

AIR HANDLING UNITS

INSTALLATION, OPERATION AND MAINTENANCE MANUAL



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INTRODUCTION

Objective

Apart from an economically sensible and ecologically suitable application, it is most important for the operation of a machine that any danger to the life and limb of people is excluded. In order to ensure this, please observe the safety instructions given in this manual. In addition to these instructions, the generally applicable Safety and Accident Prevention Regulations must be complied with.

The air handling unit you have purchased is the state-of-the-art product and operates reliably and safely if this operation manual is observed. Inexpert use can cause both malfunctions and danger to people. Therefore, this operation manual is binding for any person in charge of installation, start-up, operation and maintenance at the purchaser's works.

The unit must be used for the purpose defined. Any use deviating here from does not comply with the contract. The manufacturer does not provide any warranty for damage resulting from this. It is not allowed to make the unit available to a third party if this includes additional risks.

The unit must be used, maintained and operated by authorized and well-trained personnel only. The operating personnel must be informed about possible dangers by reading this operation manual.

It is necessary to observe the all procedures described in the operation manual of the system into which the unit is integrated.

It is not allowed to carry out any work, which impairs the reliability of the unit and associated system components. The operator has to make sure that no unauthorized person works at the unit. He is also obliged to immediately inform the purchaser about changes of the unit, which reduce operating safety and reliability. The purchaser, for his part, is obliged to inform the manufacturer in writing about all defects without any delay, however 15 days after the defect has been detected at the latest.

The purchaser is obliged to run the unit always in perfect condition. The manufacturer declines liability for unauthorized changes, which impair the function and safety of the unit. Work on the unit must always be carried out during shutdowns. This applies especially to the removal of safety guards. In this case the drive must be secured against being switched on inadvertently.

It is not allowed to remove information, mandatory, and prohibitive signs. If the unit is started up again after a shutdown, make sure that all safety guards have been mounted properly.

The manual should always be in proximity of the device and within easy reach of the servicing personnel.

Warning and Cautions

Notice that **WARNING** and **CAUTION** appear at appropriate intervals throughout this manual.

WARNING

WARNING indicates a potentially hazardous situation that could result in personal injury or death.

CAUTION

CAUTIONs are designed to alert you to conditions that could result in minor personal injury or equipment damage.

GENERAL INFORMATION

Unit Description

VAYHAN designs air handling unit for a variety of air handling applications. The basic components of the unit consist of a fan, heating and/or cooling coils, filters, and dampers. See the sales catalog for various available options and components.

The units are also available with factory-fitted controls for stand-alone operation or operation compatible with building automation system.

VAYHAN units ship as complete assemblies or sectional sub-assemblies. Some assembly is required when the units ship as sub-assemblies.

Unit Nameplates

Each unit is provided with a nameplate. This nameplate includes model number, serial number, month & year of manufacturing, fan model, airflow capacity, static pressure, motor rating and fan speed. Refer to model number and serial number when ordering parts or requesting service.

Receiving

The VAYHAN unit can ship as individual sections, section subassemblies, or a complete air handler. Upon receipt of the unit(s) and prior to unloading, inspect the unit for damage and verify that the shipment is complete.

Inspection

1. Visually inspect components for any damage that may have occurred during shipment.
2. Check all access doors to confirm that the latches and hinges are not damaged.
3. Check all coil connections to confirm they are straight and undamaged.
4. Inspect the coils for damage to the fin surface.
5. Manually rotate the fan wheel to ensure free movement of the shaft, bearings, and drive.
6. Inspect the fan housing for any dents.
7. Inspect the interior of each section for any internal damage.
8. If the unit shipped in subassemblies, locate assembly hardware. The necessary assembly hardware will be packaged in separate box.

Resolving Shipping Damage

The VAYHAN generally ships FOB. If damage has occurred to the unit sections during shipment, the following instructions should be completed:

1. Make specific notation describing the damage on the freight bill.
2. Report all claims of shipping damage to the delivering carrier immediately.
3. Keep damaged material in the same location as it was received. It is the receiver's responsibility to provide reasonable evidence that the concealed damage was not incurred after delivery.
4. Notify the VAYHAN sales representative of the damage and arrange for repair. Do not attempt to repair the unit without consulting the sales representative.

NOTE: VAYHAN IS NOT RESPONSIBLE FOR SHIPPING DAMAGE.

STORAGE CONSIDERATIONS

General

VAYHAN unit requires no special protection for storage before installation. **The warranty will not cover damages to the unit due to negligence during storage.**

For longer periods of storage, allow enough clearance around the unit to perform periodic inspection and maintenance of the equipment. In addition, loosen belt tension on drive belts.

Long Term Storage

Every two weeks, rotate the fan and motor shaft thirty revolutions by hand. Check for free rotation.

Every six months, check fan shaft bearings. Check the motor lubrication; remove and clean grease plugs and check for the presence of moisture in the grease. If moisture is present, remove the motor and send it to an authorized repair shop for bearing inspection/ replacement. If no moisture is present, refer to the motor manufacturer's lubrication recommendation for proper lubrication.

RIGGING AND HANDLING

The unit will be shipped (as specified by sales order) as 1) a complete assembly, 2) in sub-assemblies (collection of sections), or 3) as individual sections. Follow appropriate lift warnings as shown in the following sections of this manual.

WARNING

Never bolt (assemble) sections or sub-assemblies together before rigging. Always rig subassemblies or sections as received from the factory.

CAUTION

Do NOT lift from the top of the unit. Lift only from the holes provided in the base of the unit by using hooks or bars. Use all holes provided. Failure to do so can damage the unit.

Determine Unit Weights

Always test lift the unit section to check for proper balance and rigging before shifting to the desired location.

When preparing to lift sections, estimate the equipment's approximate weight and center of gravity. Due to placement of internal components, the weight of the unit may be unevenly distributed, with more weight being present in the fan and coil areas.

Lifting Instructions

VAYHAN recommends that the contractor use spreader bars and slings to rig units and sub-assemblies (sections).

1. Always assemble the unit at the installation site.
2. Always rig subassemblies or sections as they ship from the factory.
3. Make the loop of the sling parallel to the direction of airflow, whenever possible.

WARNING

Follow good lifting practices before lifting the unit. Never lift units in windy conditions or raise units above personnel. Failure to follow all instructions may result in personal injury or equipment damage.

UNIT ASSEMBLY

VAYHAN unit is extremely versatile and can be assembled easily. **Prior to unit assembly, refer to the correct submittals for correct placement of sections.** Failure to review the submittal could result in performance or assembly problems. If there are any discrepancies, contact VAYHAN representative before proceeding.

NOTE: VAYHAN RECOMMENDS ASSEMBLY OF THE UNIT AT SITE TO BE UNDERTAKEN BY ANY AUTHORISED PERSONNEL ONLY.

IMPORTANT: All shipping support on the face of the sections and sectional subassemblies must be removed and discarded to permit proper fit up and sealing of the surfaces.

General

WARNING

To avoid personal injury or death, keep open flame away from unit exterior or interior. Do not weld or use cutting torch on the exterior or interior of the unit. The unit contains polyurethane insulation. Failure to keep open flame away from unit exterior or interior may result in the production of toxic gas that could result in death or serious injury.

Provide clearance around the unit to allow adequate free air and necessary service access. Also, allow room for supply and return piping, ductwork, electrical connections, and coil removal.

1. Complete all necessary requirements **before starting assembly of the unit.**
2. Complete all ductwork, piping and electrical connections only after mounting the unit.

Assembly Hardware

VAYHAN units ship with all necessary assembly hardware and gasket material. This hardware is packaged in either a clear plastic envelope or cardboard box. Please check thoroughly before contacting VAYHAN Representative to report missing hardware.

Unit Assembly - All Sizes

Mounting

If a unit arrives in **sections**, then each section **must** be individually shifted and assembled. When mounting the unit make sure that the gasket between the panels and the framework provides an airtight seal.

CHECK THAT THE UNIT IS LEVEL TO ENSURE PROPER OPERATION.

IMPORTANT: FOR PROPER OPERATION, THE UNIT MUST BE INSTALLED LEVEL (ZERO TOLERANCE) IN BOTH HORIZONTAL AXES. FAILURE TO LEVEL THE UNIT PROPERLY CAN RESULT IN CONDENSATE MANAGEMENT PROBLEMS SUCH AS STANDING WATER INSIDE THE UNIT. STANDING WATER AND WET SURFACES INSIDE AIR HANDLING UNITS CAN RESULT IN MICROBIAL GROWTH (MOLD) IN THE DRAIN PAN THAT MAY CAUSE UNPLEASANT ODORS AND SERIOUS HEALTH-RELATED INDOOR AIR QUALITY PROBLEMS.

For vertical discharge units, allow space over the unit for supply air ductwork connections.

Component Installation Requirements

The VAYHAN unit is extremely versatile and the assembled unit is a complete air handling system. Each section may have installation requirements that will affect the performance of the unit.

High Efficiency Bag and Cartridge Filter Section

The Bag and Cartridge Filter sections can be used as either a pre-filter section or a Final Filter section or both. This is determined according to the application.

Filter Installation

NOTE: CARTRIDGE AND BAG FILTERS PROVIDED BY VAYHAN ARE FITTED WITH FRAME THAT FITS IN THE FILTER TRACK. IF USING FILTERS SUPPLIED BY ANOTHER MANUFACTURER, FILTERS SHOULD BE PURCHASED WITH THE SAME FRAME. IN SOME CASES IT MAY BE NECESSARY TO GASKET THE LOCALLY PURCHASED FILTERS TO INSURE A GOOD AIR SEAL.

FILTERS SHOULD BE INSTALLED WHEN THE UNIT IS SET. THIS WILL PROTECT INTERNAL COMPONENTS SUCH AS THE UNIT'S HEATING AND COOLING COILS.

WARNING

Pressurized Cabinet!

Disconnect all electric power before opening door. Failure to disconnect power before servicing can cause severe personal injury.

1. Disconnect the power to the unit.
2. Open the filter section access door, if provided.
3. Slide the filters into the tracks. .
4. Close the access door, if provided and confirm that there is a good seal of the filter track.

Fan Section

The Fan section can be configured as either draw-thru or blow-thru. Refer the submittals prior to assembly. The fan and motor assembly are internally isolated. The fan and motor bases are bolted to isolators. The isolators are secured to the fan section support base.

Unit Isolation

Review the specifications and determine the type of isolation to be used.

SET UP

Once VAYHAN unit is assembled and installed, attention must be directed to individual components for proper operation.

Dampers

(Including mixing sections, face and bypass dampers and supply air dampers)

Before installing the Mixing sections fitted with filter racks, be sure adequate clearance is provided to open the access doors and install the filters.

Controls and End Devices

VAYHAN unit is also available with factory mounted controls or end devices. If the unit is not ordered with controls or end devices, it is the responsibility of the installer to provide and install them.

Duct Connections

All duct connections to the VAYHAN unit should be installed in accordance with the standards for installing of air conditioning and ventilating systems. To ensure the highest fan efficiency, duct turns and transitions must be made carefully minimizing air friction losses and turbulence. Proper ductwork installation, as outlined by such organizations as SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.) should be adhered to.

Fan Discharge Connections

When using lined duct, the insulation should not obstruct the discharge opening. Connections made directly to the discharge opening of the fan should have a necessary minimum of straight duct required before any turns or transitions. The first turn of the connection should be in the same direction as the fan rotation. The air that the fan discharges into the duct is extremely turbulent and requires some length of duct to stabilize.

Dampers

Ductwork attached to the dampers should be sized to fit the opening of the damper. Ensure that the duct connection does not obstruct the damper opening.

Discharge Plenum

Discharge plenum sections are available with or without openings. Sections with openings have a framed opening that can be used to secure the duct to the frames. Ensure that the duct connection does not obstruct the discharge opening.

Miscellaneous Sections

Miscellaneous sections include access sections, coil sections, fan sections and intake sections. It is important to ensure that the ductwork does not obstruct the opening of the section.

Drain Pan

Condensate Drain Pan Connections

CAUTION

Failure to provide adequate condensate piping may result in water damage to the equipment and or building.

Threaded condensate drain connections are provided on only one side of the coil section. Fix the connection lines horizontal or downward toward an open drain. VAYHAN recommends installing a plug to facilitate cleaning of the trap.

IMPORTANT: PROPER TRAPPING OF THE COOLING COIL CONDENSATE DRAIN LINES IS NECESSARY FOR PROPER CONDENSATE MANAGEMENT. IMPROPER TRAPPING CAN RESULT IN STANDING WATER INSIDE THE UNIT OR WET INTERIOR SURFACES THAT CAN CAUSE UNPLEASANT ODORS AND SERIOUS HEALTH-RELATED INDOOR AIR QUALITY PROBLEMS.

It is essential that the drain pan condensate trap to be of correct design to ensure water seal in the trap while allowing the condensate pan to drain. Incorrect design can cause the drain pan to overflow.

Coil Piping And Connections

General Coil Piping Recommendations

Proper installation, piping and trapping is necessary to ensure satisfactory coil operation and to prevent operational damage.

1. Support all piping independently of the coils.
2. Provide flexible fittings on all connections that are adjacent to heating coils in order to absorb thermal expansion and contraction strains.
3. If ordered with factory-mounted controls, install the control valves. The valves ship separately in the unit. The contractor should supply the pipe nipples, couplings, etc. for installation.

For best results, VAYHAN recommends that a short pipe nipple be used on the coil headers prior to making any welded flange or welded elbow type connections.

IMPORTANT: TEFLON TAPE OR PIPING COMPOUND SHOULD NOT BE USED FOR ANY FIELD CONNECTIONS BECAUSE ITS HIGH LUBRICITY MAY ALLOW CONNECTIONS TO BE OVER-TIGHTENED, RESULTING IN DAMAGE TO THE COIL HEADER.

NOTE: USE A BACK-UP WRENCH WHEN ATTACHING PIPING TO COILS WITH TUBE HEADER CONSTRUCTION TO PREVENT DAMAGE TO THE COIL HEADER. DO NOT USE BRASS CONNECTORS. BRASS DISTORTS EASILY AND COULD CAUSE CONNECTION LEAKS.

When attaching the piping to the coil header, make the connection only tight enough to prevent leaks. Use pipe sealer on all threads connections. After completing the piping connections, use mastic to seal between the pipe and casing before insulating

NOTE: THE PIPING PENETRATION INTO THE UNIT CASING MUST BE SEALED BEFORE INSULATING. FAILURE TO SEAL THE PENETRATION WILL PERMIT INFILTRATION OF UNCONDITIONED AIR INTO THE SECTION.

NOTE: IF GLYCOL IS USED IN THE CHILLED WATER OR HOT WATER SYSTEMS, BE SURE TO USE A GLYCOL APPROVED FOR USE WITH COMMERCIAL COOLING SYSTEMS AND COPPER TUBE COILS. FOLLOW THE MANUFACTURER'S RECOMMENDATIONS FOR WATER TREATMENT AND MIX. FAILURE TO DO SO COULD AFFECT COIL PERFORMANCE OR DAMAGE THE TUBES OR BRAZE JOINTS.

VAYHAN units fitted with steam coils should be installed properly. Check that the coil is installed correctly and that the unit installation agrees with the submittals.

VAYHAN units fitted with direct expansion coils should be installed properly. Check that the coil is installed correctly and that the unit installation agrees with the submittals. Before connecting the coil, check if pipes are perfectly horizontal.

1. Check the coil for fin damage and straighten if necessary.
2. Check that the coil is installed correctly with the airflow in the same direction as indicated on the submittals.
3. Install a drain line and shutoff valve in the supply line near the coil.

Heat Exchangers

Proper installation is necessary to ensure satisfactory operation and to prevent operational damage.

1. Pay attention when mounting heat exchanger, as it is made of fragile components.
2. Check the gasket and silicon sealing to prevent air by-pass.
3. Check the position of heat exchanger, it should be perfectly horizontal, and check the regular wheel movement.
4. The electrical connection should be in compliance with local authority norms.
5. Check the inspection door is provided with safety switch.

Wet Deck Humidifier

Proper installation is necessary to ensure satisfactory operation and to prevent operational damage.

1. Connect the humidifier to the water supply.
2. Equip the drain/ tank discharge pipe with a siphon.
3. Connect the pump to the power supply. All the equipment should be in compliance with regulations.

Wiring

WARNING

Disconnect electrical power source before servicing the unit or connecting electrical wires. Failure to do so may result in personal injury or death from electrical shock or entanglement in moving parts. If the unit includes a factory-mounted starter, use of the lockout/ tag out is required while servicing the unit.

If the unit does not include a factory-mounted starter, wiring to the unit fan motor must be provided by the installer and must comply with all local authority norms. The installer must also furnish a fused disconnect switch in compliance with local authority norms. Fan motors require overload protective devices rated or selected in compliance with the local authority norms.

CAUTION

Use copper conductors only for terminal connections. Use of aluminum or other type of wiring may result in galvanic corrosion or overheating and result in equipment damage.

INSTALLATION CHECKLIST

The following list provides detailed installation information and should be used to ensure proper installation.

1. Examine the unit and components for material shortage or shipping damage.
2. Check unit location for unit dimensions, weights and clearances.
3. Rig each section properly and hoist it to its final position.
4. Check that unit is installed level.
5. Install filters, if supplied.
6. Connect supply and return air ductwork.
7. Complete coil and condensate drain piping connections.
8. Complete electrical connections to the unit.
9. Leave the unit installation and maintenance manual with the unit.

Pre-startup Checks

Before operating the unit, complete the following checks for safe and efficient operation.

WARNING

Disconnect electrical power source when connecting or disconnecting electrical wires for test procedures. Failure to exercise caution when inspecting unit operation may result in injury or death from electrical shock, air movement or rotating parts.

1. Rotate all fan wheels manually. Fans should turn freely in the proper direction.
2. Check fan drive belt tension.

NOTE: IF VAYHAN UNIT FAN IS GOING TO OPERATE AT OTHER THAN DESIGN RPM OR WITH A VARIABLE SPEED DRIVE NOT SUPPLIED BY VAYHAN, THE UNIT VIBRATION LEVELS SHOULD BE CHECKED AT THE NEW RPM AND THROUGHOUT THE SPEED RANGE.

3. Inspect fan motor and bearings.
4. Inspect electrical connections. They should be clean and secure.
5. Check piping and valve for leaks. Open or close the valves to check operation. Drain lines should be open.
6. If unit has a refrigerant coil, it must be charged, leak-tested, and ready for operation according to instructions provided with the condenser equipment. Adjust superheat setting.
7. Check that air filters are in place and positioned properly.
8. Remove all foreign material from the drain pan and check pan opening and condensate line for obstructions.
9. Check unit for debris.
10. Close and secure all unit access doors.

START- UP

CAUTION

The use of untreated or improperly treated water in unit coils may cause scaling, erosion, corrosion, algae, slime or other equipment damage. Consult a qualified water treatment specialist to determine if water treatment is required. VAYHAN assumes no responsibility for equipment damage caused by untreated or improperly treated water.

Start-Up Procedures

After completing all pre-startup checks and procedures, the unit may be started. The following checks and adjustments should be made during initial start-up:

WARNING

Disconnect electrical power prior to access into a fan or ductwork. The impeller should be secured to physically restrict rotational movement. Failure to secure impeller can cause severe personal injury or death. Disconnect electrical power source when connecting or disconnecting electrical wires for test procedures. Do not open service access doors while the unit is operating. Failure to exercise caution when completing test procedures or while inspecting unit operation may result in injury or death from electrical shock, air movement or rotating parts.

Excessive Vibration

EXCESSIVE VIBRATION MUST BE CORRECTED TO PREVENT BEARING AND SHAFT DAMAGE. SEE THE SECTION TITLED "TROUBLESHOOTING" FOR DETAILS ON THE COMMON CAUSES FOR VIBRATION.

Determine Fan RPM

Fan rpm can be determined by using a strobe-type tachometer, or revolution counter.

Fan Belt Alignment

Tighten the belts slightly and rotate the drive several times. On multiple belt drives, determine that the force of deflection is approximately the same on each belt. If this force is not the same for each belt, the motor and fan shaft are not parallel. Realign as required. After realignment, tighten the belts again to the standard belt tensioning specifications. Over-tensioning of belts can cause damage to bearings, shafts, and drive components.

Fan Belt Tension

NOTE: FAN BELT TENSION SHOULD BE CHECKED AT LEAST THREE TIMES DURING THE FIRST DAY OF OPERATION, SINCE THERE IS A RAPID DECREASE IN TENSION UNTIL BELTS SETTLE IN.

CAUTION

Do not over-tension the belts. Excessive tension will reduce fan and motor bearing life, accelerate belt wear and possibly cause shaft failure.

PERIODIC MAINTENANCE

The following checklist provides a guide to periodic maintenance.

After 48 Hours Operation

Belts have acquired their permanent stretch. Readjust but do not over-tighten.

Weekly

Observe unit weekly for any change in running condition and unusual noise.

Every Month

1. Check air filters. Clean or replace if clogged or dirty. Change bag filters when pressure drop is 1-inch W.G.
2. Check fan bearings if operating conditions include high speeds, moist or dirty air, or high temperatures.
3. Re-lubricate motor bearings in accordance with motor manufacturer's recommendations if operating conditions include high speeds, moist or dirty air, or high temperatures.
4. Check and adjust fan belt tension.

Every Three to Six Months

1. Check fan bearing.
2. Check motor lubrication.
3. Check motor bracket bolt.
4. Check and adjust fan belt tension.
5. Tighten electrical connections.
6. Inspect coils for dirt build-up.

Every Year

1. Inspect the unit casing for corrosion.
2. Clean the fan wheels and fan shaft.
3. Inspect the condensate drain pan and drain line, remove sludge or foreign materials that might obstruct proper drainage. Remove obstacles.
4. Check damper linkages, set screws and blade adjustment. Clean, but do not lubricate, the nylon damper rod bushings.
5. Clean damper operators.
6. Inspect the control and power box wiring for secure connections and insulation.
7. Rotate the fan wheel and check for obstructions in the fan housing.
8. Examine flexible connections for cracks or leaks. Repair or replace damaged material.

Drain Pans

Inspecting and Cleaning Drain Pans

The units have sloped drain pans. If evidence of standing water or condensate overflow exists, identify and rectify the cause immediately. (Refer to the troubleshooting section for possible causes and solutions.) If microbial growth (mold) in the drain pan is observed, clean the pan immediately using the following procedure:

1. Disconnect all electrical power to the unit.
2. Remove all standing water.
3. Use a scraper or other tools to remove any solid matter.

4. Thoroughly clean the contaminated area with a mild bleach and water solution or an approved sanitizer specifically designed for HVAC use.
5. Immediately rinse the drain pan thoroughly with fresh water to prevent potential corrosion from the cleaning solution of the drain pan and drain line components.
6. Allow the unit to dry thoroughly before putting the system back into service.
7. Determine and correct the cause of the microbial contamination.
8. Be careful that the contaminated material does not contact other areas of the unit or building.
9. Properly dispose of all contaminated materials and cleaning solution.

IMPORTANT: STANDING WATER IN DRAIN PANS CAN PROMOTE MICROBIAL GROWTH (MOLD) THAT MAY CAUSE UNPLEASANT ODORS AND SERIOUS HEALTH-RELATED INDOOR AIR QUALITY PROBLEMS. IF MOLD IS FOUND, IT MUST BE REMOVED IMMEDIATELY AND THAT PORTION OF THE UNIT PROPERLY CLEANED AND SANITIZED.

Air Filters

Throwaway Filters

To replace throwaway filters, install new filters in direction of airflow.

NOTE: FILTERS MUST HAVE AN AIRTIGHT SEAL TO PREVENT AIR BYPASS.

Permanent Filters

To clean permanent filters, wash under a stream of water to remove dirt. Rinse in clean, hot water and allow them to dry for about 12 hours.

Cartridge or Bag Filters

To install cartridge or bag filters follow the following procedure:

1. Open the filter section access door, if provided and remove the filters from their installed position.
2. Slide each filter into the filter rack, pushing them tightly.
3. Close and secure the access door, if provided.

ON REQUEST, DIFFERENTIAL MANOMETERS CAN BE INSTALLED ON THE FILTER SECTION TO CHECK THE PRESSURE DROP ACROSS THE FILTERS.

Fans

Inspecting and Cleaning Fans

Fan sections of air handlers should be inspected every six months at a minimum or more frequently. Accumulated dirt and organic matter on the interior surfaces of fans should be cleaned immediately. The suggested procedure for cleaning these surfaces is:

1. Disconnect all electrical power to the unit.
2. If no microbial growth (mold) exists, thoroughly clean the fan and associated components with an industrial cleaning solution.
3. If microbial growth (mold) is present, remove the contamination and thoroughly clean the affected area with an approved sanitizer specifically designed for HVAC use.
4. Allow the unit to dry completely before putting it back into service.
5. Use caution to assure that any contaminated material does not contact other areas of the unit or building. **Properly dispose of all contaminated materials and cleaning solution.**

IMPORTANT: IF MICROBIAL GROWTH (MOLD) WAS FOUND, THE CAUSE OF THE CONTAMINATION MUST BE DETERMINED AND ACTION TAKEN TO ASSURE IT DOES NOT RECUR.

Fan Bearings and Motors

Fan Bearing

Inspect fan bearings periodically for excessive vibration or temperature. Operating conditions will vary the frequency of inspection.

Fan Motors

Inspect fan motors periodically for excessive vibration or temperature. Operating conditions will vary the frequency of inspection and lubrication.

Coil Cleaning

The frequency of required cleaning is dependent on the operating hours of the system, filter maintenance and efficiency and dirt load.

IMPORTANT: COILS BECOME EXTERNALLY FOULED AS A RESULT OF NORMAL OPERATION. DIRT ON THE SURFACE OF THE COIL REDUCES IT'S ABILITY TO TRANSFER HEAT THAT CAN RESULT IN COMFORT PROBLEMS, INCREASED RESISTANCE TO AIR FLOW AND THUS INCREASED OPERATING ENERGY COSTS. IF THE DIRT ON THE SURFACE OF THE COIL BECOMES WET, SUCH AS COMMONLY OCCURS WITH COOLING COILS, MICROBIAL GROWTH (MOLD) CAN RESULT THAT MAY CAUSE UNPLEASANT ODORS AND SERIOUS HEALTH-RELATED INDOOR AIR QUALITY PROBLEMS.

Steam, hot water and chilled water coils

Steam, hot water and chilled water coils should be kept clean to maintain maximum performance. If fins become dirty, clean with steam and detergent, hot water spray and detergent, or one of the commercially available chemical coil cleaners. Rinse coils thoroughly after cleaning.

WARNING

Follow all directions provided with chemical cleaners to avoid personal injury and/or coil damage. Commercially available chemical cleaners may contain caustic or hazardous agents.

1. Disconnect all electrical power to the unit.
2. Use a soft brush to remove loose debris from both sides of the coil.
3. Use a steam-cleaning machine, starting from the top of the coil and working downward. Clean the leaving airside of the coil first, then the entering air side.
4. Confirm that the drain line is open.
5. Allow the unit to dry thoroughly before putting the system back in service.
6. Straighten any coil fins that may have been damaged during the cleaning process with a fin rake.
7. Replace all panels and parts and restore electrical power to the unit.
8. Use caution to assure that any contaminated material does not contact other areas of the unit or building. **Properly dispose of all contaminated materials and cleaning solution.**

Refrigerant coils

Refrigerant coils should be kept clean to maintain maximum performance. If fins become dirty, clean with cold water and detergent, or one of the commercially available chemical coil cleaners. Rinse coils thoroughly after cleaning.

WARNING

Never use steam or hot water to clean a refrigerant coil. Dangerous pressures may be built up by the improper application of heat resulting in equipment damage or personal injury.

Heat Exchanger Cleaning

The frequency of required cleaning is dependent on the operating hours of the system, filter maintenance and efficiency and dirt load. It is important to clean the heat exchanger, pay attention and act delicately as fins are fragile.

1. Disconnect all electrical power to the unit.
2. Use a soft brush to remove loose debris from both sides of the heat exchanger.
3. Use a brush or vacuum cleaner or a water jet or steam cleaning machine. Clean the leaving airside of the heat exchanger first, then the entering airside.
4. Allow the unit to dry thoroughly before putting the system back in service.
5. Straighten any fins that may have been damaged during the cleaning process with a fin-rake.
6. Replace all panels and parts and restore electrical power to the unit.
7. Use caution to assure that any contaminated material does not contact other areas of the unit or building. **Properly dispose of all contaminated materials and cleaning solution.**

Wet Deck Humidifier Cleaning

The frequency of required cleaning is dependent on the operating hours of the system, water hardness, throwaway water or re-circulated water, filter maintenance and efficiency and dirt load.

To dry the evaporating pad only the fan should operate while the humidification should not operate. Clean the evaporating pads using the following procedure:

1. Stop the pump.
2. Close the water on-off valve.
3. To empty drain tank remove the overflow connected to the discharge through the rubber ring.
4. Remove the water filter made of stainless steel wire mesh and clean it with a brush.
5. Pull the evaporative pad out of the unit.
6. Remove the casing panel corresponding to the humidifier.
7. Pull the water distributor out. Pull the evaporating pad out.
8. Remove the sheet steel blocking devices of the evaporating pad casing.
9. Pull the water distributor out. Pull the evaporating pad out.

Muddy deposits of the evaporating pad can be removed with water, but it should be replaced if there is a lime deposition.

The spray tube installed on the distributor can be cleaned with a metallic brush and steel tips to clean little holes. To remove it you have to remove first the water connection rubber pipe. Check if this pipe has no faults, which could cause leakage. Wash the drain tank inside and the various component parts.

TROUBLESHOOTING

Use the table in this section to assist in identifying the cause or causes of a VAYHAN unit operation. The column header “RECOMMENDED ACTION” suggests repair procedures.

NOTE: THIS TABLE IS INTENDED AS A DIAGNOSTIC AID ONLY. FOR DETAILED REPAIR PROCEDURES, CONTACT YOUR LOCAL VAYHAN REPRESENTATIVE.

WARNING

Disconnect electrical power source and allow all rotating equipment to stop completely before inspecting or servicing the unit. Failure to do so may result in personal injury or death from electrical shock or moving parts.

Disconnect electrical power prior to access into a fan or ductwork. Even when locked out electrically, fans may cause injury or damage if the impeller is subject to “wind milling.” The impeller should be secured to physically restrict rotational movement. Failure to secure impeller can cause severe personal injury or death.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Bearing is excessively hot	First start after re-lubricating (Grease distribution)	Allow machine to cool down and restart.
	Over-lubrication	Clean surface of grease and purge
	Over tensioned belts	Adjust belt tension
	No lubricant	Apply lubricant. Check bearings for damage.
	Misaligned bearing	Correct alignment. Check shaft level.
Motor fails to start	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker
	Overload trip	Check and reset overload
	Improper wiring or connections	Check wiring with diagram
	Improper current supply	Compare actual supply power with motor nameplate recommendations. Contact power company for adjustments.
	Mechanical failure	Check that motor and drive rotate freely. Check bearing lubricant.
Motor stalls	Open phase	Check line for an open phase.
	Overloaded motor	Reduce load or replace with larger motor
	Low line voltage	Check voltage across AC line. Correct voltage if possible.
Excessive vibration	Poor alignment	Align bearing setscrews. Loosen and retighten bearing setscrews.
	Over tensioned belts	Adjust belt tension.
	Misaligned drive	Align drive.
Motor runs and dies down	Partial loss of line voltage	Check for loose connections. Determine adequacy of main power supply.
	Stator shorts when motor warms up.	Replace stator.

Motor does not come up to speed	Low voltage at motor terminals.	Check voltage across AC line and correct voltage loss if possible.
	Line wiring to motor too small	Replace with larger sized wiring.
Motor overheats	Overloaded motor	Reduce load or replace with a larger motor.
	Motor fan is clogged with dirt preventing proper ventilation	Remove fan cover, clean fan and replace cover.
Excessive motor noise	Motor mounting bolts loose	Tighten motor mounting bolts.
	Rigid coupling connections	Replace with flexible connections.
	Worm motor bearings	Replace bearings and seals.
	Fan rubbing on fan cover	Remove interference in motor fan hosing.
Loosen fan belt	Motor is poorly positioned	Adjust belt tension.
	Worn or damaged belt	Replace belt or belt set.
Shorter belt life	Misaligned belt	Realign belt .
	Grease or oil on belts	Check for leaky bearings.
	Belt slipping	Adjust tensions
	Belts rubbing	Remove obstruction or realign drive for clearance.
Bearing noise	Poor alignment	Loosen bearing setscrews and realign.
Low coil capacity (chilled water)	Air is bypassing coil	Prevent bypass with block-offs
	Coil tubes are blocked	Clean and unblock tubes
	Incorrect air flow	Check fan operating conditions
	Incorrect gpm	Check water pumps, valves and lines for obstruction
	Incorrect water temperature	Provide proper water temperature.
Low coil capacity (refrigerant)	Air is bypassing coil	Prevent bypass with block-offs
	Coil tubes are blocked	Clean and unblock tubes
	Incorrect air flow	Check fan operating conditions
	Expansion valve not operating	Check sensible bulb location.
	Poor refrigerant distribution	Check for blockage in distributor and tubes
Drain pan is overflowing	Plugged drain line	Clean drain line
	Unit not level	Level unit
Standing water in drain pan	Improper trap design	Design trap for unit
Excess dirt in unit	Missing filters	Replace filters
	Filter bypass	Reduce filter bypass
Mold inside air handler	Standing water in drain pan	See standing water symptom.