be necessary to assemble the curb on the jobsite. Assembly drawings and hardware packages are shipped with each curb. Each part of the curb is identified with the proper tags and/or markings. It is important the curb be installed level and square. When installing the curb, obtain a copy of the approved submittal, as each unit and actual curb installation may not be identical. Installation of roof curb must be in accordance with national or local code requirements as applicable. See section under receiving instructions when receiving curbs and inspecting for freight damage and filing of freight damage claims.

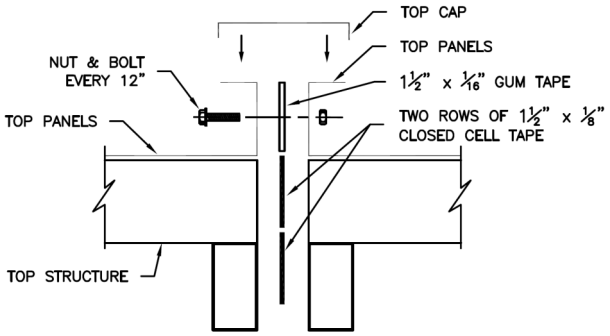
SEALING THE UNIT

It is the responsibility of the installing contractor to ensure that unit has been sealed properly at all duct connections, demounts and curb locations.

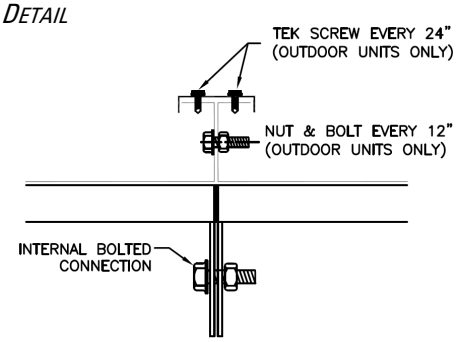
When setting the unit onto the curb, the installer should ensure that the sealing gasket or silicone (as appropriate) is positioned between the unit and curb to provide a continuous airtight and watertight connection.

Curb, nailer and gasket are factory supplied. All other parts such as wood or fiber cant strips, roofing felts, roofing material and curb-to-roof fasteners are to be field supplied by others.

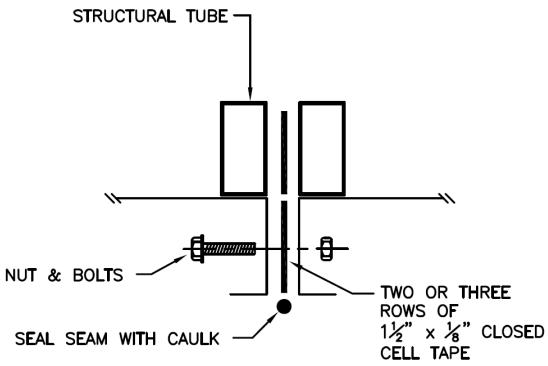
FIGURE 3 –DEMOUNT DETAIL



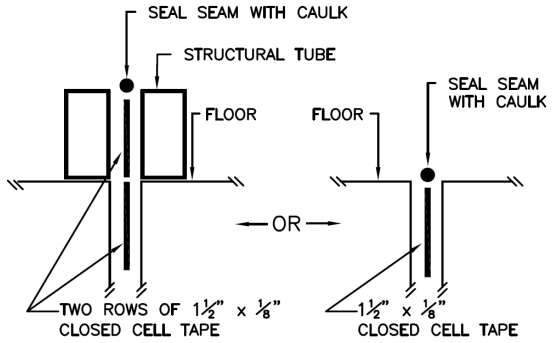
ELEVATION VIEW OF ROOF CONNECTION



ELEVATION VIEW OF ROOF CONNECTION



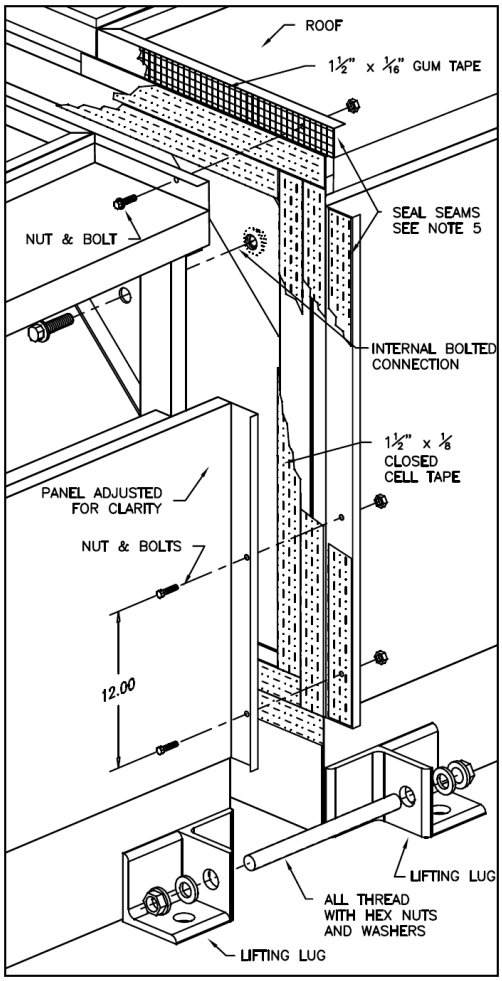
PLAN VIEW OF WALL CONNECTION



FLOOR JOINT CONNECTION WITH HORIZONTAL TUBE

FLOOR JOINT CONNECTION WITHOUT HORIZONTAL TUBE

ELEVATION VIEW OF FLOOR JOINT CONNECTION



NOTES:

1. 1½" CLOSED CELL TAPE, GUM TAPE, CAULK & FASTENERS (SUPPLIED BY U.M.P.) MUST BE USED BETWEEN THE UNITS TO ENSURE AN AIR TIGHT SEAL.
2. BEFORE APPLYING CLOSED CELL TAPE, GUM TAPE & CAULK, MAKE SURE SURFACE IS CLEAN, DRY, AND FREE OF LOOSE DEBRIS. (METAL FILINGS, PAINT CHIPS, ETC.)
3. MAKE SURE ALL SCREWS, NUTS, BOLTS & FASTENERS ARE TIGHT AND THAT CLOSED CELL & GUM TAPE IS COMPRESSED ALONG ENTIRE SEAM.
4. CAULK AND SEAL INTERIOR FLOOR SEAM, EXTERIOR WALL SEAMS, AND ALL REMAINING HOLES AND GAPS TO COMPENSATE FOR IMPERFECTIONS AND ENSURE A WATER TIGHT SEAL.
5. CAULK AND SEAL TOP CAP ENDS, TOP CAP JOINTS, AND ALL REMAINING HOLES AND GAPS TO COMPENSATE FOR IMPERFECTIONS AND TO ENSURE A WATER TIGHT SEAL.

©DUPLICATION PROHIBITED

ELECTRICAL CONNECTIONS

⚠ WARNING *RISK OF ELECTRIC SHOCK. CAN CAUSE INJURY OR DEATH: DISCONNECT ALL REMOTE ELECTRIC POWER SUPPLIES BEFORE SERVICING. If the unit is thermostatically controlled, the thermostat is not to be used as a disconnect as it may reset and start the unit unexpectedly.*

⚠ WARNING *DO NOT PENETRATE WIREWAYS in any manner! These sheet metal channels, which run along the top panel, contain electrical wires and connections. Electrical shock and/or damage to the unit may result.*

NOTICE *Electrical conduits that penetrate the exterior of the unit will need to be externally and internally sealed so that unconditioned air will not be drawn into the unit through and around the conduit.*

Installation must be in accordance with current NEC or local code requirements as applicable and all work must be performed by qualified personnel only.

Refer to the units electrical schematic and equipment submittals for specific details on electrical connections, control components and design layout. Units may require single or multiple point power connections.

Units that have demounts may require the installing contractor to field connect electrical wiring from one section to the other depending on unit configuration. If required, junction boxes will typically be provided on one section of the demount location for field termination. The adjoining section will have flexible conduit with enough wiring provided to make the necessary connections. The installing contractor will be required to install the factory provided flexible conduit to the junction box and make the connections per the units wiring diagram.

Under some circumstances, control components may be shipped loose in one or more of the units sections. These components will require field installation by the installing contractor or controls contractor. Refer to the submittal documents for additional details.

PLUMBING CONNECTIONS

Support all piping independently of the coils. Provide swing joints or flexible fittings on all connections that are adjacent to heating coils to absorb thermal expansion and contraction strains. Use a backup wrench when attaching piping to coils to prevent damage to the coil header. Properly seal all penetrations in unit casing. Failure to seal penetrations from inner panel to outer panel may result in unconditioned air entering the unit, and water infiltrating the insulation, resulting in equipment damage. Confirm that the internal piping connections are insulated when appropriate. Verify the coils water lines are correctly installed for counter flow operation. (Fig. 4)

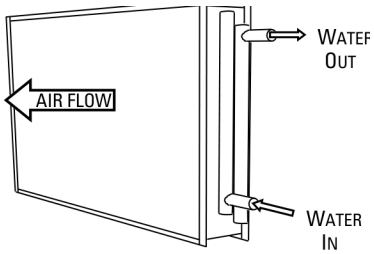


FIGURE 4 - Counter Flow

A units configuration may require the installing contractor to make necessary plumbing connections between sections. Units that require field connections between sections will typically be provided with the necessary unions or fittings unless otherwise specified in the submittal. Refer to the submittal documents for additional details.

P-TRAPS & CONDENSATE DRAINS

Proper installation, piping and condensate drain trapping is necessary to ensure satisfactory coil operation and prevent operational damage. In order to properly size and configure the condensate drain and trap, the installing contractor must calculate the static pressure present at the drain line with the unit running under normal conditions of operation and reference the attached chart. Note that trap designs vary depending on whether the drain line is under positive or negative pressure. (Fig. 5)

When two or more drain lines are connected to a common drain line, each component shall be trapped individually. (Fig. 6) Installation must be in accordance with national or local code requirements as applicable and all work must be performed by qualified personnel only.

STATIC PRESSURE AT DRAIN OR OVERFLOW	NEGATIVE PRESSURE APPLICATIONS		POSITIVE PRESSURE APPLICATIONS
	A	B	C
0.25 "	1 1/4	5/8	1 1/4
0.5 "	1 1/2	3/4	1 1/2
1 "	2	1	2
1.5 "	2 1/2	1 1/4	2 1/2
2 "	3	1 1/2	3
2.5 "	3 1/2	1 3/4	3 1/2
3 "	4	2	4
3.5 "	4 1/2	2 1/4	4 1/2
4 "	5	2 1/2	5
4.5 "	5 1/2	2 3/4	5 1/2
5 "	6	3	6
5.5 "	6 1/2	3 1/4	6 1/2
6 "	7	3 1/2	7
6.5 "	7 1/2	3 3/4	7 1/2
7 "	8	4	8
7.5 "	8 1/2	4 1/4	8 1/2
8 "	9	4 1/2	9
8.5 "	9 1/2	4 3/4	9 1/2
9 "	10	5	10
9.5 "	10 1/2	5 1/4	10 1/2
10 "	11	5 1/2	11

FIGURE 5- P-Traps

P-TRAPS & CONDENSATE DRAINS

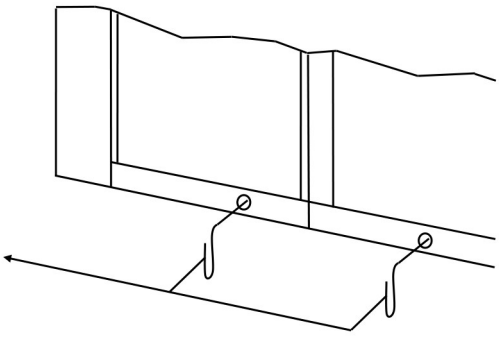
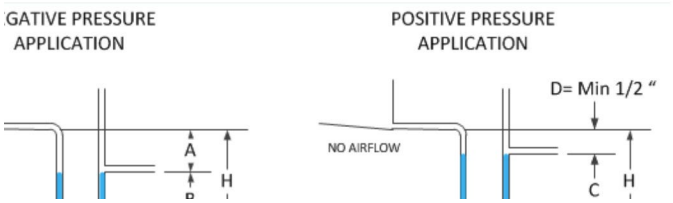


FIGURE 6 - Condensate Drains



All drain pans and overflow pipework need to be trapped and vented in accordance with local and national codes. This document is provided for guidance only.

If the drain lines are not properly trapped and vented they may not drain correctly. The Uniform Mechanical Code (2012 UMC) states that the pipe shall not be less than ¾ inches inside diameter and shall not be decreased in size from its connection at the condensate pan to the point where the condensate water finally clears the pipe. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than one-eighth inch vertical in 12 inches horizontal (1% slope). Proper support and strapping is essential to prevent sags which can lead to clogging. Always vent on the downstream side of the trap.

REFRIGERANT PIPING

⚠ WARNING *REFRIGERANT WARNING! Systems that contain oil and refrigerant are under high pressure. See unit nameplate for refrigerant type. All technicians who handle refrigerant must be certified and appropriately trained to handle them. All technicians must comply with the requirements set forth in Section 608 of the Federal Clean Air Act. Some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.*

Custom air handling equipment design can vary greatly. It will be the responsibility of the installing contractor to familiarize themselves with the approved submittal and any reference documents associated with the air handler.

When a unit has been provided with a factory pre-piped refrigeration system, it will be the responsibility of the in-

stalling contractor to verify the system has been properly charged with refrigerant once unit installation is complete. Since the system requires the proper airflow and operating conditions to be accurately charged, final charging will typically be required in the field unless otherwise noted in the approved submittal. The unit will typically come precharged with a nominal amount of refrigerant that will allow the installer to start-up and operate the unit for the purpose of refining the charge. In some cases the unit may only be pressurized with dry nitrogen and will be clearly labeled as such. Refer to the approved submittal for specifics.

When specified, the installing contractor will be required to field install the refrigerant lines between the air handler and the refrigeration equipment. The installer is required to familiarize themselves with both the United Metal Products approved submittal and the installation literature provided with any refrigeration equipment prior to beginning the installation process. Unless otherwise specified, the installing contractor will be required to furnish all materials, including but not limited to refrigerant, piping, insulation and any accessories required for the proper installation and operation of the system.

GAS PIPING

The installing contractor will be required to field install the gas line to the unit and terminate the gas line to each furnace within the furnace compartment.

As a standard, holes for each furnace will typically be provided in the footer panels, below the furnace access doors. Use of these openings is at the discretion of the installing contractor. It will be the responsibility of the installer to size the gas lines correctly for a properly operating system. Refer to the furnace IOM manual for specific installation, maintenance and trouble shooting inquiries.

A factory provided flue cap will ship loose with each furnace as appropriate. It will be the responsibility of the installing contractor to provide any necessary flue piping to meet job conditions or requirements.

All piping must be done to industry standards and meet national or local codes, whichever is more restrictive.

⚠ WARNING *Fire or explosion hazard. Gas piping must be installed and leak tested by qualified personnel.*

SHIPPING RESTRAINTS

Carefully inspect all sections for shipping restraints and/or packaging material.

Remove any shipping blocks under the fans, CW valves, piping, coils etc. Inspect the fan base carefully to ensure all shipping restraints have been removed.

The shipping block fixes the equipment at the operating height. After the equipment is installed at it's final location, remove the shipping bolt. If the block will not slide out, turn the adjusting nut counter clockwise until equipment dead load is no longer resting on shipping block. Remove shipping block and discard. (Fig. 7)

Follow the start-up instructions provided in the start-up section of this manual for properly adjusting the seismic isolators.

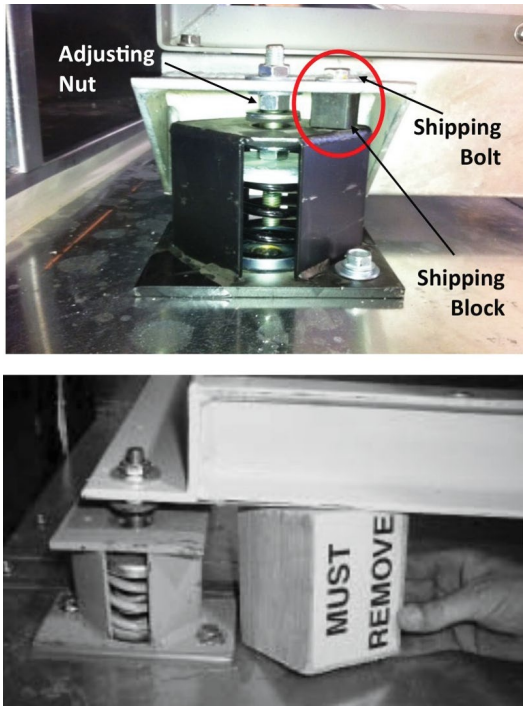


FIGURE 7 - SHIPPING RESTRAINTS

THRUST RESTRAINTS

Thrust restraints are required to limit excess horizontal movement of a spring mounted fan system due to the thrust created by operating static pressure. They are recommended when air thrust exceeds 10% of the equipment weight, and mass cannot be added to the system to increase resistance of the spring constant.

Thrust restraints are also required when the resulting displacement of the isolators exceeds 1/4" for open springs and 1/8" for housed or seismic springs.

Thrust restraints are pre-compressed at the factory and adjusted in the field to allow for the maximum movement during starting and stopping of the fan.

Thrust restraints are typically installed in pairs across the flexible connection of the fan. Refer to the factory provided literature regarding the final adjustment of the thrust restraints. This will be found bundled with the other supplemental IOM paper work inside the unit.

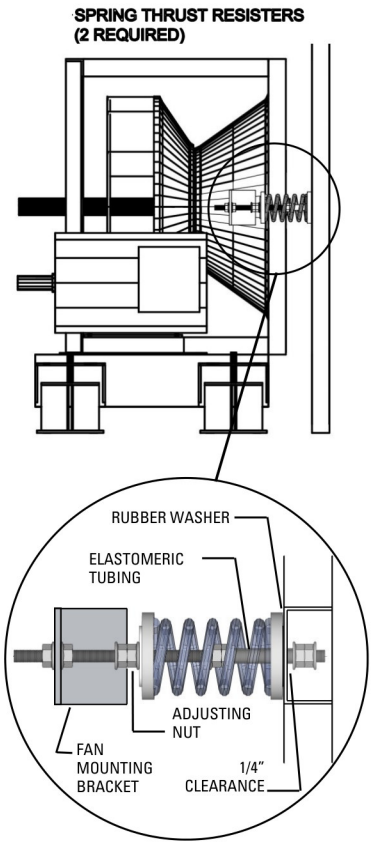


FIGURE 8– DRAW THRU APPLICATION

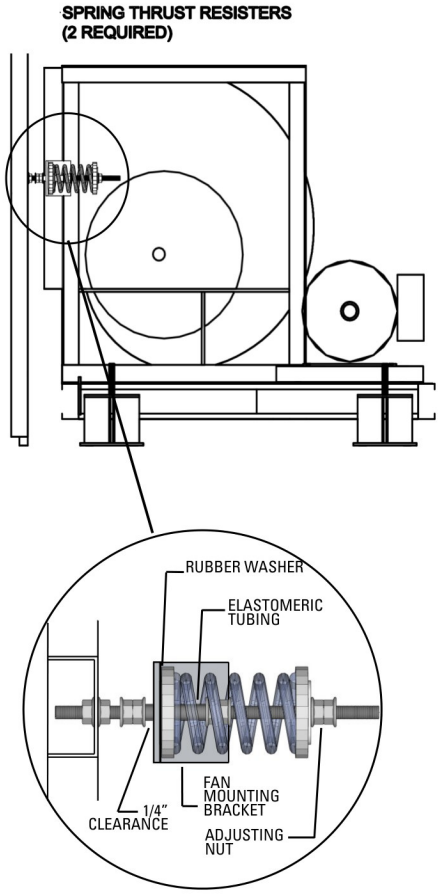


FIGURE 9– BLOW THRU APPLICATION

SHIPPED LOOSE ITEMS

Carefully inspect all sections for items that may have been shipped loose that were intended for installation at the jobsite by the installing contractor. Typically items that ship loose will be packaged and placed in the fan, mixing or access sections.

Filters will typically be shipped loose and stored in their original cartons located in one of the sections listed above. Refer to the equipment submittal to identify the proper location and type of filter to be installed.

Install any and all items shipped loose. Installation instructions will typically be provided with each component. Refer to components IOM for additional details.

General Information

⚠ WARNING *RISK OF ELECTRIC SHOCK. CAN CAUSE INJURY OR DEATH: DISCONNECT ALL REMOTE ELECTRIC POWER SUPPLIES BEFORE SERVICING. If the unit is thermostatically controlled, the thermostat is not to be used as a disconnect as it may reset and start the unit unexpectedly.*

⚠ DANGER *LIVE ELECTRICAL COMPONENTS! During installation testing and servicing of this product it may be necessary to work with live electrical components. This procedure must be performed by a licensed electrician or qualified individual who has been properly trained in handling live electrical components. Failure to follow all safety precautions when exposed to live electrical components could result in death or serious injury.*

⚠ WARNING *ROTATING COMPONENTS! During installation testing and servicing of this product it may be necessary to measure the speed of rotating components. This procedure must be performed by a qualified or licensed service individual who has been properly trained in handling exposed rotating equipment. Failure to follow all safety precautions when exposed to rotating components could result in death or serious injury.*

Before operating the unit, read and understand this manual in its entirety. Contact the factory if there are any questions or concerns prior to energizing the unit.

For safety, a tool operated mechanical lock has been provided on all doors for which that section may present a hazard. (Fig. 10)

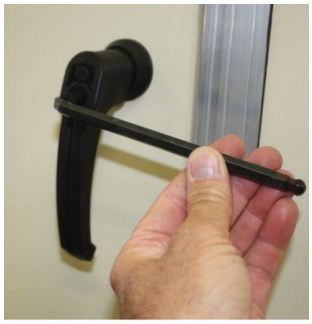


FIGURE 10

Once the air handler has been installed and assembled, attention must now be directed to individual components for proper operation.

A **start-up checklist** has been provided with this manual. This checklist must be completed by the installing contractor and returned to United Metal Products within 30 days of start-up for warranty validation. Email, mail or fax this form to the number and/or address located at bottom of this page.

Fans, Belts & Bearings

Proper belt tension is required to ensure maximum bearing and drive component life. Check the fan belt tension at least three times during the first few days of operation because there is a rapid decrease in tension until the belt settles in.

1. To measure belt tension, use a belt tensiometer (Fig. 11). Determine actual deflection by depressing one belt with the belt tensiometer and measuring the deflection relative to the other belts or to belt line. Adjust the belt tension to the correct pounds force and tighten all set screws to the proper torque. (Fig. 12)

Belt Tensioner

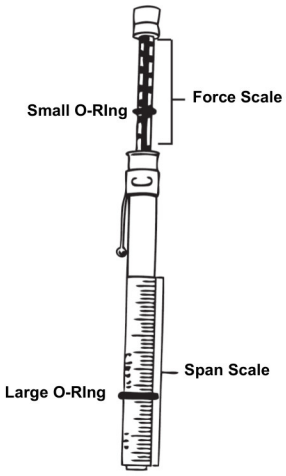


FIGURE 11

2. Check for proper drive alignment. Align the fan and motor sheaves using a straightedge. The straightedge must be long enough to span the distance between the outside edges of the sheaves.

3. Check that all bearing block bolts are tight and all set screws are secure.

4. Follow the start-up checklist provided with this manual.

Belt Tension Measurement

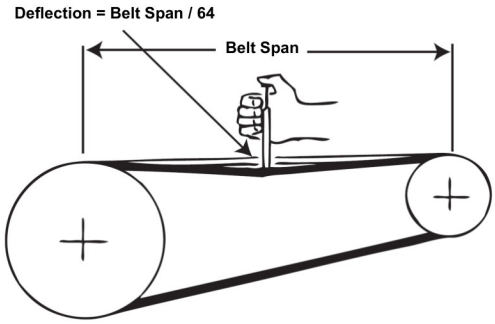


FIGURE 12

NOTE: *IMPORTANT! Email, mail or fax the Start-up form to United Metal Products within 30 days of start-up for warranty validation.*

BELT ADJUSTMENT

⚠ WARNING *Disconnect and lock out all electric power and make sure the fan has stopped before adjusting belts.*

The belt can typically be adjusted by loosening the 4 motor mounting nuts and turning the 2 adjustment bolts either clockwise or counter clockwise. Clockwise rotation (looking at the bolt head) will tighten the belt. Make sure to turn both adjustment bolts an equal number to keep the motor pulley and fan pulley in the same plane with each other. (Fig. 13)

Once proper belt tension has been achieved re-tighten the 4 motor mount nuts.

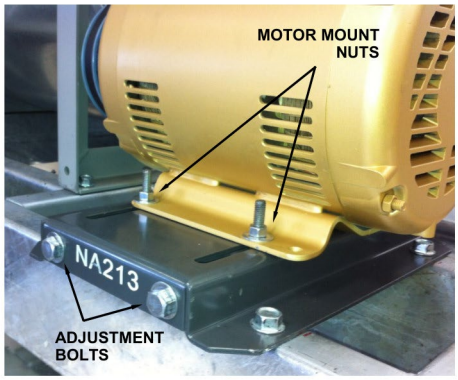


FIGURE 13 - *Motor Adjustment*

SEISMIC ISOLATORS

NOTE: *Isolators are pre-adjusted and set at the factory. Follow this procedure only if necessary and as it applies to the isolators used in this unit. This procedure can and should be performed by one person to ensure that the proper sequence is followed.*

Read instructions in their entirety before beginning.

Field Instructions

Shipping block fixes the equipment at the operating height. After equipment is installed at its final location, remove shipping bolt. If the block will not slide out, turn adjusting nut counter-clockwise until equipment dead load is no longer resting on shipping block. Remove shipping block and discard.

Verify isolator attachment nuts "B" are tightened as described in step 5.

Isolators have been selected for the given weight of the equipment, distributed to each spring. This procedure assumes the base surface is level. Isolators are not intended to be leveling devices. (Fig. 14)

1. Remove shipping bolt, but leave the shipping block in place.

2. Remove the equipment attachment nut "B" on isolator stud "C". The equipment weight will compress the spring inside the housing and the equipment bracket will rest on the shipping block at the "Operating Height".

3. Turn the adjusting nut "D" under the washer counter-clockwise to compress the spring. When the load is equalized, turning the nut will raise the equipment until the internal gap "G-1" is approximately equal to the external gap "G-2". (I.E. The equipment can move up or down, the same distance in a seismic event).

4. The adjusting process should be done gradually on all isolators until the equipment weight is no longer resting on the shipping blocks. Remove shipping blocks.

5. Replace isolator attachment nut "B" on adjusting bolt "C" to secure machine legs to isolators. Hand tighten where there is firm contact between the nut and equipment (hand tools may be used), then tighten the nut an additional 1/3 turn.

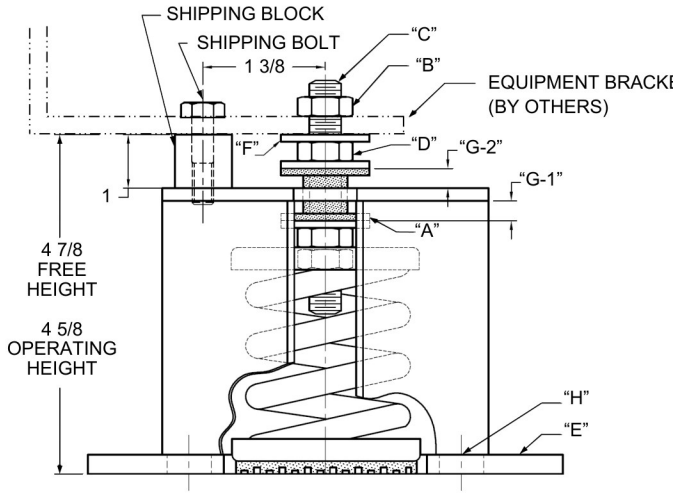


FIGURE 14 - *Typical spring shown. Types may vary.*

EVAPORATIVE MEDIA

Verify the air handling unit is level. The unit must be level for proper operation. Confirm evaporative media is installed correctly by making sure the 45 degree angled flutes are slanted downward toward the entering air stream. (Fig. 15)

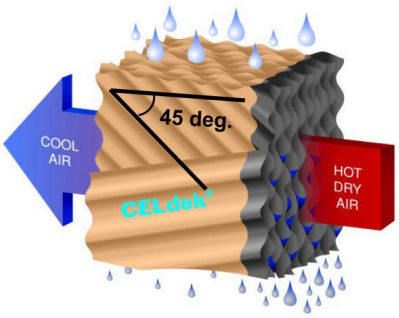


FIGURE 15 - PROPER MEDIA ORIENTATION

SETTING MAX FILL RATE

NOTICE *Due to various on-site conditions such as water pressure or drain line configurations it is imperative that the installer sets the max fill rate for each unit.*

(Step-1) Before opening the supply water shut-off valve (provided by others), completely remove the float arm by loosening the thumb screw (Fig. 16, #1) or adjust the (optional) electronic fill valve to its full open position.

(Step-2) Open the supply water shut-off valve to it's full open position and fill the sump until the water begins to overflow into the drain.

(Step-3) Closely monitor the water level in the sump to determine if the flow rate of the unregulated supply water will exceed the overflow capacity.

(Step-4) If the water level continues to rise above the overflow elbow and threatens to overflow the sump, close the supply water shut-off valve incrementally until the maximum overflow rate can be determined . This will dictate the maximum fill rate.

(Step-5) Mark the position of the supply water shut-off handle in relation to the valve body and place a weather proof tag (provided by installer) on valve indicating valve has
been set to the maximum fill rate.

(Step-6) Re-install float arm and secure thumb screw or adjust electronic fill valve for normal operation. Proceed to setting the water level.

SETTING THE WATER LEVEL

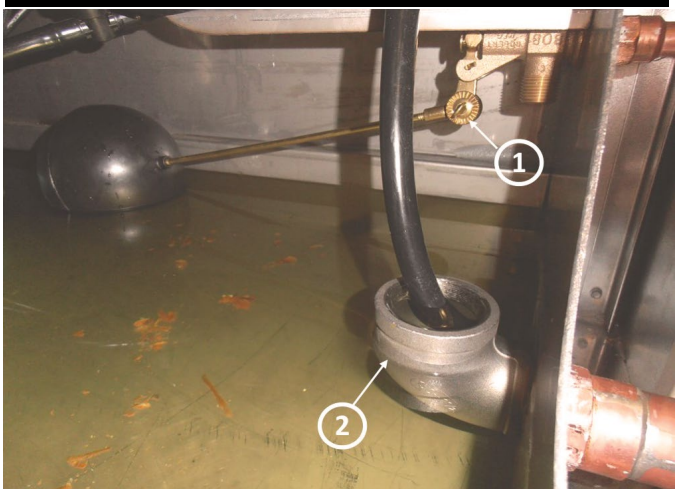


FIGURE 16- SETTING WATER LEVEL

(Step-1) Set the supply water max fill rate. With the supply water shut off valve open, monitor the water level. Loosen the thumb screw (Fig. 16, #1) to adjust float position to achieve recommended water levels outlined in step 2.

(Step-2) Fill the sump until the water level is 1/2" below the top edge of the overflow. (Fig. 16, #2)

(Step-3) Energize the pump & monitor the sump water level. Ensure that the float is allowing adequate make up water to fill the sump without allowing the pump to draw in air. Allow the pump to run for approximately 15 minutes to fully saturate the media with water and rinse off any debris that may have been left behind.

(Step-4) De-energize the pump and monitor the water level. Check that as the water drains off the media and back into the sump that the water level does not spill into the overflow.

(Step-5) Drain the sump completely. Repeat step 2.

SETTING THE WATER FLOW

The water flow over the media will be set at the factory. In the event field adjustment is necessary, a ball valve will be located in the pump discharge line for adjusting the flow of water over the media. Proper water flow over the media is important in order to flush the dirt and minerals accumulated in the pads back into the sump. If too little flow, minerals will prematurely clog the pads. Too great of flow and water may carry off the pads and wet the area down stream of the media. (Fig. 17, #1)

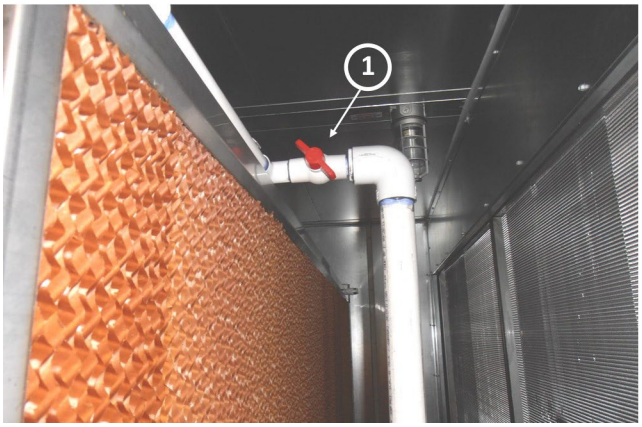


FIGURE 17 - SETTING WATER FLOW

FLUSH VALVE & TIMER (OPTIONAL)

The primary function of the flush valve is to clear debris from the distributor to prevent clogging. The flush valve and timer are not intended to act as a bleed. A fixed bleed will typically be provided on all evaporative sections unless otherwise specified in the units submittal.

The factory recommended timer setting is 1 flush cycle per 24hrs of operation. Each timed flush cycle will run for a set period.

A manual ball valve (Fig. 18, #1) is located up stream of the flush valve to provide throttling of the discharged water. Monitor the flush valve (Fig. 18, #2) through a flush cycle and verify that the water level DOES NOT drop below a level that will cause pump cavitation. Adjust the valve to provide maximum flush WITHOUT causing pump cavitation.

Verify the flush tubing is securely installed in the overflow drain and oriented to eliminate splash back of water into the airstream. (Fig 16)

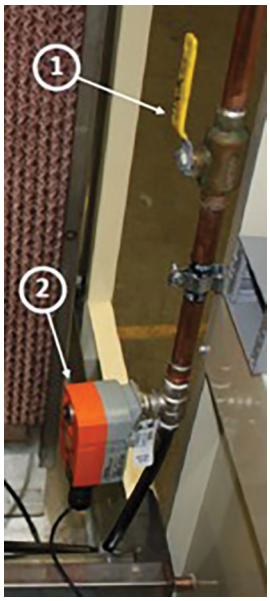


FIGURE 18

SETTING THE BLEED RATE

There will be a black poly vinyl tube connected to a tee located in the pump discharge line and inserted into the over flow drain. A manual ball valve (Fig. 19, #1) will be installed in this line for setting the bleed rate. The valve will come from the factory in the full open position and requires final adjustment in the field. With the pump running, measure the amount of water bleeding into the overflow using a measuring container and timer. Remove the bleed line from the overflow and measure the amount of bleed discharged in **one minute**.



FIGURE 19- BLEED RATE ADJUSTMENT

Taking several samples, adjust the bleed valve until it matches the bleed rate pre-calculated on the bleed rate chart (Fig. 20) which is based on the evaporative media's actual CFM.

BLEED RATE	
Cooler Air Volume:	Required bleed rate and time to fill a 12 oz. container:
5,000 cfm	11 oz/min = 68 sec
10,000 cfm	21 oz/min = 34 sec
15,000 cfm	32 oz/min = 23 sec
20,000 cfm	43 oz/min = 17 sec
25,000 cfm	53 oz/min = 14 sec
30,000 cfm	64 oz/min = 11 sec
Adjust the bleed rate to maintain clean water and reduce media scaling.	

FIGURE 20- BLEED RATE CHART

Tip: *Various unit bleed rates can be calculated from the chart by taking the evaporative media actual CFM and finding a divisible volume on the chart and multiplying the bleed rate accordingly.*

Example: 100,000cfm actual / 25,000cfm on chart = 4 x 53oz per minute = 212oz required bleed in one minute.

TDS CONTROLLER & FLUSH VALVE (OPTIONAL)

The function of the TDS controller and flush valve is two fold. The TDS controller will monitor the water quality and open the flush valve when the total dissolved solids exceeds the user defined set point. This will simultaneously allow water to be drained from the sump and allow debris to be removed from the distributor. Fresh water will enter the sump through the float valve and reduce the total dissolved solids in the sump until the set point value is reached and the flush valve is closed.

TDS controllers may vary based on job specifications. Refer to the job submittal and controller specific manuals provided with the unit for detailed instructions.

Although custom configurations may occur, typically a sensor will be plumbed in a branch circuit in the pump discharge line. Balancing valves will divert a controlled amount of water over the sensor. (Fig. 21)

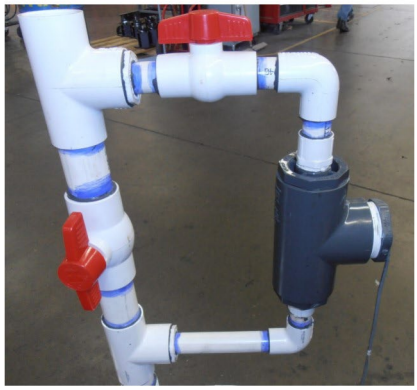


FIGURE 21- TDS SENSOR PIPING

1. To remove the sensor, make sure the pump is unplugged.

2. Using a marker, place a small mark on the sensor and tee to record the position of each component relative to one another. Using a back-up wrench, unscrew the sensor from the tee. Follow the products IOM instructions to carefully clean or replace the sensor as needed.

3. Re-seal threads with Teflon tape. Re-install sensor paying close attention to sensor orientation and alignment marks. Follow directions in component IOM for additional details. (Fig. 22)



FIGURE 22 TDS SENSOR REMOVAL

SUPPLEMENTAL IOM'S

Unit configuration can be simple or complex and component selection can vary greatly from unit to unit to meet design requirements. It will be the responsibility of the service technician to read and understand not only this manual but all associated component literature to ensure the equipment is operating properly.

All miscellaneous component literature and individual IOM's will be compiled and saved with the air handler. (Fig. 23) Examples of other components could include: Gas furnaces, electric heaters, humidifiers, actuators, UV lights, etc.

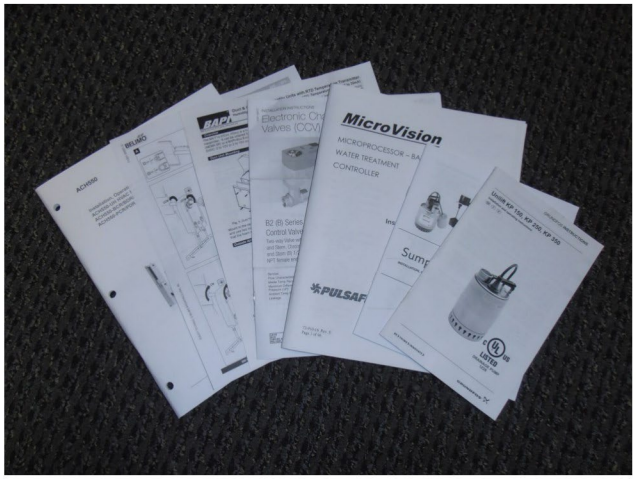


FIGURE 23– SUPPLEMENTAL IOM'S

General Information

⚠ WARNING *Disconnect all electric power, including remote disconnects before servicing. Follow proper lock-out / tag-out procedures to ensure the power can not be inadvertently energized.*

Unit configurations can vary greatly. This maintenance manual provides information intended to inform the service technician of general maintenance items. Service personnel will be required to read and understand any supplemental IOM's provided with individual components and follow the recommended maintenance procedures outlined in those manuals. Read and comply with all warnings, cautions and notices.

Air Filters

It is important to replace the filters on regular maintenance cycles. It is also important to replace the filters with the same filter type that was provided by the factory. Check that the filters called for are the filters used; failure to use the filters that the air handler has been designed for can cause fan motor overload and /or cause the coils to become prematurely dirty and restrict airflow. Refer to the units data sheet for specific filter type.

Filter Replacement:

1. Side Withdraw—Open filter access door, pull filters along filter slide track (using pull tab) and remove from unit. Install new filters with the directional arrows pointing in the direction of airflow.

2. Front Withdraw—Access filter section. Open or remove the filter clip. Remove the filter from the rack. Install new filters with the directional arrows pointing in the direction of airflow. Secure the filter using the appropriate clip for each filter.

3. Front Withdraw Slide Track—Access filter section. Remove filter access cover from filter slide track. Remove filters through access section on filter track sliding the filters along the track. Install new filters with the directional arrows pointing in the direction of airflow. Secure the filters by re-installing the filter access cover on filter track.

Coil Cleaning

Dirt acts as an insulator to heat transfer. Coils will require periodic cleaning to prevent reduction to performance. Follow the recommended coil cleaning maintenance schedule outlined in this manual.

Indoor coils typically accumulate dirt and residue that may require the use of a mild detergent. Numerous products are available on the market for this purpose. Follow all instructions and safety procedures provided with the product. Coil cleaners that are highly acidic are not recommended.

Check that the condensate pan is clean and draining properly. Verify the condensate trap is clear of debris and draining adequately. Clean as required.

Drain Pan Cleaning

⚠ CAUTION *Standing water, debris and cleaning solutions in the drain pan can irritate skin, eyes and lungs. Wear appropriate personal protective equipment.*

1. Disconnect all electrical power to the unit.

2. Wearing the appropriate personal protective equipment, remove any standing water.

3. Scrape solid matter off of the drain pan.

4. Vacuum the drain pan with a vacuum device that uses high-efficiency particulate arrestance (HEPA) filters with a minimum efficiency of 99.97 percent at 0.3 micron particle size.

5. Thoroughly clean any contaminated area(s) with a mild bleach and water solution or an EPA- approved sanitizer specifically designed for HVAC use.

6. Immediately rinse the affected surfaces thoroughly with fresh water and a fresh sponge to prevent potential corrosion of metal surfaces.

7. Allow the unit to dry completely before putting it back into service.

8. Be careful any contaminated material does not contact other areas of the unit or building.

9. Properly dispose of all contaminated materials and cleaning solution.

FAN BEARING LUBRICATION

⚠ WARNING *Disconnect all electric power, including remote disconnects before servicing. Follow proper lock-out / tag-out procedures to ensure the power can not be inadvertently energized.*

NOTICE *BEARING FAILURE—Do not mix greases with different bases within the bearing. Mixing grease within the bearing may result in premature bearing failure.*

The grease used in fan bearings is usually not compatible with the grease used in electric motor bearings.
Never mix the two grease types!

Do not over grease. A major cause of bearing failure is over greasing. (Fig. 24 & 25)

Follow the specific bearing manufacturers instructions for proper lubrication.



FIGURE 24 - *FAN BEARING LUBRICATION*

TYPICAL FAN BEARING GREASE TYPES
Shell Gadus S3 V220C 2

Figure 25 *Fan Bearing Grease Type*

NOTICE Motor bearing grease and fan bearing grease are not compatible lubricants. Don't mix grease types.

MOTOR INSPECTION & LUBRICATION

Check that the interior and exterior of the motor is free of dirt, oil, grease , water, etc. If the motor is not properly ventilated, overheating can occur and cause early motor failure. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.

Check all electrical connections to be sure they are tight.

Bearing grease will lose its lubricating ability over time, not suddenly. A high grade ball or roller bearing grease should be used. (Fig. 26)

Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your motor manufacturer if a grease other than the recommended type is to be used.

If the motor has a grease outlet plug, make sure the motor is stopped, clean all grease fittings with a clean cloth.

Below are some general motor lubrication instructions. Follow the specific motor manufacturers instructions for proper lubrication procedures.

1. Remove grease outlet plug.
2. Add the recommended amount of grease.
3. Operate the motor for 15 minutes with the grease plug removed. This allows excess grease to purge.
4. Reinstall grease outlet plug.

MOTOR BEARING GREASE TYPE:
Polyrex EM (Exxon Mobil).

FIGURE 26 *MOTOR GREASE TYPE*

EVAPORATIVE SECTION

⚠ WARNING *Always disconnect power before servicing pump and evaporative components!*

Periodic maintenance is critical for the proper operation of the evaporative section. Follow the recommended maintenance timeline provided at the back of this manual.

Evaporative media should be checked for scale build-up at the beginning and mid season. Scale build-up can occur when heavy mineral laden water is not diluted correctly through the proper use of a bleed. Scale build up can also be caused from lack of water flow over the media not allowing the minerals to be rinsed back into the sump.

Check that the proper bleed rate is set. (Refer to the operation section of this manual for instructions on setting the bleed).

Check & clean the pump inlet screen periodically. Reduced water flow will impact cooling performance and may cause premature media scale build up.

Periodically flush out the distributor manually if an automatic flush kit has not been installed. If an automatic flush kit has been installed verify it is working properly. (Refer to the operation section of this manual for flush operation) (Fig. 18)

The distributor should be periodically cleaned with a distributor brush to clear any debris blocking the distributor holes. To access the distributor clean out plug, remove the media access side panel. Unscrew the distributor end plug, flush out any debris in distributor, insert the distributor brush (Fig. 28) and push across the full length of the distributor (multiple passes may be required to thoroughly clean). Re-assemble in reverse order. Energize pump and verify even water distribution on evaporative media face.

At the end of the cooling season it will be necessary to turn off the water supply to the cooler and drain the reservoir. Do not leave water standing in unit for prolonged periods of time while unit is not in use. Make sure the pump has been unplugged and cannot be energized during shut down. NEVER operate the water pump without having the reservoir filled with water.

When replacing the media, be sure the 45 degree angled flutes are slanted downward toward the entering air stream (Fig. 15). A removable media frame has been provided for cleaning dirt & debris that may have collected under the evaporative media (Fig. 27).

It is not recommended that soft water equipment be attached to any water lines going to the cooler. "Soft Water" may cause corrosion and decrease effective life of the cooler.

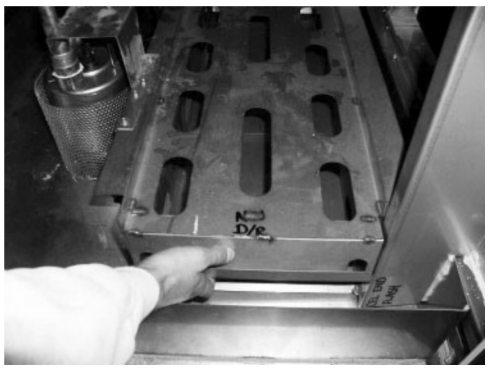


FIGURE 27– REMOVEABLE MEDIA FRAME



FIGURE 28 - DISTRIBUTOR CLEANING BRUSH

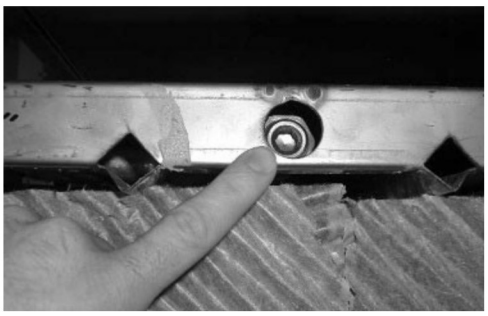


FIGURE 29– DISTRIBUTOR CLEAN-OUT

RECOMMENDED MAINTENANCE SCHEDULE

TYPE OF SERVICE	START-UP	MONTHLY	3 MONTH	6 MONTH	SHUTDOWN
Inspect General Condition	X	X			
Clean Debris from Unit	X	X			X
Check Unit for Unusual Noise & Vibration	X	X			
Tighten / Inspect Electrical Components	X	X			
GFCI - Press TEST / RESET Buttons to Assure Proper Operation	X	X			
Check Motor Voltage & Current	X	X			
Check & Test all Safety Components as Appropriate to Unit	X	X			
Check Pulley Alignment & Wear	X	X			
Check Belt Tension & Wear	X	X			
Check Fan Bearing Locking Collars & Mounting Bolts for Tightness	X			X	
Lubricate Motor Bearings	X			X	
Lubricate Motor Base Adjustment Bolts	X			X	
Lubricate Fan Shaft Bearings	X		X		
Inspect, Test & Lubricate Damper Linkage (Silicone Lubricant Only)				X	
Replace Filters		X			
Wash Evaporative Media					X
Clean Coils, Condensate Pans & Drains				X	
Clean Water Pump	X	X			
Clean Water Reservoir	X			X	
Check & Adjust Evaporative Bleed Off Rate	X		X		
Drain Evaporative Reservoir					X
Flush Evaporative Distributor and Clean Distribution Holes					X
Miscellaneous Components - Follow Components IOM	X				

FIGURE 30 - RECOMMENDED MAINTENANCE SCHEDULE

Personnel must comply with all warnings, cautions and notes provided in this manual as well as any warnings, cautions and notes found in supplemental documents provided with the unit.

LIMITED WARRANTY

UNITED METAL PRODUCTS, INCORPORATED extends this limited warranty to the original buyer and warrants that products manufactured by United Metal Products shall be free from original defects in workmanship and materials for 12 months from start-up or 18 months from date of shipment (whichever is sooner), provided same have been properly stored, installed, serviced, maintained and operated with bleed-off system properly installed. This warranty shall not apply to products which have been altered or repaired without United Metal Products' express authorization, or altered or repaired in any way so as, in United Metal Products' judgment, to affect its performance or reliability, nor which have been improperly installed or subjected to misuse, negligence, or accident, or incorrectly used in combination with other substances. Warranties on purchased parts, such as electric motors, pumps and pads, are limited to the terms of warranty extended by our supplier (usually one year duration).

LIMITATION OF REMEDY AND DAMAGES: All claims under this warranty must be made in writing and delivered to United Metal Products, Inc., 1920 East Broadway Road, Tempe, Arizona 85282, within 15 days after the date of shipment by United Metal Products of the product claimed defective, and buyer shall be barred from any remedy if buyer fails to make such claim within such period.

Within 30 days after receipt of a timely claim, United Metal Products shall have the option either to inspect the product while in buyer's possession or to request buyer to return the product to United Metal Products at buyer's expense for inspection by United Metal Products. United Metal Products shall replace, or at its option repair, free of charge, any product it determines to be defective, and it shall ship the repaired or replacement product to buyer FOB. point of shipment; provided, however, if circumstances are such as in United Metal Products judgment to prohibit repair or replacement to remedy the warranted defects, the buyer's sole and exclusive remedy shall be a refund to the buyer of any part of the invoice price, paid to United Metal Products, for the defective product or part.

United Metal Products is not responsible for the cost of removal of the defective product or part, damages due to removal, or any expenses incurred in shipping the product or part to or from United Metal Products plant, or the installation of the repaired or replaced product or part.

Implied warranties, when applicable, shall commence upon the same date as the express warranty provided above, and shall, except for warranties of title, extend only for the duration of the express warranty. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. The only remedy provided to you under an applicable implied warranty and the express warranty shall be the remedy provided under the express warranty, subject to the terms and conditions contained therein, United Metal Products shall not be liable for incidental and consequential losses and damages under the express warranty, any applicable implied warranty, or claims for negligence, except to the extent that this limitation is found to be unenforceable under applicable state law. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

No employee, agent, dealer, or other person is authorized to give any warranties on behalf of United Metal Products or to assume for United Metal Products any other liability in connection with any of its products except in writing and signed by an officer of United Metal Products. Liability shall in no case exceed the unit price of the defective product or part.

TECHNICAL ADVICE AND RECOMMENDATIONS, DISCLAIMER: Notwithstanding any past practice or dealings or any custom of the trade, sales shall not include the furnishing of technical advice or assistance or system design. All structural and/or seismic calculations are not provided. Please refer to engineering plans and specifications. Any such assistance shall be at United Metal Products' sole option.

⚠ *WARNING*

Our products are designed and manufactured to provide performance, but they are not guaranteed to be 100% free of defects. Even reliable products will experience occasional failure, and this possibility should be recognized by the user. If these products are used in a life support ventilation system where failure could result in loss or injury, the user should provide adequate back-up ventilation, supplementary natural ventilation or failure alarm system, or acknowledge willing ness to accept the risk of such loss or injury.

DO NOT USE IN HAZARDOUS ENVIRONMENTS where fan's electrical system could provide ignition to combustible or flammable materials.

NOTE

If any assistance from the factory is needed to check, test, or start-up any UMP equipment, a prevalent rate per day, per person plus travel, lodging, food, etc., will be paid by the buyer/contractor.

⚠ *WARNING*

Guards must be installed when fan is within reach of personnel or within seven (7) feet of working level or when deemed advisable for safety.

DISCLAIMER

United Metal Products, Inc. had made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions or dimension. All information in this literature is subject to change without notice.