



Operations, Maintenance, and Installation Instructions

SST-E Series Evaporators

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Read the following instructions carefully before attempting to rig or install EVAPCO evaporator units. Also read the "General Precautions and Safety Procedures" section on page 5 for important safety information.

TFC Evaporators

Evaporator models that start with "TFC" in the model number nomenclature indicate that the model is a custom unit and deviates from the SST-E standard model product catalog. Much of the information in this Bulletin applies to TFC models in general. However, unit specific information such as hanger locations and lifting points may not follow the standard products shown in this Bulletin. For TFC model specific information, consult the certified unit drawing or the factory for additional assistance.

Receiving

Carefully inspect all units upon arrival to assure that no damage has occurred during shipment. This should include searching for dirt and debris caused by shipping, as well as inspecting all components and accessories for physical damage. If any units have been damaged during transit, immediately notify the carrier and file a claim with that carrier.

The refrigerant coils on all EVAPCO evaporators are shipped from the factory with a low-pressure nitrogen charge. Maintain the nitrogen charge unless connecting the evaporator to the refrigerant system piping.

To confirm this nitrogen charge, quickly open then close the valve located on the coil header and listen or feel for escaping nitrogen. A coil without the factory nitrogen charge may have been damaged during shipment. In this case, the coil should be pressure tested with dry nitrogen gas to assure that it is leak free prior to installation. Please notify your EVAPCO representative before installing any evaporator that has lost the factory nitrogen charge during shipment.

Lifting Requirements

All evaporator models covered in this manual are designed to be removed from the truck by forklift or crane. Please refer to the appendix for detailed information pertaining to each specific unit.

Always use extreme care when employing a forklift to remove the units from a truck. The forks must be placed properly as shown in the appendix and not make contact with the unit itself. Be sure to follow standard industry forklift guidelines for proper load securing and lifting procedures.

When using a crane, lift the units **ONLY** by the lifting/mounting brackets as shown in the appendix and be sure to lift the units in an even and balanced manner.

REFER TO THE APPENDIX FOR EACH UNIT'S SPECIFIC LIFT POINTS. FAILURE TO USE THE PROPER LIFT POINTS MAY RESULT IN UNIT DAMAGE AND/OR PERSONAL INJURY.

Mounting

All Evapco evaporators covered by this manual may be mounted from the ceiling, on the floor or steel supports. Refer to the applicable section below for further instructions.

Ceiling Hung Applications

Confirm that there is a support rod firmly anchored in place for each 13/16 inch mounting hole on the unit. (The actual diameter of the rod is to be determined by accepted engineering methods up to a maximum diameter of 3/4 inch.) Carefully lift each unit into place and attach it to the support rods with nuts and washers as shown in the Appendix. **All mounting holes must be used.**

NOTE:

For SSTME, SSTLE, SSTHE, SSTXE and SSTWE units, the top of the hanger channel or brackets must be level. Do not level by the top of the unit which is sloped for drainage.

For SSTDE units, the top of the unit must be level.

For SSTWE units, a 5 inch clearance is recommended between the top of the fan discharge and the ceiling.

For ceiling hung units only, legs and/or forklift channels may be removed following unit installation.

Upon installation of unit, remove bolts securing hinged access panels. Bolts are for shipping purposes only.

Floor or Structural Steel Mounting Applications

Once each unit is in its desired position (on the floor or steel framework) all of the factory-supplied legs must be adequately supported. In addition, each leg must be adequately secured to the support structure.

Refrigerant Piping

All piping should be designed to minimize vibration transmission, allow for thermal expansion and be properly supported in accordance with recognized standards. External piping or valves **CANNOT** be supported by the evaporator connections.

All evaporators are furnished with multiple refrigerant connections, sealed at the factory and charged with nitrogen. The units should remain charged unless connecting the units to the refrigerant system piping.

The piping that connects the evaporators to the rest of the refrigeration system has a direct effect on the efficiency of the units and the system's overall performance.

Refer to the latest edition of the IAR Ammonia Refrigeration Piping Handbook for detailed instructions related to pipe sizing, connections etc.

Equipment Layout

Proper equipment layout is essential to ensure effective air distribution within the cooled space. All SST-E evaporators require proper air circulation; thus adequate spacing around the unit must be provided to ensure proper performance. During the system design process, special attention should be given to space limitations, surrounding structures, existing units, piping and any potential future expansion plans.

Drain Piping

Drain piping should be kept as short as possible, trapped properly and have a pitch of at least 1/4 inch per foot.

For all spaces with temperatures of 33°F or lower, all drainpipes and traps must be properly heated and/or insulated.

Wiring

All wiring must be installed in accordance with applicable electric codes to ensure safe operation.

Before wiring the motors, confirm that the electrical supply is compatible with the motors and note the direction of fan rotation as indicated on the fan panel. Electrical overloads should be sized in accordance with the "DESIGN MOTOR AMPS". All electrical data for each unit is provided on the EVAPCO certified drawing.

The "DESIGN MOTOR AMPS" shown on the EVAPCO certified drawing is per motor (not per unit) and takes into account motor service factor and air density correction at the design operating room air temperature shown.

Refer to pages 5-6 of this bulletin for more information regarding the use of Variable Frequency Drives.

Centrifugal Fan Evaporators Only

Lubrication

All fan shaft bearings require lubrication every 2000 hours or six months with the following low temperature waterproof inhibited grease or equivalent:

Chevron SRI#2
Mobil Polyrex EM
Timken Pillow Block Grease GR 220

When lubricating, grease must be fed into the extended lube lines slowly to avoid damaging the bearing seals.

Belt Driven Fan Units

Fan belt tension must be checked before start-up and after the first 24 hours of service. After the break-in period, belt tension should be checked every month.

To check belt tension, follow these steps:

- 1.) Using one finger, put moderate pressure on the drive belt, half way between the two sheaves. The belt should deflect approximately 1/2 inch.
- 2.) If it deflects more or less than 1/2 inch, release the locking nuts/bolt on the motor base, then turn the adjustment bolt(s) on the motor base evenly so that the belt deflects approximately 1/2 inch when moderate pressure is applied as described in step 1.
- 3.) Check sheave alignment by placing a straight edge across both sheaves at the same time. There should be four points of contact between the sheaves and the straight edge. (See figure 1.)
- 4.) If there are not four contact points, adjust the bolts individually to obtain four contact points.
- 5.) Re-tighten the locking nuts/bolt.

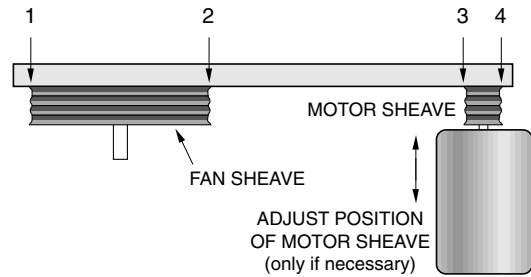


FIGURE 1

General Fan Motor Information

All evaporator standard fan motors have sealed bearings with low-temperature grease and do not require periodic greasing.

All 900, 1200, and 1800 rpm nominal fan motors are standard as Inverter Ready and are compatible for use on a VFD control. All 700 rpm nominal fan motors are Standard Duty rated and will require additional voltage conditioning at the VFD output for successful operation and lifespan. See the Variable Frequency Drives (VFD's) section on pages 5- 6 for important information regarding use of VFD's with all Evapco evaporators and fan motors.

Coil Cleaning

As a means to assure optimum performance and maximum unit life, routine cleaning of the evaporator coil is highly recommended.

Cleaning and sanitizing solutions (and their resulting vapors) which may come in contact with the evaporator should be non-corrosive and compatible with all materials of construction of the unit (e.g. galvanized steel, stainless steel, aluminum or copper).

If a high pressure washer is required to clean the evaporator, the spray pressure must not exceed 1500 psig and the spray wand must be at least 12 inches away from the coil using a 25 degree or wider spray nozzle. In addition, the nozzle spray should be directed perpendicular to the coil face area.

Use of high-pressure water washers in a manner inconsistent of the above recommendations and the use of corrosive cleaning/sanitizing chemicals may physically damage and corrode the unit, thereby, reducing the efficiency and life expectancy of the evaporator coil.

Refer to Tables A and B for a current listing of acceptable cleaning solutions and sanitizers for different coil construction materials. This information is based on actual corrosion tests performed by EVAPCO.

*** Applies to Stainless Steel Tube/Stainless Steel Fin Coils, also.**

The Table B Compatibilities are Based on the Following:

- Chemicals are applied within the concentration range recommended by the supplier.
- Daily exposure to the chemicals is limited to 30 minutes or less at a room temperature of 70°F or less.
- Water used has hardness of 50 ppm CaCO₃ or greater.
- Chemicals are considered compatible when loss over ten (10) years is less than 50% of the aluminum fin thickness or 50% of the zinc thickness (galvanized coils).

TABLE A
Acceptable Cleaning Solutions

STAINLESS STEEL / ALUMINUM COILS*	
Trade Name	Manufacturer
CL-122	NALCO
CL-127	NALCO
LMC-44	LW Chemical
SoilSolv	DuChem
FS Process Cleaner	Zep
Formula 940	Zep

HOT DIPPED GALVANIZED COILS	
Trade Name	Manufacturer
CL-127	NALCO
E+	Refrigeration Technologies
FS Process Cleaner	Zep
Formula 940	Zep

ALUMINUM / ALUMINUM COILS	
Trade Name	Manufacturer
CL-122	NALCO
CL-127	NALCO
LMC-44	LW Chemical
SoilSolv	DuChem
FS Process Cleaner	Zep
Formula 940	Zep

COPPER / ALUMINUM COILS	
Trade Name	Manufacturer
CL-122	NALCO
CL-127	NALCO
LMC-44	LW Chemical
SoilSolv	DuChem
FS Process Cleaner	Zep
Formula 940	Zep

* Applies to Stainless Steel / Aluminum Coils Only.

TABLE B
Acceptable Sanitizing Solutions

STAINLESS STEEL / ALUMINUM COILS*	
Trade Name	Manufacturer
Coil Clear One	NALCO
DQS	DuChem
Amine A	Zep
Amine Z	Zep

HOT DIPPED GALVANIZED COILS	
Trade Name	Manufacturer
Coil Clear One	NALCO
DQS	DuChem
Amine A	Zep
Amine Z	Zep

ALUMINUM / ALUMINUM COILS	
Trade Name	Manufacturer
Coil Clear One	NALCO
DQS	DuChem
Amine A	Zep
Amine Z	Zep

COPPER / ALUMINUM COILS	
Trade Name	Manufacturer
Coil Clear One	NALCO
DQS	DuChem
Amine A	Zep
Amine Z	Zep

For routine cleaning of stainless steel tube/aluminum fin, stainless steel tube/stainless steel fin, aluminum tube/aluminum fin and copper tube/aluminum fin coils, consider the COIL-FLO® program from Nalco Company (or equivalent coil cleaning system). For example, the Nalco program consists of a pH balanced cleaner (CL 127) for use on all coil surfaces including aluminum fins, an HP 500 feeder, and Coil Clear One®, an EPA-registered microbicide. For more information on COIL-FLO®, contact your local Nalco Sales/Service office.

General Precautions and Safety Procedures

Caution must be employed when people or product may be exposed to refrigerants. Frequent visual inspections and continuous system monitoring are recommended for detecting defects and malfunctions which may result in the release of refrigerant, as this may be harmful to people, product or equipment. Electronic refrigerant detection devices should be used for sensing refrigerant vapors in the atmosphere. Only qualified and experienced personnel should service, operate and maintain refrigeration equipment.

Specific precautions must be taken to avoid hydraulic shock, liquid hammer, and thermal expansion. Hydraulic shock and hammer affect hot-gas defrost piping most often and are the result of a sudden change in velocity of a liquid slug. If this change is large enough, the energy dissipated can be sufficient to break coil header caps, plugs and piping elbows. Hydraulic thermal expansion (lock-up) may occur when the ambient temperature rises and causes the liquid in a vapor-free section of trapped piping to expand. The pressure created during this expansion can be great enough to rupture the associated piping and valves. For all hot-gas defrost applications, the units should never be operated without a check valve or similar device that prevents liquid refrigerant from accumulating in the hot-gas coil(s) in the drain pan. For more information on this subject, see the latest revision of IAR 2 or ASHRAE Standard 15.

If isolating an evaporator, remove liquid refrigerant from the coils or section to be isolated before hand valves are closed in order to protect equipment, product and personnel. Pump liquid out of piping so that it cannot cause hydraulic shock, hammer or thermal expansion (lock-up).

Refrigerants and feed types MUST NOT differ from that which is indicated on the factory certified drawing as this may result in property damage or injury. Likewise, the units must never be subjected to pressures exceeding the nameplate design pressure.

All refrigerant piping systems must be properly evacuated to remove non-condensables and moisture prior to charging with refrigerant.

Variable Frequency Drives (VFDs)

EVAPCO evaporators are designed for industrial duty applications, which may be operated with standard motor starters or Variable Frequency Drives (VFDs). Variable Frequency Drives are electronic devices used for the purpose of controlling the speed of AC motors. The primary benefit of using VFDs compared to standard starters is the ability to adjust the speed of the motor to fit the constantly changing variables in the refrigeration system. VFDs allow the unit to be more efficient by matching the thermal capacity to the system load, thereby conserving energy. Refer to EVAPCO's Engineering Bulletin No. 44 available on EVAPCO's website www.evapco.com for more information regarding Variable Frequency Drive Applications.

When using VFDs, refer to the VFD Manufacturer's recommended installation and start-up instructions before energizing the fans.

Most VFDs are designed with "Skip" frequency settings which may be programmed as part of their commission procedure. The "Skip" frequency setting enables the VFD to skip over a particular frequency to eliminate mechanical harmonics. The "Skip" frequency is actually a frequency band and the number of "Skip" frequency bands may vary depending on the VFD Manufacturer's design.

The VFD start-up procedure should always include a process to manually run through the drive's frequency increments slowly from 0 Hz to 60 Hz while taking note of any critical frequencies that result in fan vibration. This may be accomplished by careful observation, preferably with a vibration meter, if one is available. Once the frequencies

that cause mechanical harmonics are identified, the start-up technician should program those "Skip" frequencies into the VFD to prevent operation at those frequencies and prevent potential damage to the evaporator.

Each VFD Manufacturer may have different recommendations for identifying potential mechanical harmonics and setting the "Skip" frequencies in the drive program. Refer to the VFD Manufacturer's Installation, Operation and Maintenance Manual for additional recommendations for VFD start-up. Failure to follow these procedures may result in excessive vibration from mechanical harmonics at reduced fan speeds which can result in major equipment damage.

Recommended Practices for Evaporator Fan Motors Installed with VFDs:

A VFD by its operating nature can produce high voltage spikes that are detrimental to the electric motor. Select a high quality VFD and follow industry recommended practices for VFD system design and installation. Improper installation of the VFD and electrical system can rapidly destroy the electric motor. Several important parameters are noted below when considering a VFD application. It is also recommended to consult the VFD manufacturer's guidelines for proper installation and configuration. **Failure to follow these recommendations may void the standard warranty coverage of the motor(s).**

- **VFD Switching (Carrier) Frequency Setting:** This is the switching speed of the insulated gate bipolar transistors (IGBT's) in the VFD. Lowering the switching frequency of the VFD will reduce the number of times that peak voltages are present at the motor and minimize motor winding insulation stress and shaft/bearing currents. Lowering switching frequency may cause additional motor noise or whine. Adjust the VFD switching frequency to its lowest recommended setting (or the lowest recommended frequency of the load filter if employed) – as practical for motor noise level - generally 5 kHz or less.
- **Lead Length Between VFD and Electric Motor:** Locate the VFD as close to the motor as possible or practical. The maximum recommended lead length is dependent on the selected motor(s), the selected VFD, control scheme, voltage and wire type. Longer lead lengths may require conditioning of the VFD output voltage with load reactors or filters as described below.
- **Wire Type / Wiring:** THHN, XHHN (low temperature) and VFD cable are typically used to connect the VFD to the motor. When using THHN or XHHN, observe lead length limits, always run conductors and ground wire in a metal conduit, and run only one set of VFD output leads per conduit. When using VFD cable, the maximum lead length is one-half (1/2) of the value shown in Table C, metal conduit is preferred but plastic is acceptable, and while multiple VFD outputs can share a common conduit a separate conduit for each is preferred. Regardless of wire type, never run AC lines or signal wires in the same conduit as the VFD output voltage. Always de-burr conduit ends during installation to prevent damage to wiring when pulling through the conduit.

For a VFD operating a single inverter ready motor or operating multiple inverter ready motors with a single wire run, the maximum recommended wire run (lead length) using THHN/XHHN wire is 100 feet or less at 460 volts. For a VFD operating multiple inverter ready motors with separate leads to each motor, the combined total of each wire run (lead length/motor) using THHN/XHHN wire should be 100 feet or less (i.e. – for a two fan unit with separate wire leads from the VFD to each motor, the maximum lead length per motor is 50 feet). These lead length recommendations do not apply to non-inverter ready motors (such as 690 rpm), see Load-Side Reactor Section below.

- Load-Side Reactor:** See also Wire Type / Wiring section above - adding a single load-side reactor at the VFD output (for single or multiple inverter ready motor protection) allows the lead length (THHN/XHHN wire) to be increased up to 500 feet for a single wire run at 460 volts (or a combined total of up to 500 feet in the case of multiple wire runs). A load-side reactor is a minimum requirement for VFD applications of any length wire run, 0 to 100 feet when using non-inverter ready motors (690 rpm motors). **NOTE:** When using VFD cable, the recommended distances for wire lead length is one-half (1/2) the distance shown in Table C.
- DV/DT Type Filter:** See also Wire Type / Wiring section above - adding a single DV/DT type filter at the VFD output (for single or multiple inverter ready motor protection) allows the lead length (THHN/XHHN wire) to be increased up to 1000 feet for a single wire run at 460 volts (or a combined total of 1000 feet in the case of multiple wire runs). A DV/DT type filter is a minimum requirement for VFD applications of any length wire run, 0 to 500 feet when using non-inverter ready motors (690 rpm motors). **NOTE:** When using VFD cable, the recommended distances for wire lead length is one-half (1/2) the distance shown in Table C.
- Sinus or Sine Wave Type Filter:** See also Wire Type / Wiring section above – adding a single Sinus or Sine Wave type filter at the VFD output (for single or multiple inverter ready motor protection) allows the lead length (THHN/XHHN wire) to be increased up to 1000 feet or more for a single wire run at 460 volts (or a combined total of 1000 feet or more in the case of multiple wire runs). A Sinus or Sine Wave type filter is a minimum requirement for VFD applications of any length wire run, 0 to 1000 feet when using non-inverter ready motors (690 rpm motors). Typically, installing a VFD with wire runs of more than 1000 feet is not recommended. **NOTE:** When using VFD cable, the recommended distances for wire lead length is one-half (1/2) the distance shown in Table C.
- Shaft Grounding Brushes or Rings:** Brush kits or grounding rings are an optional accessory recommended on most motors that are located more than 100 feet from the VFD.

TABLE C
**Recommended VFD Output Voltage
 Conditioning Device for Motor Lead Length**

230 VOLT

Horsepower	Wire Lead Length*	Inverter Ready Motor	Non-Inverter Motor
0.1 – 50 HP	0 – 1000 ft.	--	Load-Side Reactor
0.1 – 50 HP	> 1000 ft.	DV/DT Filter	DV/DT Filter

460 VOLT

Horsepower	Wire Lead Length*	Inverter Ready Motor	Non-Inverter Motor
0.1– 50 HP	0 – 100 ft.	--	Load-Side Reactor
0.1 – 50 HP	100 – 500 ft.	Load-Side Reactor	DV/DT Filter
0.1 – 50 HP	500 – 1000 ft.	DV/DT Filter	Sinus Filter
0.1 – 50 HP	> 1000 feet	Sinus Filter	Sinus Filter

575 VOLT

Horsepower	Wire Lead Length*	Inverter Ready Motor	Non-Inverter Motor
0.1 – 50 HP	< 50 ft.	Load-Side Reactor	DV/DT
0.1 – 50 HP	> 50 ft.	DV/DT	DV/DT

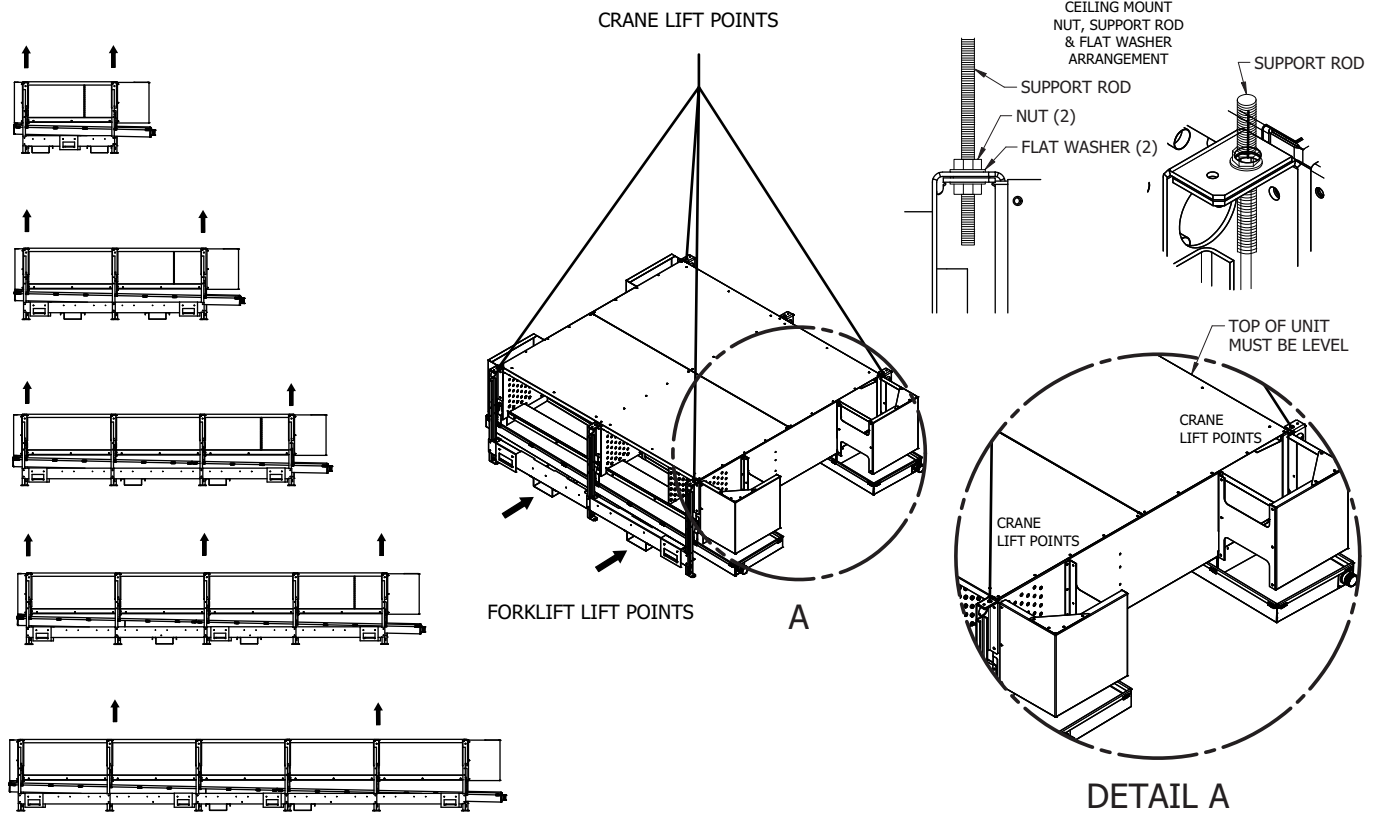
* Assumes THHN/XHHN type of wire – if using VFD cable, use one-half (1/2) the distance shown above in Table C. Length shown is for a VFD with a single wire run to a single motor or a single wire run to multiple motors. For a VFD with separate wire runs to multiple motors, divide distance shown above by number of motors controlled by the VFD for the maximum wire lead length per motor.

NOTE: A higher grade output voltage filter can always be used for a lower required duty. These devices provide inexpensive but highly effective protection of motors on any VFD application of any wire lead length. A conservative approach is recommended to maximize motor service life.

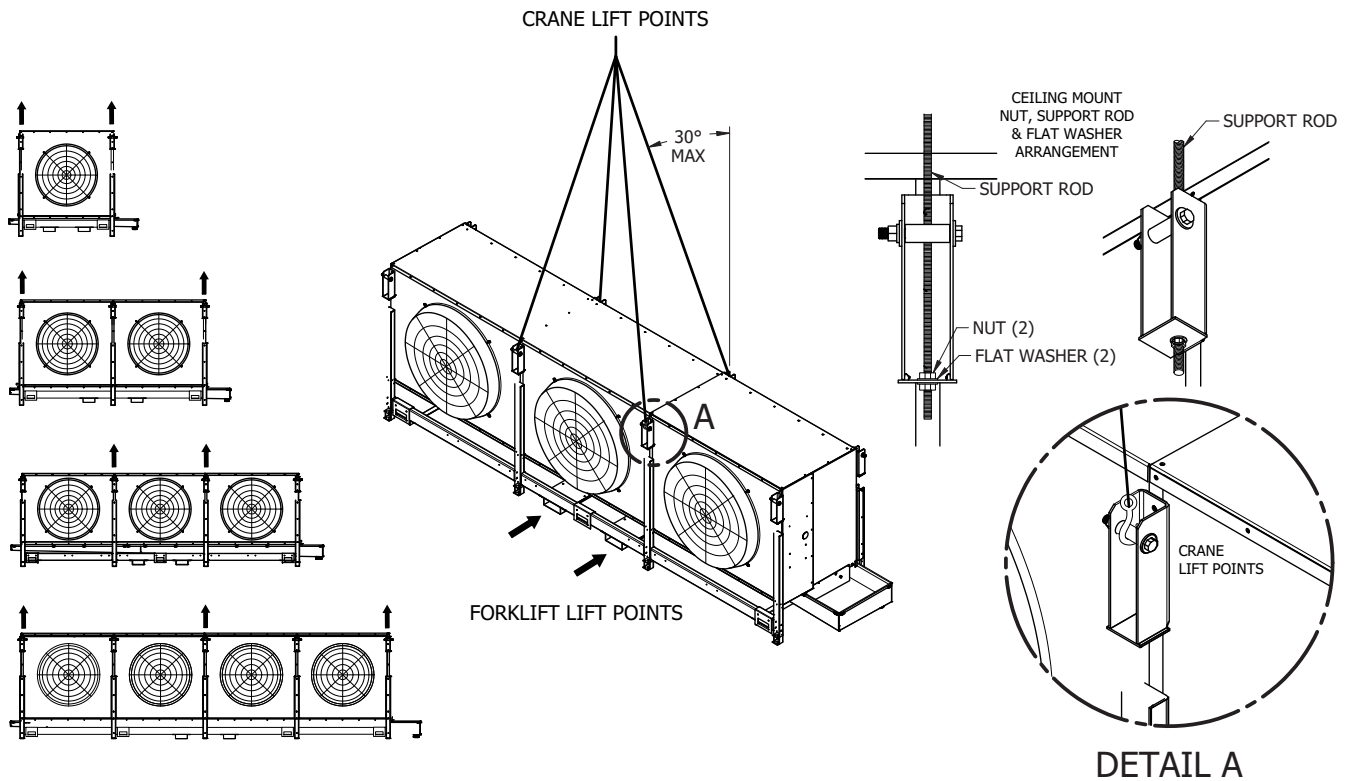
Appendix

This appendix shows details for lifting and mounting that are specific to each unit. Please refer to the proper section(s) for specific unit details.

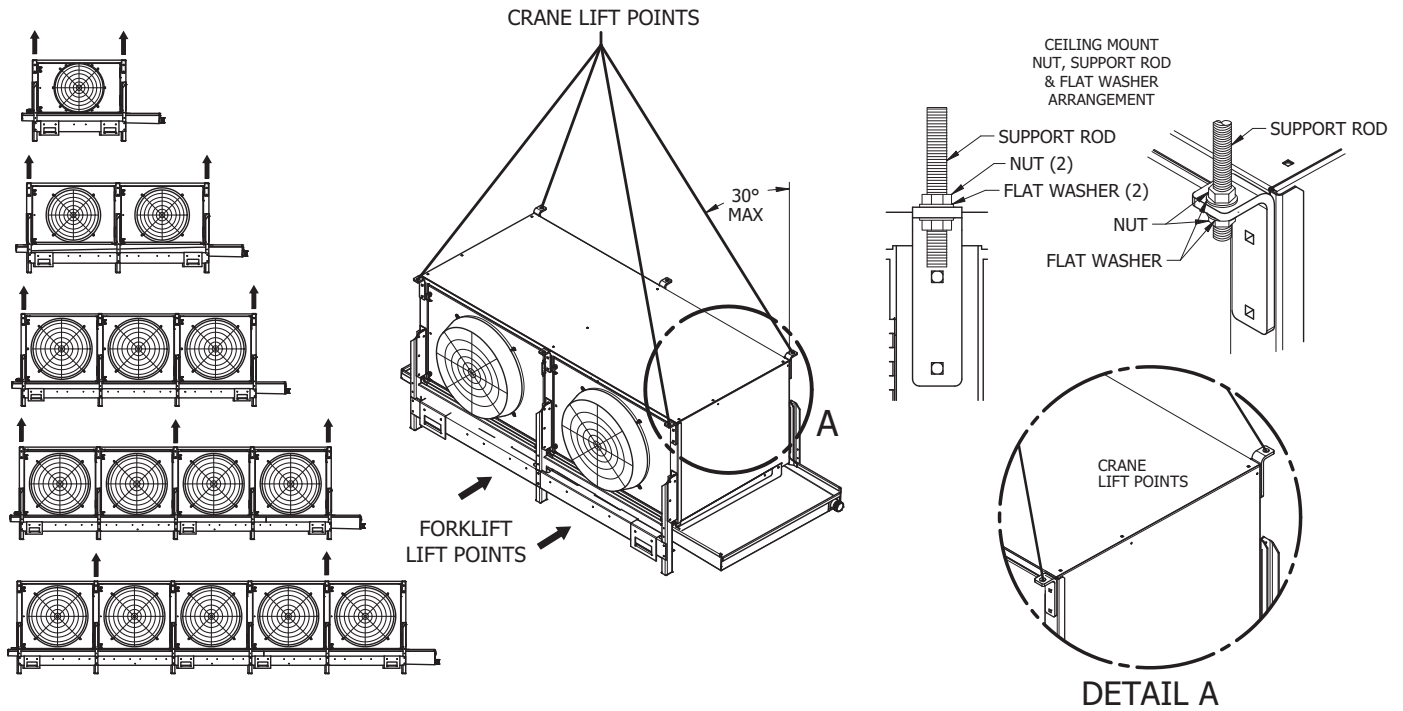
LIFTING REQUIREMENTS — SSTDE MODELS



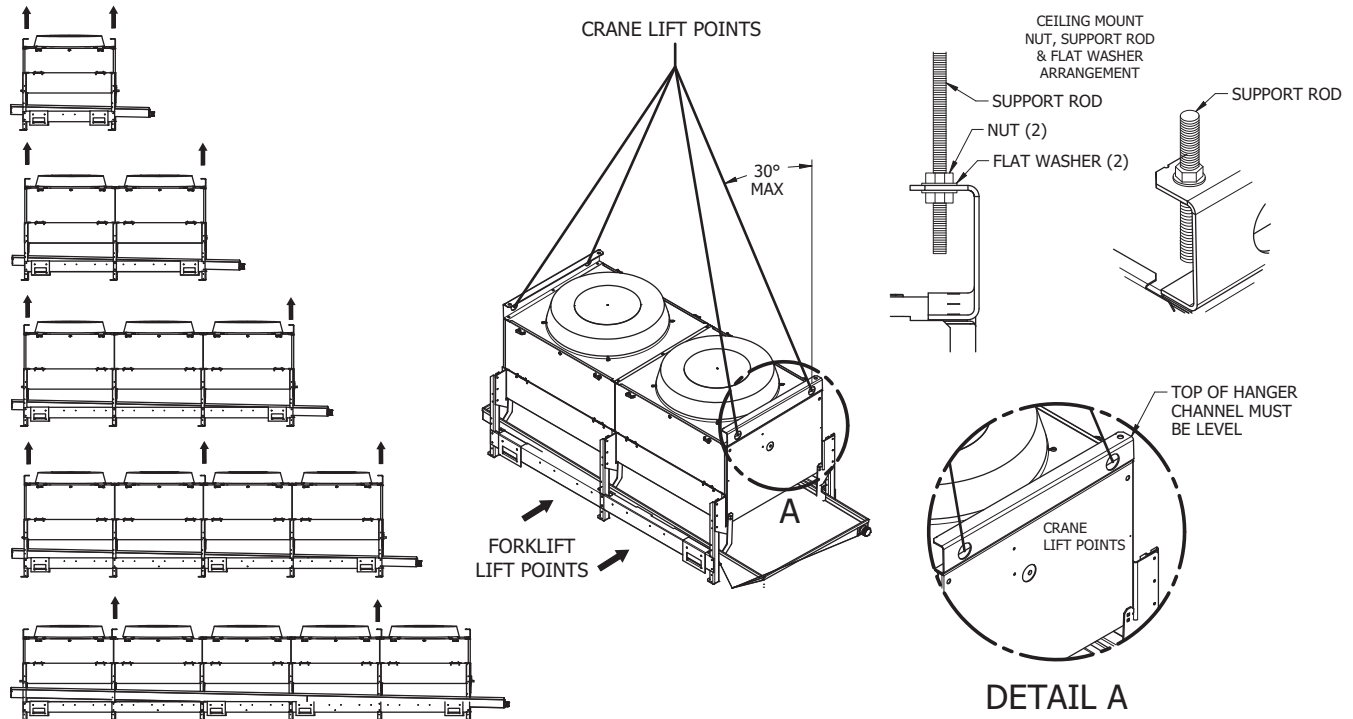
LIFTING REQUIREMENTS — SSTLE & SSTHE MODELS



LIFTING REQUIREMENTS — SSTME & SSTXE MODELS



LIFTING REQUIREMENTS — SSTWE MODELS



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