STROBIC AIR TECHNOLOGIES

user manual

Tri-Stack™ exhaust system

INSTALLATION - OPERATION - MAINTENANCE

SA-TRISTACK-IOM-23 ISSUED 10/2023

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT

contents

Note

This manual contains vital information for the proper installation and operation of the Generation III Tri-Stack. Carefully read the manual before installation or operation and follow all instructions. Save this manual for future reference.

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

⚠ Warning

Indicates presence of a hazard which can cause severe personal injury, death or substantial property damage if ignored.

⚠ Caution

Indicates presence of a hazard which will or can cause personal injury or property damage if ignored.

Note

Indicates special instructions on installation, operation or maintenance which are important but not related to personal injury hazards.

installation

Delivery and Inspection

All fans are factory tested to ensure proper balance, alignment, air delivery, correct motor load, and correct working of all moving parts.

Equipment is designed to be removed from truck with a crane.

⚠ Caution

A forklift should not be used to pick up equipment from underneath units as they could damage internal components and/or paint.

For an additional fee, Strobic Air Technologies can properly skid equipment for forklift removal, and/or crane yard storage can be provided, with written request prior to shipping.

Prior to Installation

- Inspect the equipment to determine if any damage has been incurred through mishandling during shipment. It is the customer's responsibility to notify the trucker immediately to claim for damages. Failure to properly notify trucker before signing off on reception of equipment will result in transfer of liability from trucking company to jobsite/parties responsible of equipment unloading.
- The name plate should be checked against the packing slip and job order for correctness. Some fans must be shipped in components due to trucker's height limitations. When this occurs and more than one fan of similar size are on the same project, carefully match and assemble components by the "line-up" tag (serial) numbers placed on each part.
- In order to maintain factory warranty, the local authorized Strobic Air Technologies representation must be present during installation.

Ensure the disconnect switch on the fans are bolted in place on the disconnect mount provided with the fan.

Note

It is not necessary to disconnect the wiring to the switch or motor in the terminal box, to do so will void the warranty.

Storage or Down Time

⚠ Caution

If your fan is to sit idle for more than 30 consecutive days during start-up or shutdown, especially in extreme cold and icy weather care should be taken to hand spin to prevent "Peening" or "Brinelling" of the bearings.

installation

If the fan is outside, exposed to the elements, care should be taken to step up this procedure. Under no circumstances should a fan be exposed to a hostile environment without adequate protection. Common sense should prevail. When fans are to be placed in service after an extended shutdown or delayed start-up (6-12 months depending on age of system), motors should be meggered before being returned to service with the motor manufacturer's start-up procedure. A minimum of 10 megaohms are recommended. In addition, all electrical connections should be checked for looseness and corrosion. The procedure for initial start-up should then be followed.

Installation

The Tri-Stack fan has been constructed in modules so it may be disassembled and installed in sections to minimize installation equipment requirements. Be sure all parts are aligned correctly per "line-up" tags and all gasketing is in place. (See customer inspection on page 3). Each fan ships with required mounting hardware and tube of caulk placed inside the inner dish of the vane section adjacent to the motor. An optional touch up paint kit, if purchased, is also located inside of the vane section.

Touch up paint kits are not available for customers outside of North America due to shipping restrictions. Contact factory if touch up paint is required and the factory will provide information for purchasing from a local supplier.

Once the fan is in place, before the power has been connected, check the alignment of the blade and inlet bell.

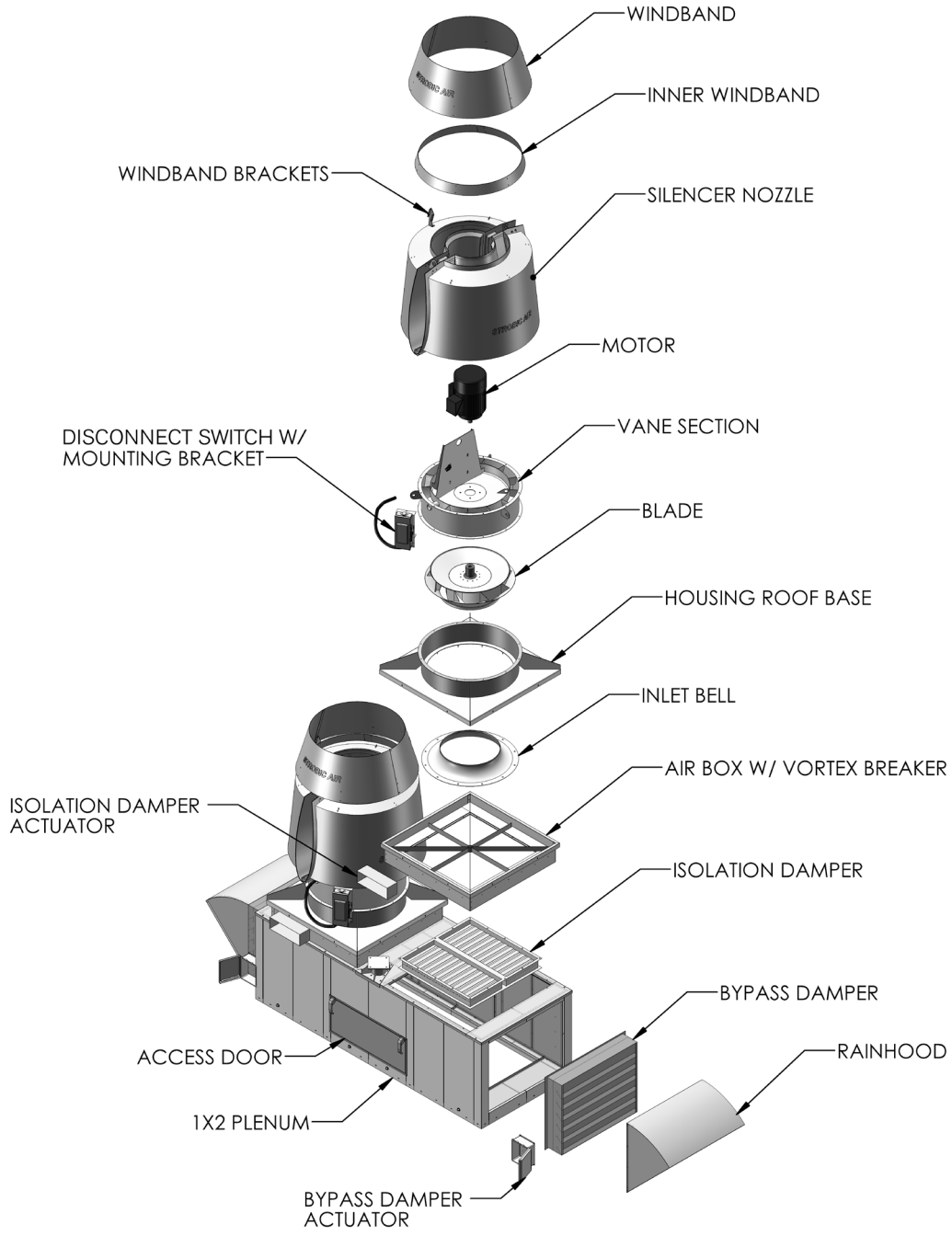
⚠ Warning

If power is already connected, be sure the power has been locked out.

Remove the fan housing access door and spin the blade by hand. Check that no foreign materials such as loose hardware are inside the housing. Check that the blade spins freely and not rub the inlet bell. If the blade rubs the inlet bell, contact your local Strobic Air Technologies representative for the Tri-Stack Field Blade Alignment Procedure. Once the blade and the housing have been checked, bolt the access door back on to the housing before starting the fan.

Note

Any unauthorized modifications to equipment without SPX Air Technologies prior approval will void warranty.



Plenum - Fan Exploded View

Table 1 — Component Weights

Tri-Stack	Tri-Stack M Series		Component Weight											Assembled Weight			
			Motor			Nozzle Windband assembly lb	Blade lb	Roof Base lb	Vane Section lb	Fan w/o nozzle lb	Silencer Component			Fan Total lb			
												outlet					
	standard nozzle	silencer nozzle	hp	rpm	weight lb						nozzle	3 ft	4 ft	standard nozzle	nozzle silencer	3 ft outlet silencer with standard nozzle	4 ft outlet silencer with standard nozzle
BS00212	M24A05N010I6		1	1200	56	94	37	86	50	230	----	300	387	323	----	623	710
BS00218	M24A05N030I4		3	1800	86	94	37	86	52	265	---	300	387	355	----	655	742
BS00218-5	M24A05N050I4		5	1800	97	94	37	86	52	275	----	300	387	366	----	666	753
BS00512			1	1200	56	81	43	99	66	265	----	365	474	345	----	710	819
BS00518			3	1800	86	81	43	99	66	295	----	365	474	375	----	740	849
BS00518-5			5	1800	97	81	43	99	66	305	----	365	474	386	----	751	860
TS1S050A12			5	1200	165	140	110	250	168	695	----	564	719	833	----	1397	1552
TS1S050B12			5	1200	165	140	115	257	168	705	----	564	719	845	----	1409	1564
TS1L050B12			5	1200	165	154	115	257	168	705	500	564	719	859	1205	1423	1578
TS1S100A18	M33A10N100I4		10	1800	186	140	110	250	168	715	----	564	719	854	----	1418	1573
TS1L100A18	M33A20N100I4	M33A20S100I4	10	1800	186	154	110	250	168	715	500	564	719	868	1215	1432	1587
TS1S150B18	M33B10N150I4		15	1800	289	140	115	257	158	820	----	564	719	959	----	1523	1678
TS1L150B18	M33B20N150I4	M33B20S150I4	15	1800	289	154	115	257	158	820	500	564	719	973	1320	1537	1692
TS1S200B18			20	1800	340	140	115	257	158	870	----	564	719	1010	----	1574	1729
TS1L200B18	M33B20N200I4	M33B20S200I4	20	1800	340	154	115	257	158	870	500	564	719	1024	1370	1588	1743
TS2S075A12	M42A20N075I6	M42A20S075I6	7.5	1200	252	185	158	215	239	865	330	621	771	1049	1194	1670	1820
TS2L075A12	M42A30N075I6	M42A30S075I6	7.5	1200	252	184	158	215	239	865	330	621	771	1048	1194	1669	1819
TS2S100B12			10	1200	274	185	161	215	239	890	330	621	771	1074	1219	1695	1845
TS2L100B12			10	1200	274	184	161	215	239	890	330	621	771	1073	1219	1694	1844
TS2S150C12	M42C20N150I6	M42C20S150I6	15	1200	364	185	175	215	252	1010	330	621	771	1191	1336	1812	1962
TS2L150C12	M42C30N150I6	M42C30S150I6	15	1200	364	184	175	215	252	1010	330	621	771	1190	1336	1811	1961
TS2S200C12			20	1200	411	186	175	215	274	1075	330	621	771	1261	1405	1882	2032
TS2L200C12			20	1200	411	186	175	215	274	1075	330	621	771	1261	1405	1882	2032
TS3S150A12	M48A40N150I6	M48A55S150I6	15	1200	364	255	221	242	336	1165	450	702	904	1418	1613	2120	2322
TS3L150A12	M48A55N150I6	M48A60S150I6	15	1200	364	253	221	242	336	1165	450	702	904	1416	1613	2118	2320
TS3S200B12	M48B40N200I6	M48B55S200I6	20	1200	411	255	230	242	336	1220	450	702	904	1474	1669	2176	2378
TS3L200B12	M48B55N200I6	M48B60S200I6	20	1200	411	253	230	242	336	1220	450	702	904	1472	1669	2174	2376
TS3S250C12	M48C40N250I6	M48C55S250I6	25	1200	545	255	236	256	336	1375	450	702	904	1628	1823	2330	2532
TS3L250C12	M48C55N250I6	M48C60S250I6	25	1200	545	253	236	256	336	1375	450	702	904	1626	1823	2328	2530
TS3S300D12	M48D40N300I6	M48D55S300I6	30	1200	571	255	238	256	336	1405	450	702	904	1656	1851	2358	2560
TS3L300D12	M48D55N300I6	M48D60S300I6	30	1200	571	253	238	256	336	1405	450	702	904	1654	1851	2356	2558
TS3S400D12			40	1200	708	275	241	260	336	1545	450	702	904	1820	1995	2522	2724
TS3L400D12			40	1200	708	272	242	260	336	1550	450	702	904	1818	1996	2520	2722
TS4S400A12	M54A50N400I6	M54A60S400I6	40	1200	708	275	317	532	563	2120	460	1002	1277	2395	2580	3397	3672
TS4L400A12	M54A60N400I6	M54A65S400I6	40	1200	708	272	317	532	563	2120	460	1002	1277	2392	2580	3394	3669
TS4S500B12	M54B50N500I6	M54B60S500I6	50	1200	757	275	323	532	563	2175	460	1002	1277	2450	2635	3452	3727
TS4L500B12	M54B60N500I6	M54B65S500I6	50	1200	757	272	323	532	563	2175	460	1002	1277	2447	2635	3449	3724
	M58E80N250I8	M58E80S250I8	25	900	685	348	347	575	633	2240	550	1097	1377	2588	2790	3685	3965
	M58E80N600I6	M58E80S600I6	60	1200	1300	348	347	575	633	2855	550	1097	1377	3203	3405	4300	4580
	M58F80N750I6	M58F80S750I6	75	1200	1495	348	347	575	633	3050	550	1097	1377	3398	3600	4495	4775
TS5L600A9			60	900	1456	800	798	1204	1834	5295	1200	1311	1622	6092	6492	7403	7714
TS5L750B9			75	900	2005	800	818	1268	1905	6000	1200	1311	1622	6796	7196	8107	8418
TS5L1000C9			100	900	2155	800	867	1363	1905	6290	1200	1311	1622	7090	7490	8401	8712
TS5L125D9			125	900	3800	800	867	1363	1905	7935	1200	1311	1622	8735	9135	10046	10357

Weights are subject to change without notice. Contact factory for Metric Equivalent Weights.

Tri-Stack Mounting

Curbs

Curbs shall be a minimum of 14-gauge steel and anchored directly into the roof structure. The site structural engineer to determine site specific requirements for anchoring/supporting of equipment to building structure. For curbs provided by Strobic Air Technologies, the assembly instructions can be found attached to the curb.

Fan to Airbox/Plenum

A square housing base with a 3" flange has been constructed for ease of installation to any frame opening. Refer to your certified drawing for other dimensions. Ensure that proper support is provided to support the weight of your fan. Ensure air leaks, if any, are properly sealed upon start-up. If the curb or structural base is not supplied by Strobic Air Technologies, consult the factory to avoid “soft base” vibration problems. Be sure the curb top or structural base is plumb and level to provide for proper drainage. The curb cap shall be appropriately lagged to the curb by means of 3/8" lag bolts or 1/4" bolts and nuts supplied by the contractor (heavier fasteners may be required by code in your area). Plenum and Roof Curbs need to be field drilled based off of your local code and touched up to prevent premature failure of coating/metal components. A 316 stainless steel fastener is recommended for corrosion resistance. See **Figure 1** through **Figure 11** for various base configurations.

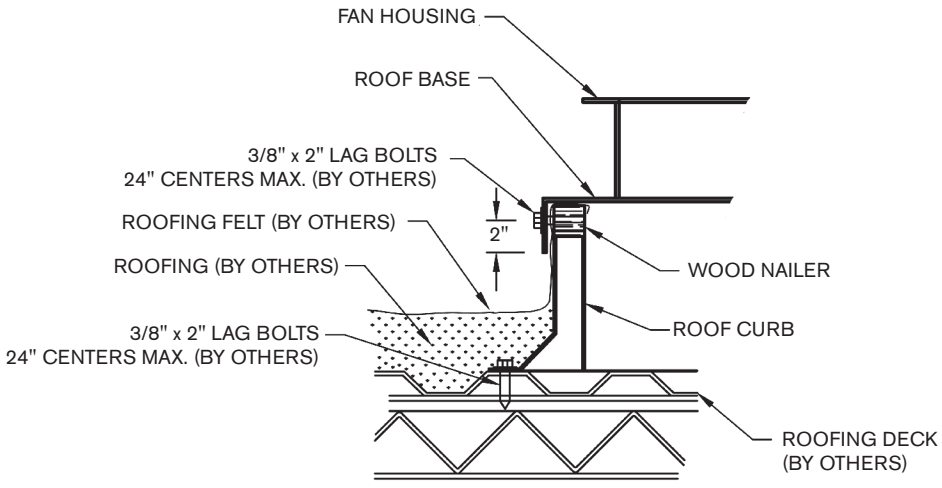


Figure 1 - Single Fan Plenum to Roof Curb

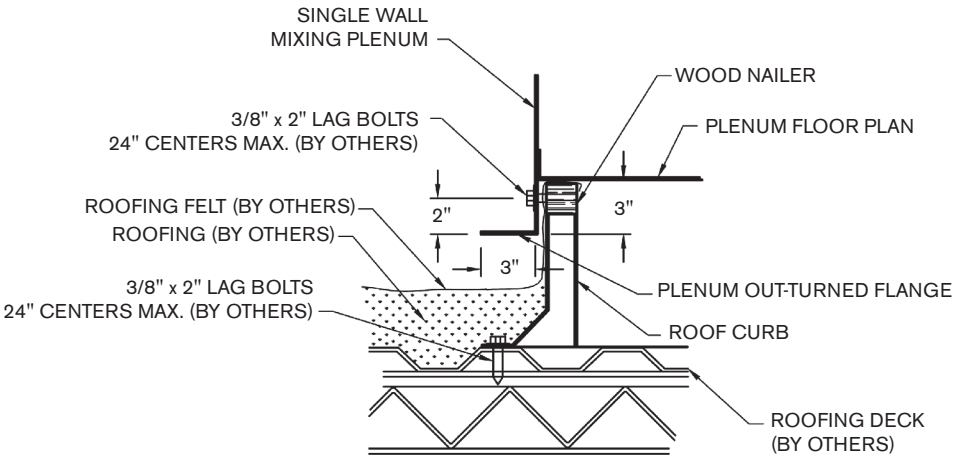


Figure 2 - Single Wall Plenum to Roof Curb

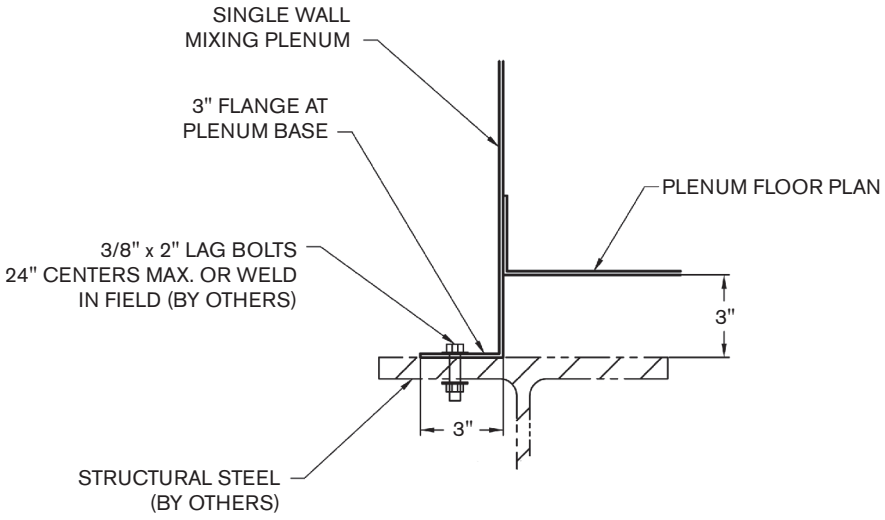


Figure 3 - Single Wall Plenum to Structural Steel

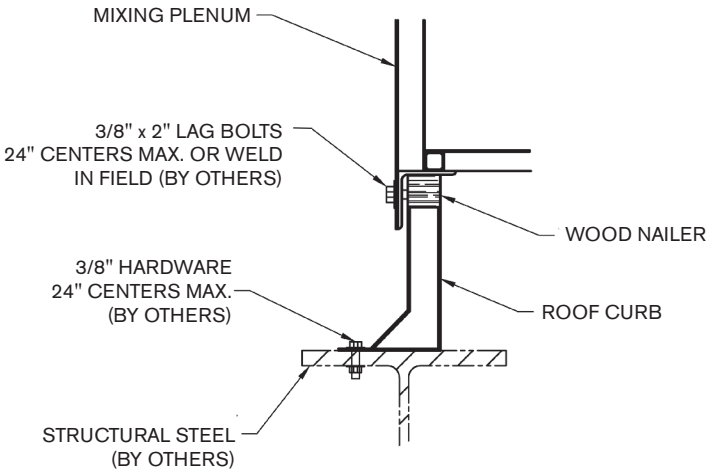


Figure 4 - Roof Curb to Structural Steel

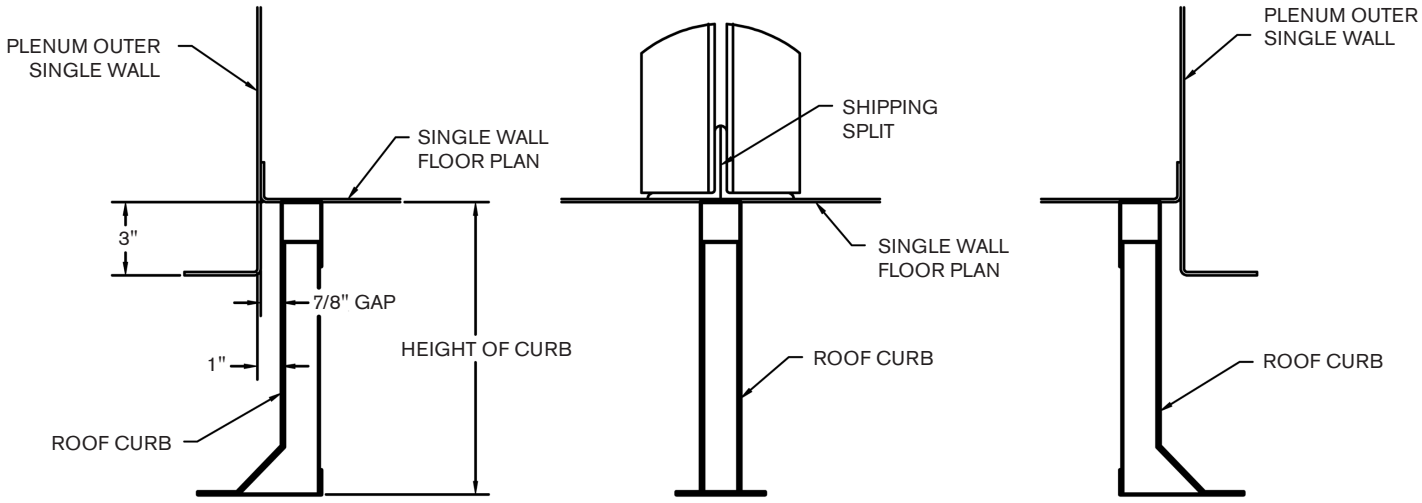


Figure 5 - Single Wall Plenum with Shipping Split on Roof Curb

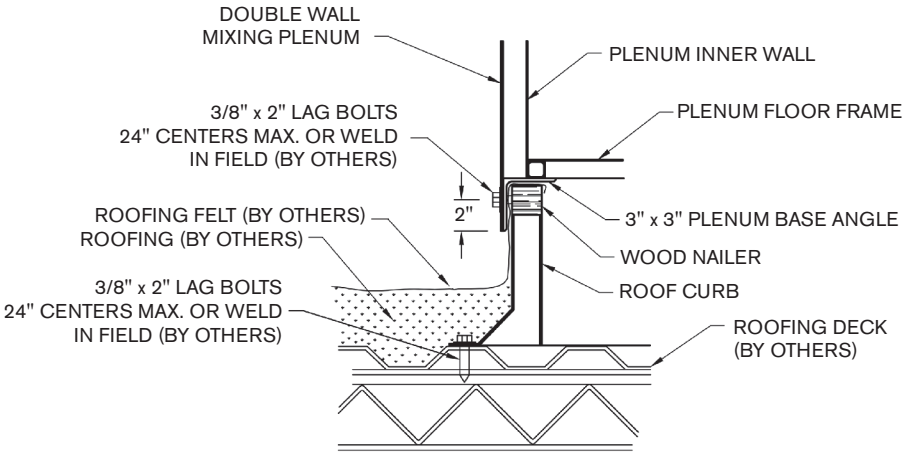


Figure 6 - Double Wall Plenum to Roof Curb

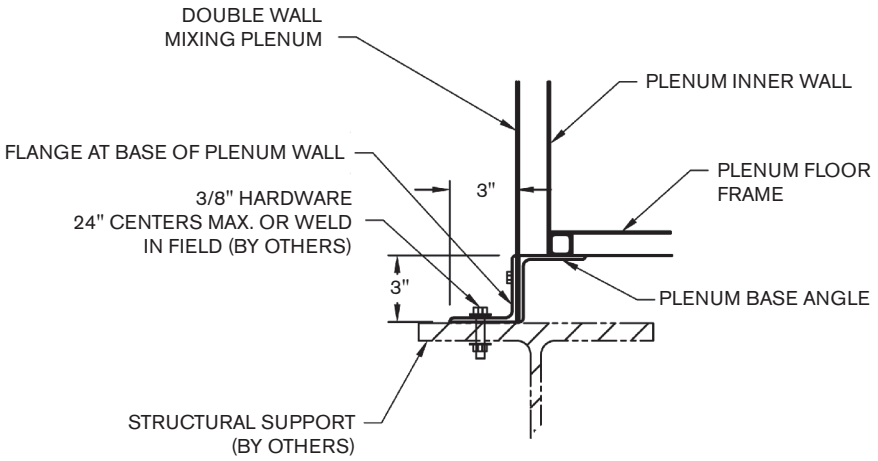


Figure 7 - Double Wall Plenum to Structural Steel

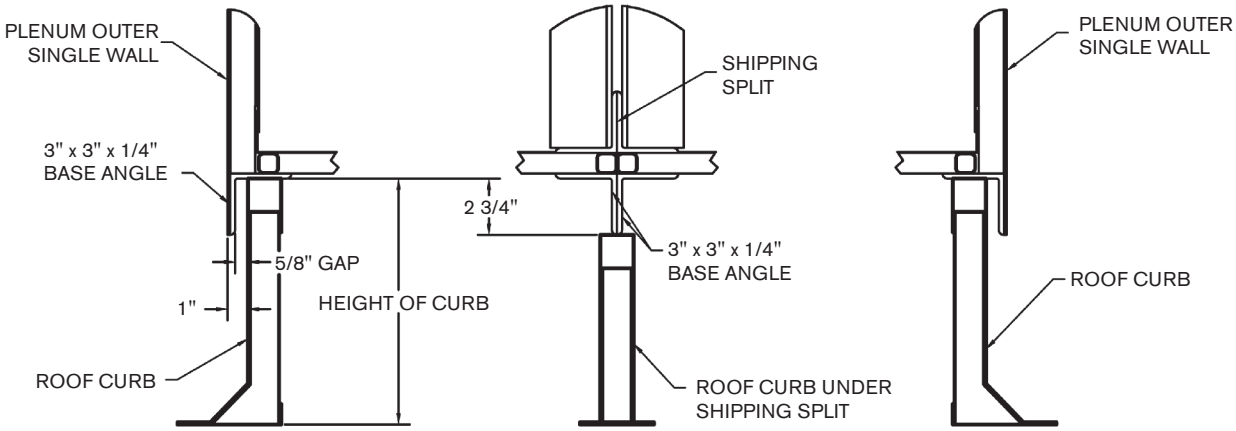


Figure 8 - Double Wall Plenum with Shipping Split on Roof Curb

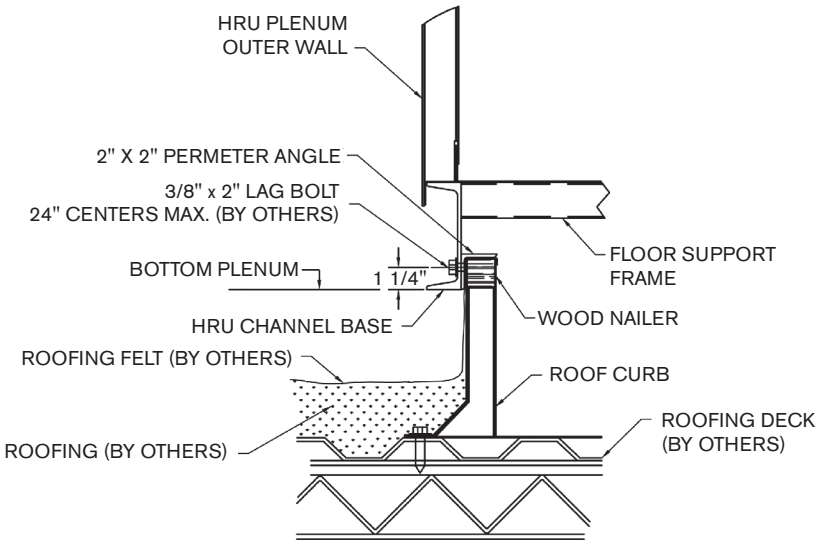


Figure 9 - HRU Plenum to Roof Curb

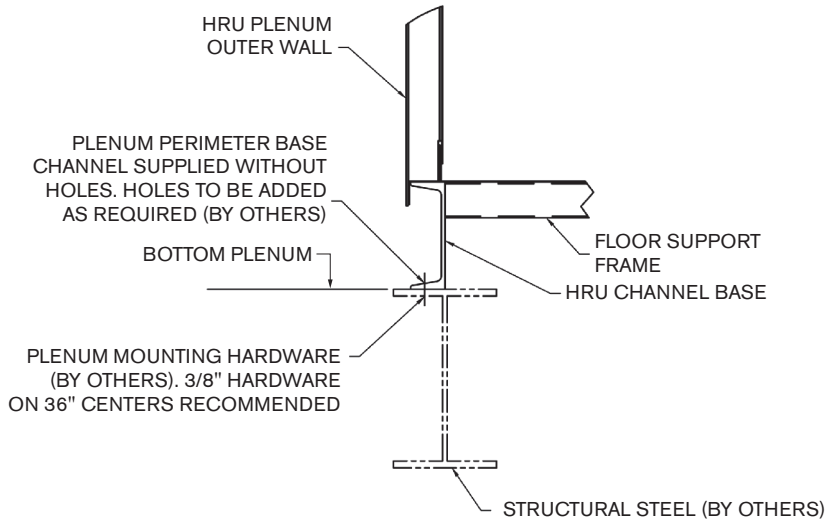


Figure 10 - HRU Plenum to Structural Steel

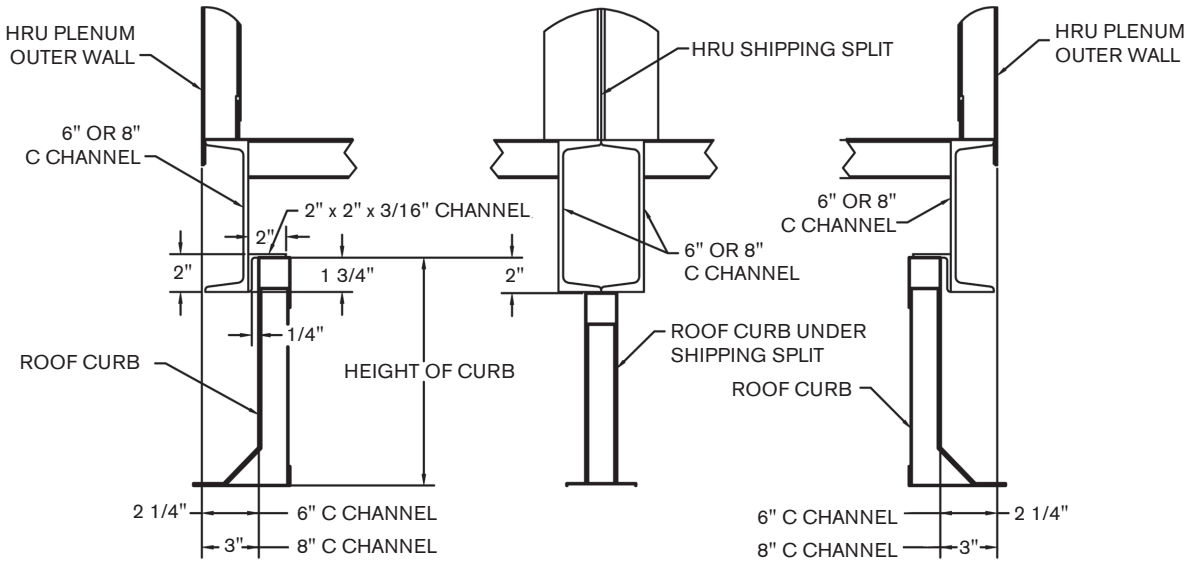


Figure 11 - HRU Plenum with Shipping Split On Roof Curb

Lifting

See **Figure 12** through **Figure 18** for standard lifting methods of common Tri-Stack components.

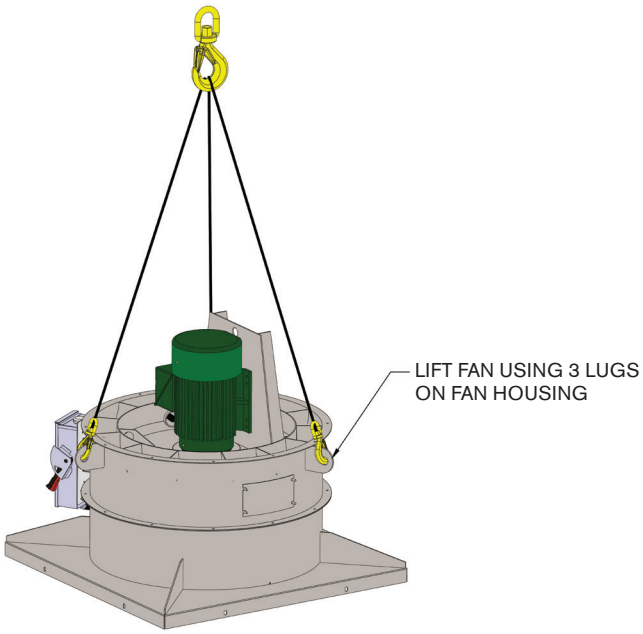


Figure 12 - Single Fan Lifting Points

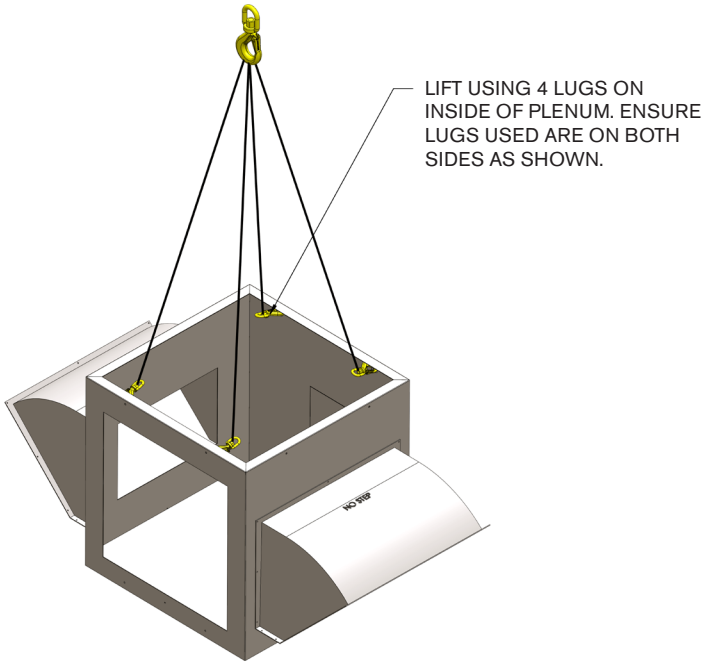


Figure 13 - Single Fan Plenum Lifting Points

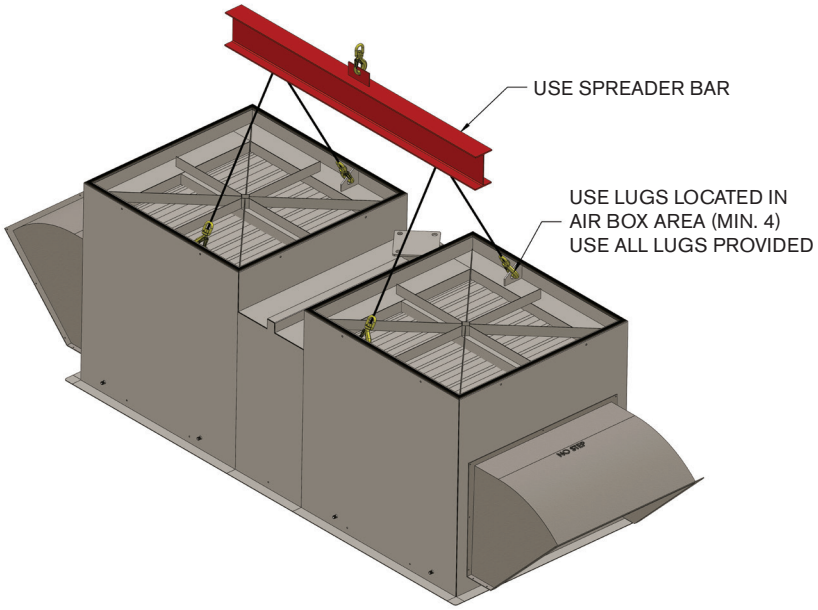


Figure 14 - Single Wall Multiple Plenum Lifting Points

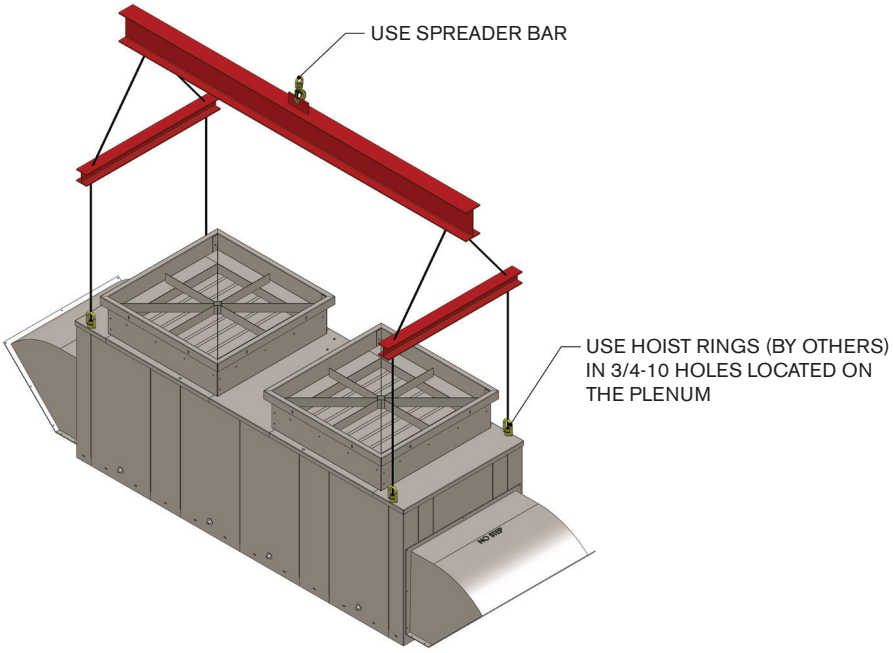


Figure 15 - Double Wall Multiple Fan Plenum Lifting Points

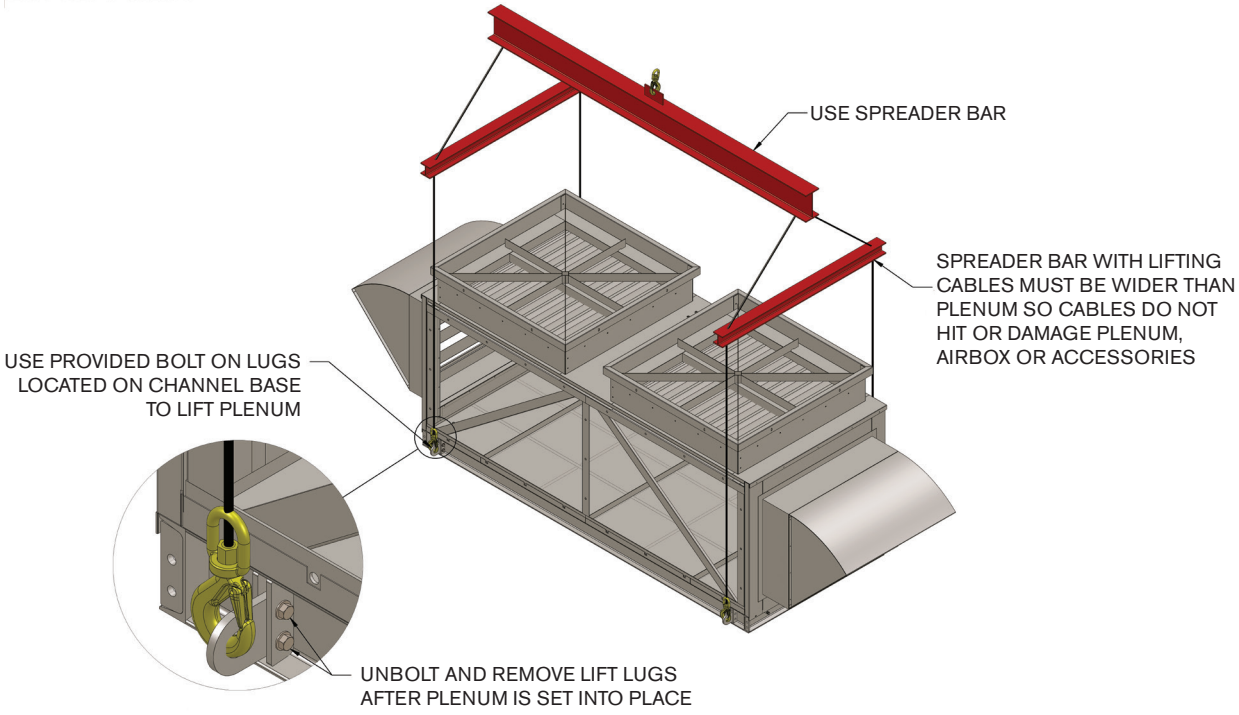


Figure 16 - HRU Plenum Lifting Points

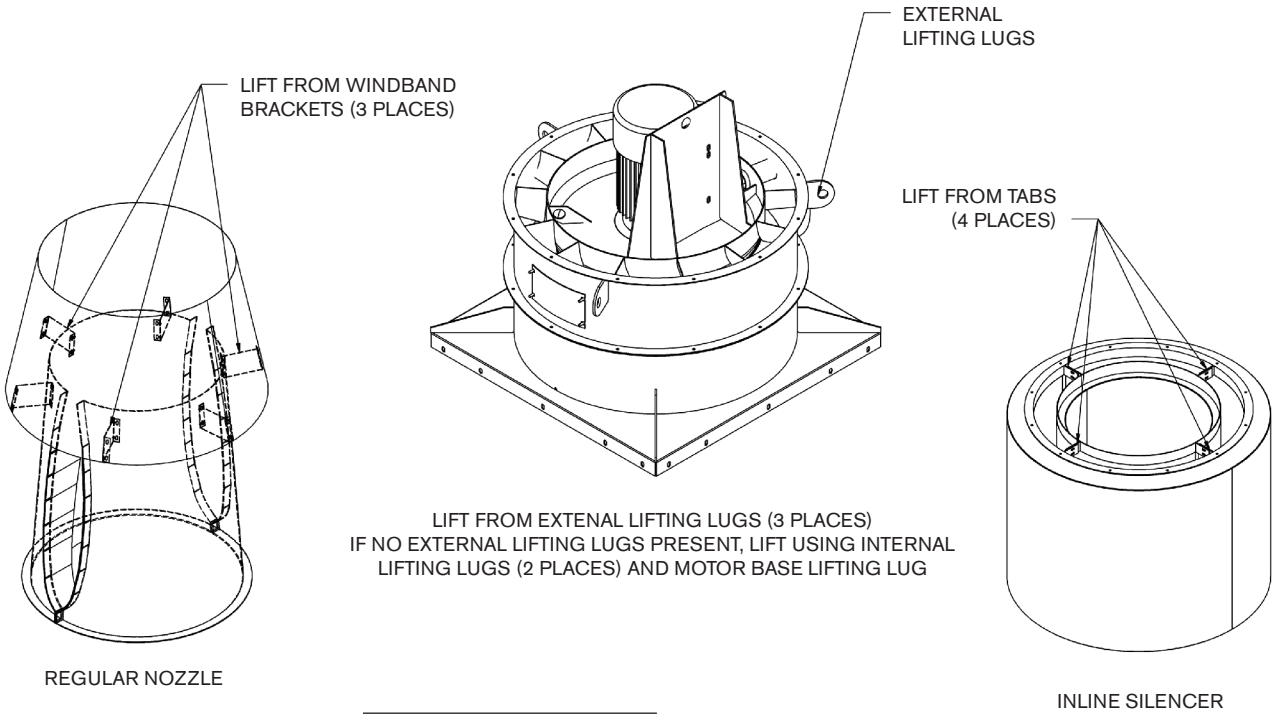


Figure 17 - Lifting Points

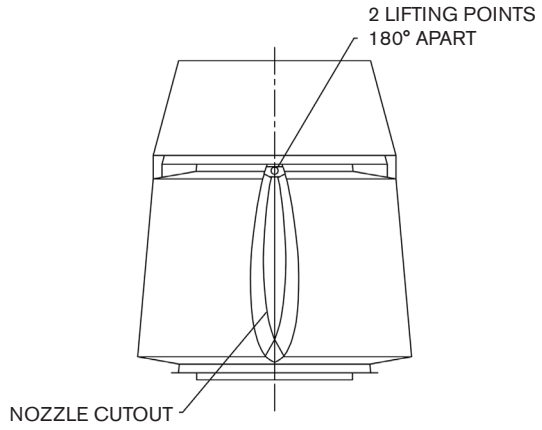


Figure 18 - Silencer Nozzle Lifting Points

Assembly

See **Figure 19** through **Figure 27** for standard assembly instructions.

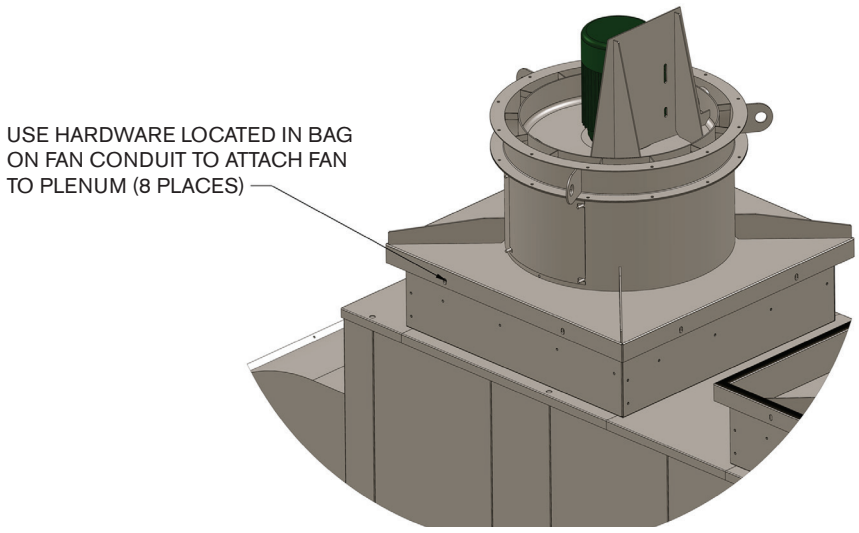


Figure 19 - Installation of Fan to Double Wall Plenum

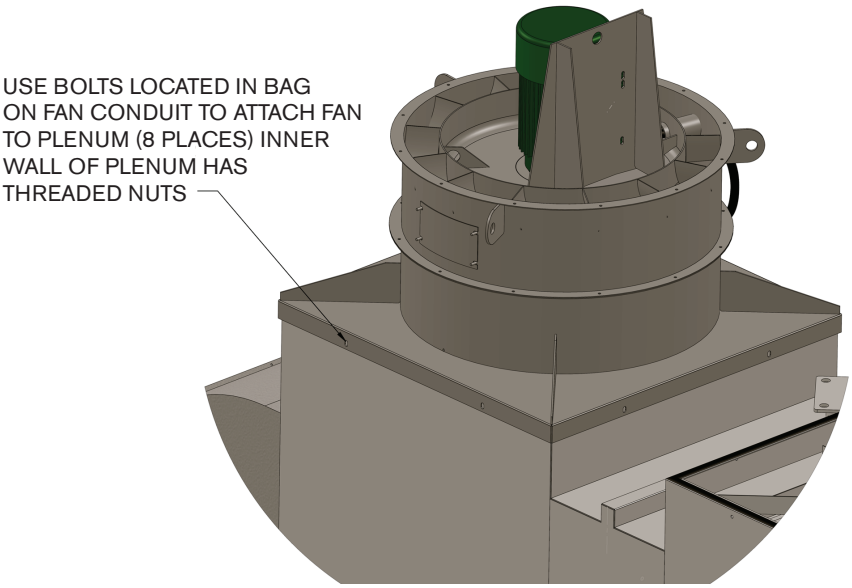


Figure 20 - Installation of Fan to Single Wall Plenum

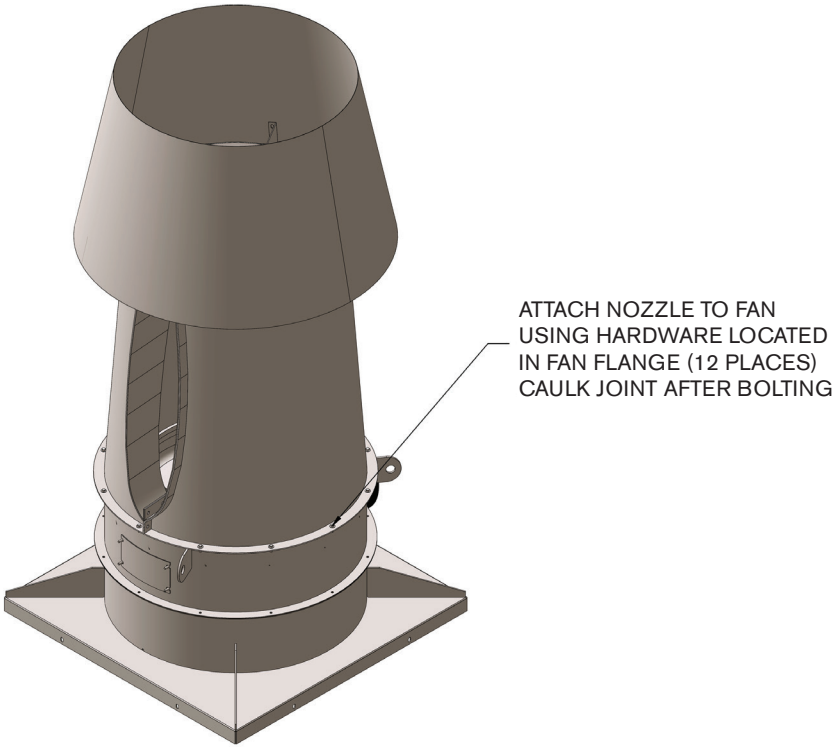


Figure 21 - Installation of Nozzle to Fan

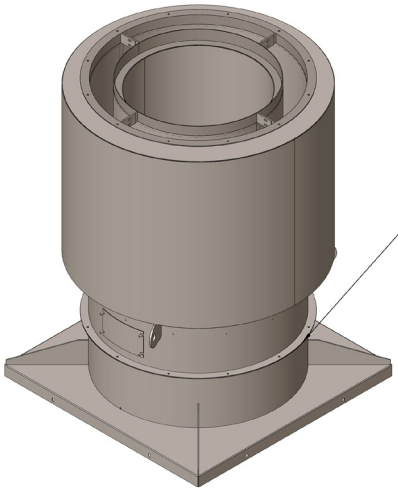


Figure 22 - Installation of Inline Silencer to Fan

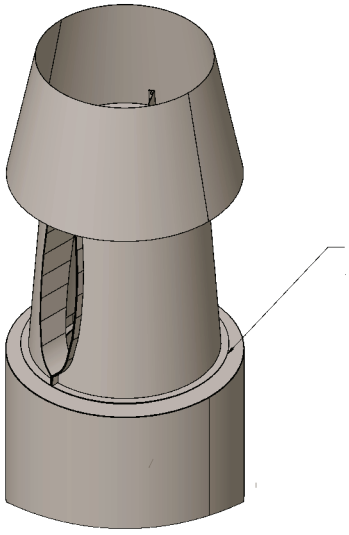


Figure 23 -Installation of Nozzle Attachment to Inline Silencer

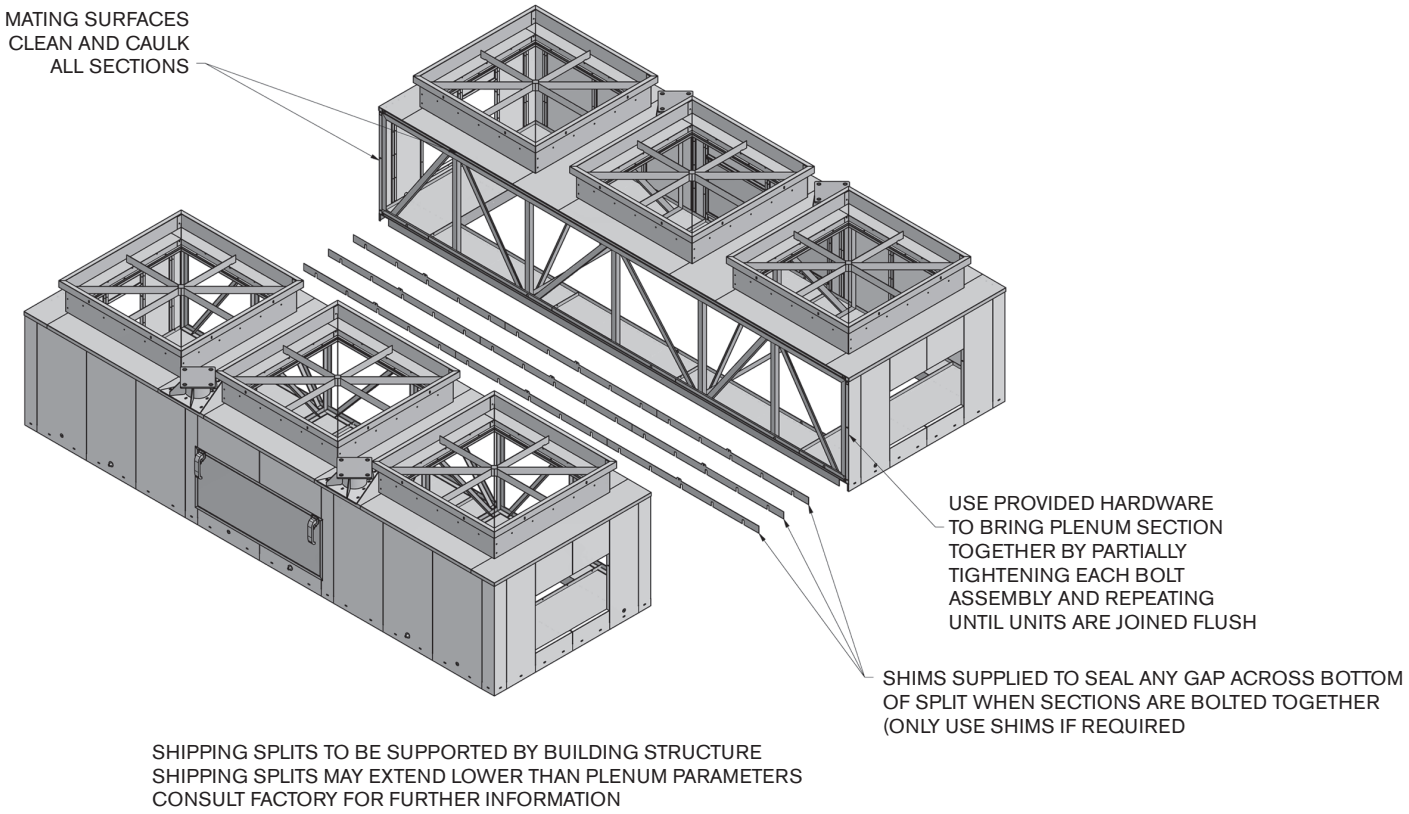


Figure 24 - Assembly of Plenum with Shipping Splits

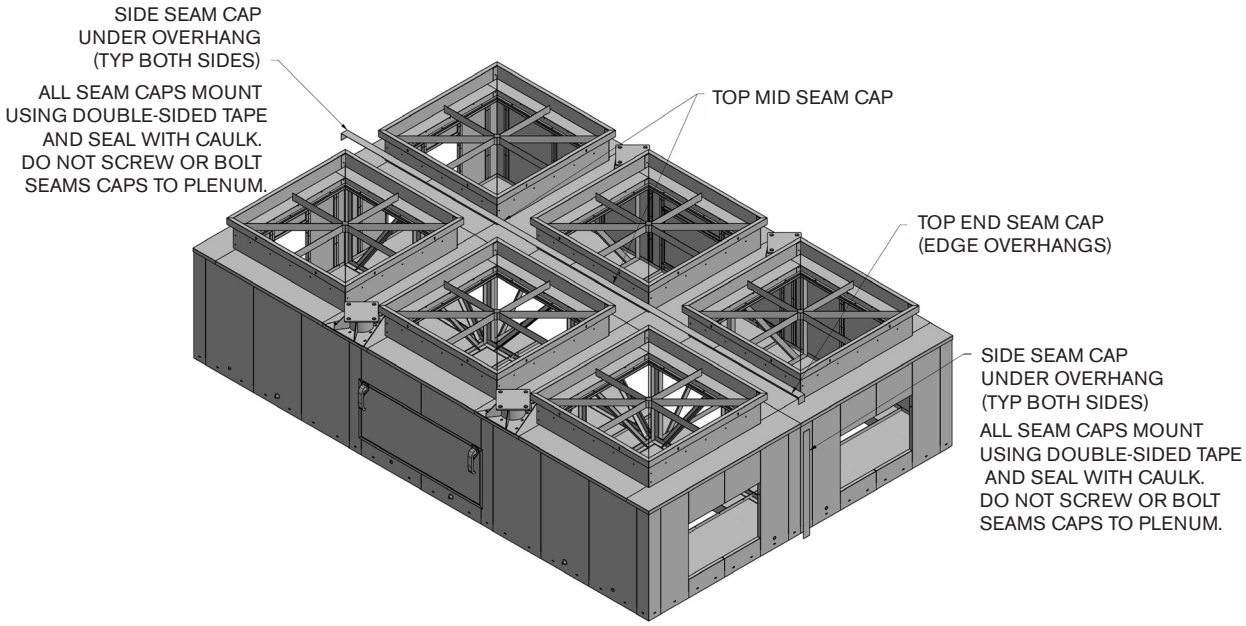


Figure 25 - Assembly of Plenum with Shipping Splits

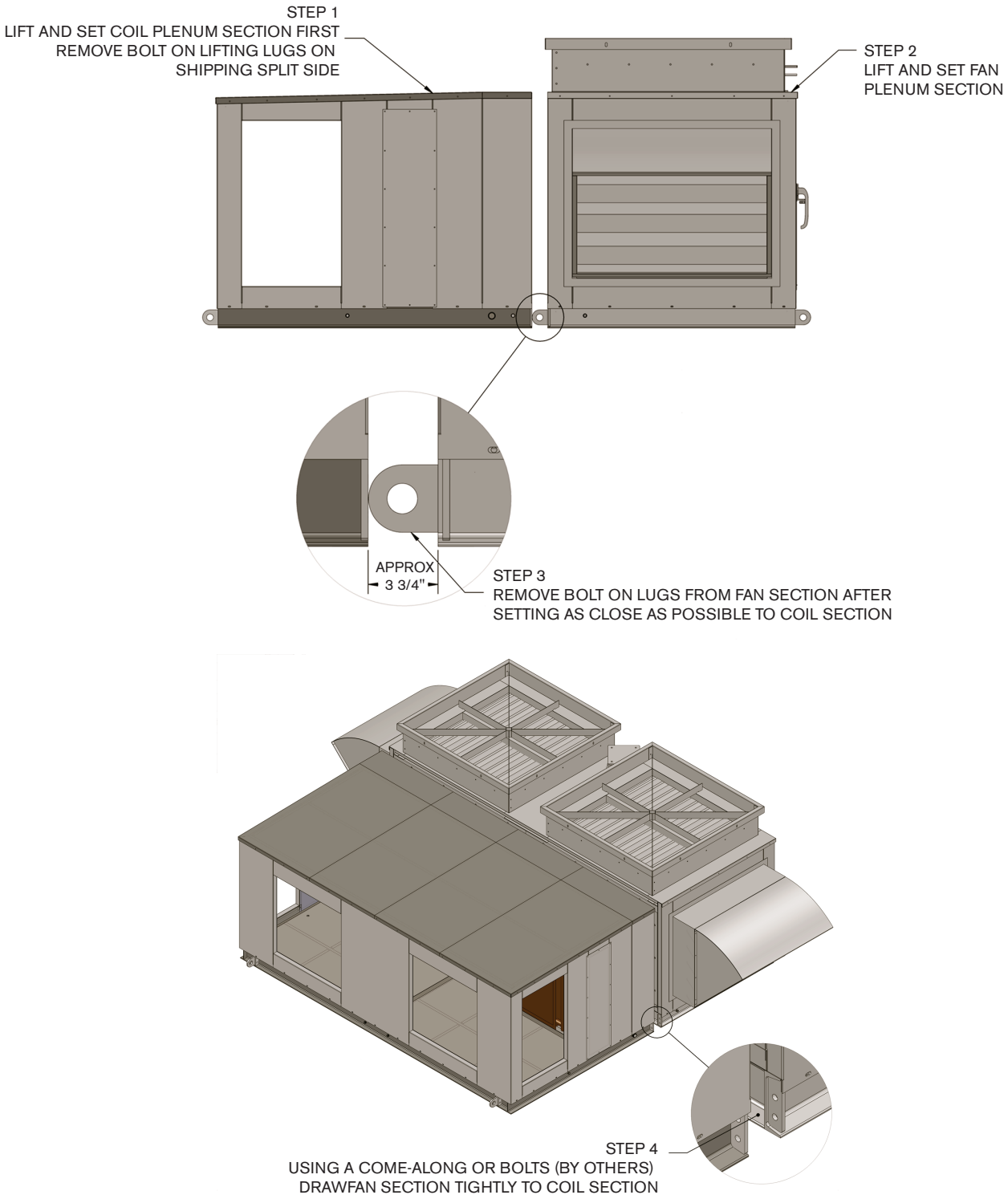


Figure 26 - Heat Recovery Multiple Plenum Section Assembly

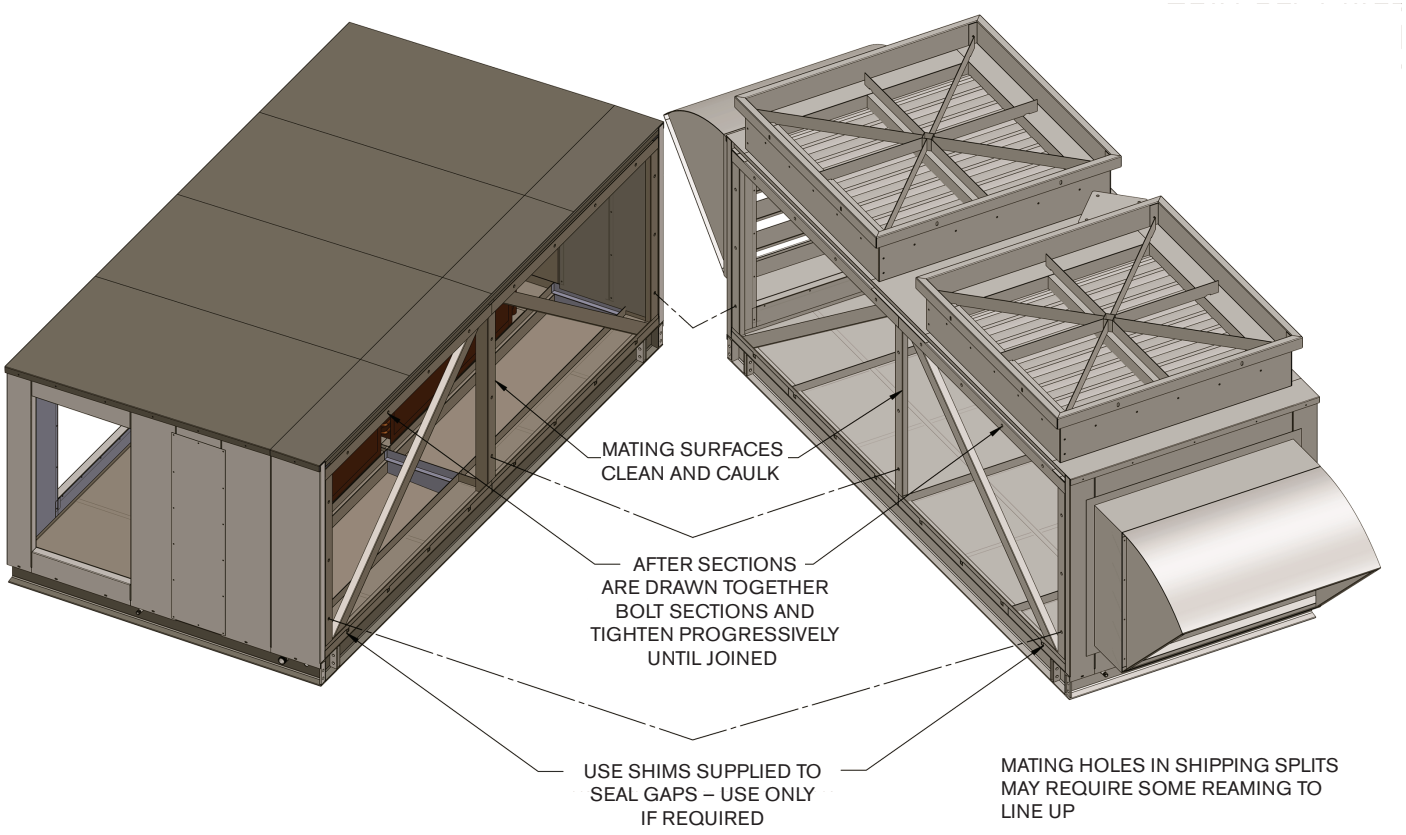


Figure 27 - Heat Recovery Plenum Shipping Split Assembly

Hardware Sizes			
Model Prefix	Nozzle to Vane or Inline Silencer to Nozzle or Vane*	Vane to Housing	Housing to Plenum*
BS-002/M-24	5/16-18 x 1 1/4" (8x)	5/16-18 x 1" (8x)	1/4-20 x 1 1/4" (8x)
BS-005	5/16-18 x 1 1/4" (12x)	5/16-18 x 1" (12x)	1/4-20 x 1 1/4" (8x)
TS-1/M-33	5/16-18 x 1 1/4" (12x)	5/16-18 x 1" (12x)	3/8-16 x 1 1/2" (8x)
TS-2/M-42	3/8-16 x 1 1/4" (12x)	3/8-16 x 1" (12x)	3/8-16 x 1 1/2" (8x)
TS-3/M-48	3/8-16 x 1 1/4" (12x)	3/8-16 x 1" (12x)	3/8-16 x 1 1/2" (8x)
TS-4/M-54	3/8-16 x 1 1/4" (12x)	3/8-16 x 1" (12x)	3/8-16 x 1 1/2" (8x)
M-58	3/8-16 x 1 1/4" (12x)	3/8-16 x 1" (12x)	3/8-16 x 1 1/2" (8x)
TS-5	3/8-16 x 1 1/4" (24x)	3/8-16 x 1" (24x)	3/8-16 x 1 1/2" (16x)

* Designates hardware that ships loose.

Fiberglass Nozzle Bolt Torque

Recommended torque values for stainless steel hardware when fastening a fiberglass nozzle to the fan flange:

Table 2 – Fastener Torque Values	
bolt size	$in{\cdot}lb_f$
1/4-20	50
5/16-18	75
3/8-16	120

⚠ Caution

Exceeding the given values by as little as 15% in some cases can cause minor cracking to occur around the nozzle flange and surrounding joints. Cracking and stress become more pronounced with further torque application.

Torque all hardware in steps to avoid damaging equipment. Start with one bolt and torque to 50% of full capacity. Work around unit until every bolt is at 50% total capacity. Repeat process at 75% and finally full torque rating.

Standard Bolt Torque

Recommended torque values for stainless steel hardware when fastening metal flanges:

Table 3 – Fastener Torque Values		
bolt size	$in{\cdot}lb_f$	$ft{\cdot}lb_f$
1/4-20	79	7
5/16-18	138	12
3/8-16	120	10
1/2-13	542	45
5/8-11	1160	97
3/4-10	1582	132

Flange Sealing

Fully caulk the outside edge of all the flanges with silicone caulk provided. See **Figure 28**.

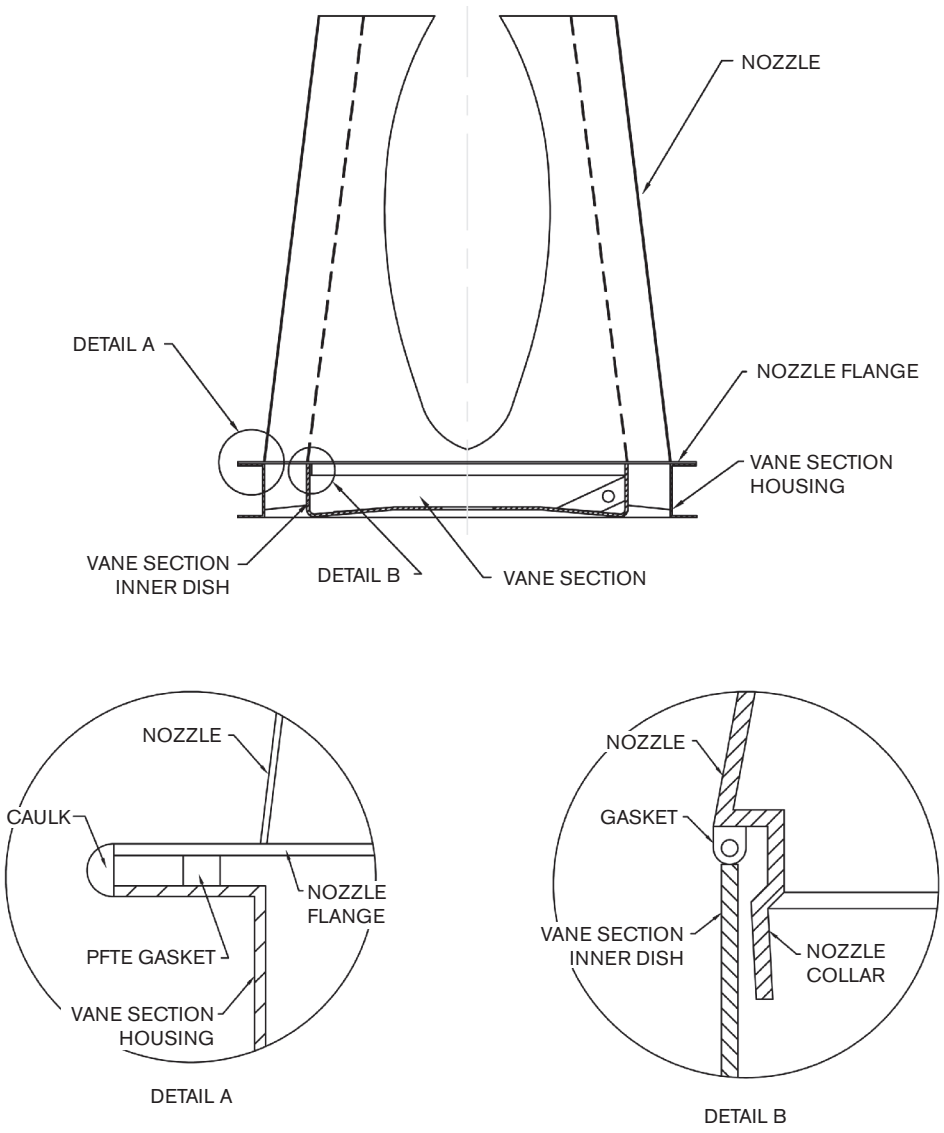


Figure 28 - Nozzle to Vane Section Detail

installation

Motor Connection

Unless specified differently, the motor on your fan has been wired to a NEMA 3R disconnect switch mounted on the side of the fan housing. Check the fan nameplate for proper voltage and amperage. If fans are stored for an extended period of time (180 days or more), all connections should be checked for looseness and corrosion.

Isolation and Bypass Dampers

Actuate the dampers slowly at start-up to observe they are free of binding and to ensure they open fully and close tightly. Adjust linkage accordingly.

Actuator

For pneumatic actuator, see separate instructions by manufacturer. Electrical schematics for typical actuators are shown on **Figure 29** and **Figure 30** (Isolation Actuator) and **Figure 31** (Bypass Actuator).

External Wiring

This equipment must be installed with remote motor-overload protection. When connecting to a circuit protected by fuses, use time-delay fuses. Starting and overload control devices must be matched to motor rating. Follow the control manufacturer's instructions to make proper installation and connections.

Connect electrical power supply to conform to National Electrical Code and any local regulations. Line voltage and wire capacity must match motor rating stamped on the nameplate.

Vibration Isolation

An 1 1/2" wide strip of neoprene bulb gasket has been factory installed on top of the mixing box. When the fan base must be shipped separately from the mixing box (due to transportation height requirements) care should be taken not to disturb this pad during installation. Check this point for air leaks upon start-up. Take necessary corrective measures to seal this joint properly.

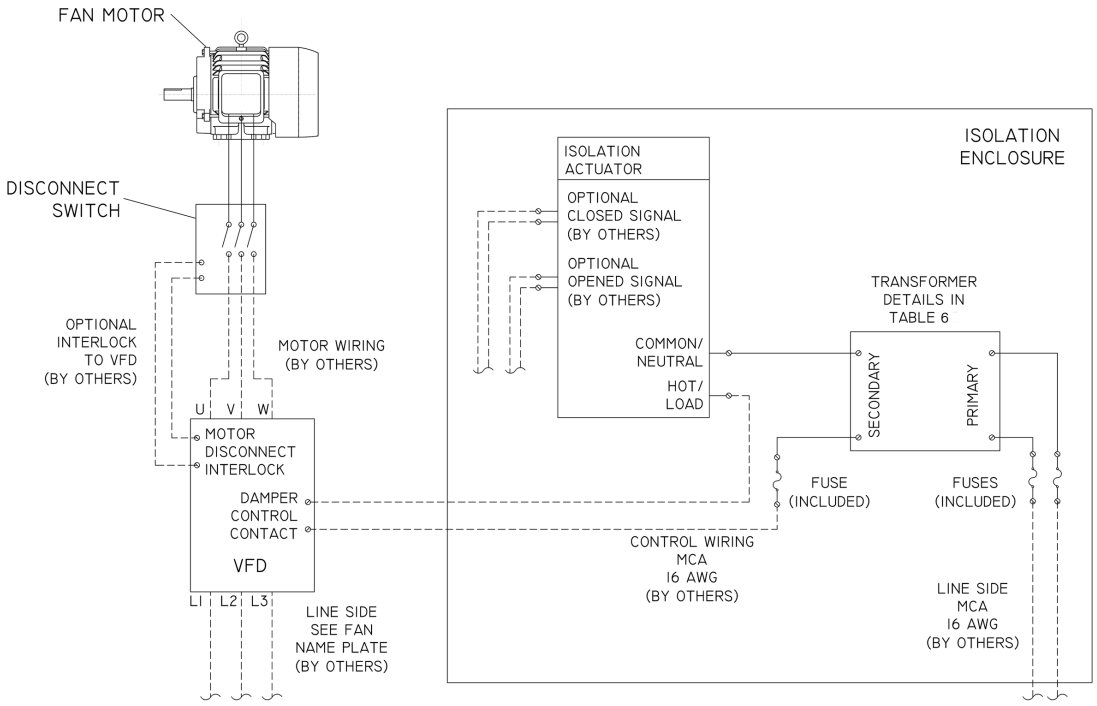


Figure 29 - Motor, VFD and Isolation Actuator Wiring Diagram.

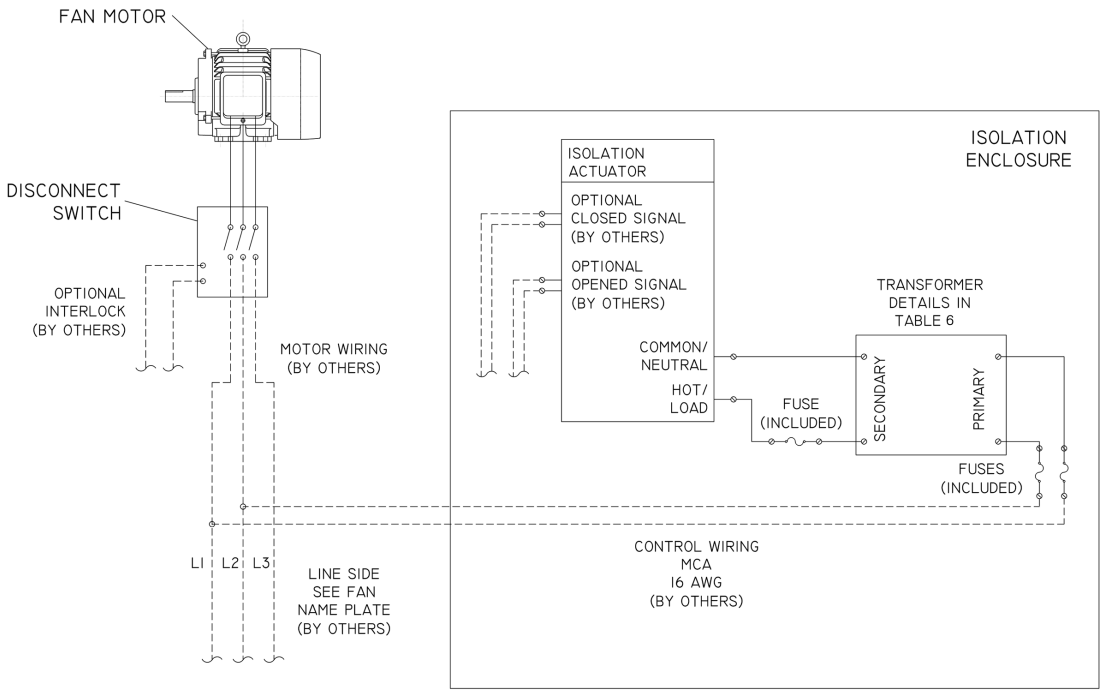


Figure 30 - Motor and Isolation Actuator Wiring Diagram

Table 4 — Isolation Actuator Specifications

Model	Voltage	Torque in·lb	Run Time Open / Close	Power Consumption	Fuse	Hot / Load	Common / Neutral	Ground	Opened Signal	Closed Signal
NFBUP-S	24-240 VAC 24-125 VDC	90	75 sec /15 sec	6 VA <1 20 9 VA >1 20	0.5 A 0.1 A	Black (2)	White (1)	n/a	S4-Common S5-NC S6-NO	S1-Common S2-NC S3-NO
AFBUP-S	24-240 VAC 24-125 VDC	180		7 VA < 120 18 VA > 120	0.5 A 0.1 A			n/a		
EFB24-S	24 VAC 24 VDC	270		16 VA	0.75 A	Red (2)	Black (1)	n/a	0.5 A 250 VAC	0.5 A 250 VAC
EFB120-S	100/140 VAC	270		21 VA	0.1 A	Black (2)	White (1)	n/a		
GGD121.1U	24 VAC	142	15 sec	160 VA	10 A	Red	Black	Green	n/a	n/a
GGD221.1U	115 VAC	142			2 A	Black	White	Green		
GGD321.1U	230 VAC	142			1 A	Brown	Blue	Greem		

Table 5 — Bypass Actuator Specifications

Model	Voltage	Torque in·lb	Run Time 90 Degrees	Power Consumption	Fuse	Hot / Load	Common / Neutral	Ground	Command	Feedback
AMB24-SR	24-240 VAC 24-125 VDC	180	150 sec	5 VA	0.25 A	Red (2)	Black (1)	n/a	White (3) 2-10 VDC	Orange (5) 2-10 VDC
GKB24-SR	24-240 VAC 24-125 VDC	360	150 sec	21 VA	1.5 A					

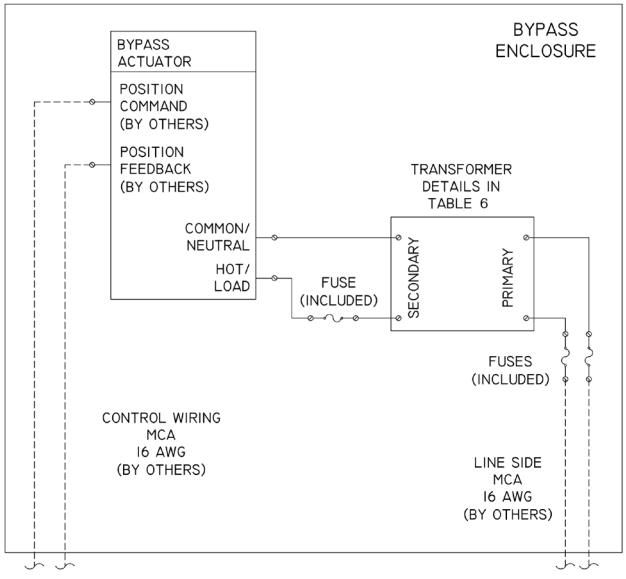


Figure 31 - Bypass Actuator Wiring Diagram

Table 6 — Transformer Details

Model	Primary		Secondary					
C050E1B	120		24		Jumper 1		Jumper 2	
	H1	H4	X1	X2	H1	H3	H2	H4
	240		24		Jumper 1		Jumper 2	
	H1	H4	X1	X2	H2	H3	n/a	n/a
C050E4W	600		24					
	H1	H2	X1	X2				
	575		23					
	H1	H2	X1	X2				
	550		22					
	H1	H2	X1	X2				
C050E5E	440/460/480		110/115/120					
	H1	H4	X1	X3				
	220/230/240		110/115/120					
	H2	H4	X1	X3				
	200/208		110/115/120					
	H3	H4	X1	X3				
	440/460/480		23/24/25					
	H1	H3	X2	X3				
	220/230/240		23/24/25					
	H1	H3	X2	X3				
	200/208		23/24/25					
	H1	H3	X2	X3				
E050TE	480		24					
	H1	H4	X1	X2				
	415		24					
	H1	H4	X1	X2				
	400		24					
	H1	H4	X1	X2				
	380		24					
	H1	H4	X1	X2				
	277		24					
	H1	H4	X1	X2				
	240		24					
	H1	H4	X1	X2				
	230		24					
	H1	H4	X1	X2				
	220		24					
	H1	H4	X1	X2				
	208		24					
	H1	H4	X1	X2				
	200		24					
	H1	H4	X1	X2				

Initial Start

After installation is completed, but before fan is put in regular service, make an initial start as follows:

- Hand turn the impeller to determine that the motor has not shifted in shipment and/or erection. The impeller should turn freely, should not touch other fan components and should be free of foreign materials.
- Check that motor, starting and control device connections agree with wiring diagrams.
- Check that voltage, phase, and frequency of line circuit (power supply) agree with fan nameplate.
- Check that all bolts on your fan supports are tight, and that no objects are left in the fan housing.
- Check motor service record and tag accompanying motor to be certain that bearings have been properly lubricated. When shipped from the factory, the bearings have been lubricated to give six (6) months satisfactory service except for sealed ball bearings which are lubricated for life and require no maintenance.
- Momentarily energize the motor to check for proper rotation. The fan should be rotating clockwise from on overhead view, as indicated by arrow markings on the fan nameplate.

⚠ **Caution**

Fans running in a reverse rotation can cause the fan motor to run into the service factor due to overamping thus the possibility of the circuit breaker tripping.

- If motor is three-phase, reverse rotation (if required) by interchanging any two of the three power leads. If two-phase, interchange stator leads of either phase, being careful not to change leads from one phase to the other. If motor is single-phase, refer to the instructions on the motor nameplate.
- While the fan is running, check the mixing box, air box, inlet connections and fan/nozzle flanges for air flow leaks and make appropriate repairs/adjustments. Check with the factory if any leaks cannot be stopped.
- Turn off fan and open access door on mixing box to observe proper full closure of isolation dampers. Make appropriate damper linkage adjustments. If adjustments are not easily implemented, consult the factory. If “fan staging” or a “stand-by fan” is employed, observe that the isolation damper under the “off” fan is fully closed while the other fans are in operation, and that no reverse windmilling is occurring. Make appropriate adjustments to the damper linkage. Consult factory for linkage adjustment procedure.
- Check the bypass dampers for proper operation. Be sure end switches are connected to the controls, when applicable.

⚠ Caution

Repeated trial starts can overheat the motor (particularly for across the line starting) or increase the resistance of external starting equipment. If repeated trial starts are made, allow sufficient time between trials to permit heat to be dissipated from windings or external resistance and prevent overheating. Starting currents are several times running currents, and heating varies as the square of the current.

Note

Due to the utilization super premium efficiency motors the electrical circuit may see a large in-rush of current (approximately 19 times the FLA) for the first 1/2 to 1 cycle of the motor starting. For circuits that experience this condition we recommend the circuit breakers' Instantons Trip Setting be set to higher levels to mitigate against any nuisance trips.

Variable Frequency Drive

It is recommended that a start-up service technician from the drive manufacturer be employed. The full load amperage of the drive may differ from that of the motor. The lower limit of the electrical equipment should be observed.

As a rule of thumb, the motor lead lengths to the VFD should not exceed 200 feet on a 200/230/380/415/460V system, and 100 feet at 575V. Noise can be amplified by lead length which can result in voltage spikes. If the motor is to be run above 60Hz, close attention needs to be paid to the current in relation to the full load amperage (FLA) of the motor. Even though the motors can maintain constant horsepower up to 90Hz, the torque capability of the motor will begin to drop off linearly to the increase of the speed. Therefore, if the torque drops off and the motor is expected to put out its rated horsepower, the current will start to increase linearly with the speed in order to meet the demand of the load. If the current increases higher than the rated FLA of the VFD, the VFD will begin to "trip-out" on an overload/over current condition. See specific drive manufacturer's installation, operation, and maintenance manual for exact running condition details.

Motor shaft grounding kits or insulated motor bearings should be employed when using VFDs for motors above 5 hp. Without such protection, static charges can build up and arc, which may cause motor bearing failure

Sequence of Operation

The following is a recommended sequence of operation for multiple Tri-Stack fans mounted on a common system.

⚠ **Caution**

Before starting the system, ensure that all bypass dampers are fully open and all isolation dampers are fully closed. Failure to open the bypass dampers could result in excessive pressure in the system and may result in damage to ductwork or other system components. Failure to close all isolation dampers could result in excessive by-pass into the system. This condition may also result in windmilling of non-energized fans which could result in damage to the fans.

System Startup and Increasing System Demand:

- Energize the first fan. At the same time, send a signal to the isolation damper actuator to begin opening the damper.
- After the fan has achieved full speed and the isolation damper is fully open, begin to close the bypass dampers as required in order to increase the system pressure to the design set point.
- As the system demand increases, (an) additional fan(s) may be required. The fans should be started one at a time. As each additional fan is energized, the isolation damper to that fan should begin to open. Opening the isolation damper of a fan before it is energized could make system control unstable.

Decreasing System Demand:

- As the system demand decreases, the controls should open the bypass dampers to increase bypass flow.
- When the bypass dampers reach the full open position and more turndown is required in the system, deenergize one fan. At the same time, close the isolation damper for this fan. Allow time for the system to stabilize before starting or stopping additional fans.

In addition to the above comments, the sequence of the fans should be varied so that all fans operate approximately equal hours. It is recommended that the fans should be sequenced so that any fan does not remain idle for more than thirty (30) consecutive days.

The above sequence is recommended for multiple fan systems utilizing bypass dampers. For fan systems using variable frequency drives, a similar approach can be taken. However, additional steps are required to ensure that all operating fans are running at the same speed and the outlet velocity of the system does not fall below safety/design requirements.

Safety Alert

This unit has been shipped in new and clean condition. However, the equipment is designed to handle fumes from a research laboratory hood or other unknown source. These fumes may be hazardous to your health. Therefore, we recommend that you:

⚠ **Warning**

Do not open any access doors on a fan or mixing box without first consulting your Facilities Safety Officer. Special cleaning procedures may be necessary prior to working on the internal components of this unit.

Without knowledge of the composition of the fumes exhausted through this unit, Strobic Air Technologies makes no general recommendation as to the cleaning procedure to be used. We are willing to consult with the Facilities Safety Officer and offer suggestions based on our field experience.

Internal Drainage System

Weep/drain holes are located in the motor cavity (via the motor conduit pipe), in the fan housing near the inlet bell and in the mixing box/plenum. These holes should be checked periodically for possible clogging, especially when the fan is off. Should excessive pooling of water occur on the floor of the mixing box/plenum, it may be necessary to install an external drain (p-trap) on the weep holes. **Figure 32** details the recommended construction for a p-trap drain.

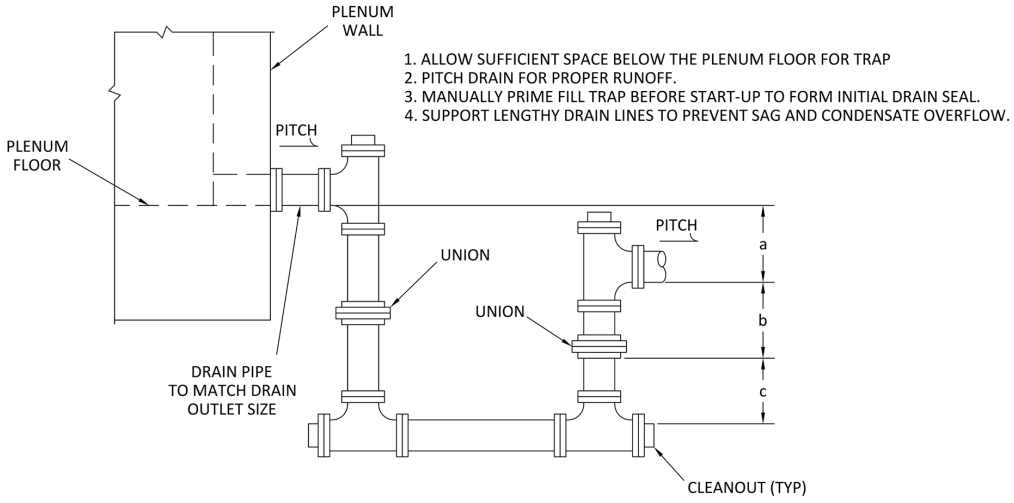


Figure 32 - Recommended Tri-Stack P-Trap Drain

maintenance

Regular Motor Maintenance

Strobic fan maintenance is limited primarily to the motor. Each motor should be inspected at regular intervals. The frequency and thoroughness will depend on the amount of operation, nature of service, and the environment. The motor exterior should be kept free of oil, dust, water, and chemicals. For fan-cooled motors, it is particularly important to keep the air intake opening free of foreign material. Do not block air outlet.

Motors will have the grease leads extended to the fan housing near the disconnect switch. For standard applications, the motor bearing should be lubricated with polyurea grease, such as Mobil Polyrex EM, as recommended by the motor manufacturer. For most general applications where the nature of service and environment is not severe, we recommend two (2) ounces of grease be supplied on each bearing in accordance with the following schedule:

Motor Lubrication Schedule*	
900 rpm fan speed	every 1 1/2 years
1200 rpm fan speed	every 1 1/2 years
1800 rpm fan speed	every 3 years

* May vary with motor manufacturer's requirements, consult motor manufacturer's instructions.

Note

The fan nameplate will show direct drive operating speeds and/or the actual motor speed. If there is difficulty with locating a proper acceptable equal to this grease or the specific grease mentioned above, please do not hesitate to consult the factory or your local agent.

It is important to remember that standard duty grease could cause shortened life to these bearings if used in lieu of the above-mentioned grease or it's equal. It is not necessary to open any access doors or remove any unit components to grease the motor bearings. We recommend a grease gun be used, with a flexible nozzle, capable of being pressed onto a zerk type fitting.

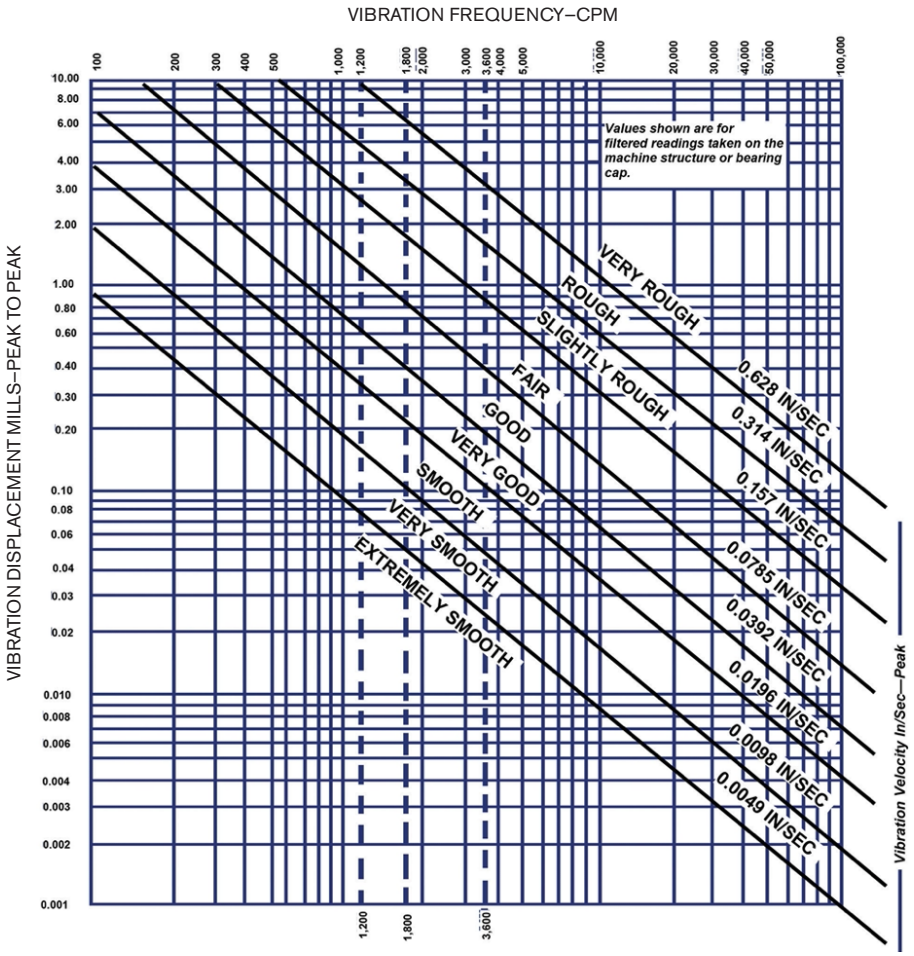
Impeller Cleaning

Regular cleaning of the impeller is essential to maintain proper balance. The frequency of this cleaning depends upon the application. An improper balance condition due to accumulated dirt on your impeller can cause an overloaded condition in your motor or unnecessary vibration resulting in loose mountings, bad bearings, or broken blades and housing.

Vibration Monitoring

We recommend that the fan be monitored for vibration on a periodic or continual basis. Periodic checks by portable vibration equipment are recommended for non-critical installations with minimal system effects. The lubrication schedule could serve as a timely vibration monitoring schedule. A significant change in vibration levels will serve as notice for scheduling preventive maintenance.

Continuous vibration monitoring can best be accomplished by installing analog vibration sensors on the fan motor. These sensors can be connected to the SAFE Controller or BMS system and can provide both a warning system (remote indicator light) and a trip-out system in case of bearing failure. This system is recommended for critical installations or where adverse system effects are present. For commercial installations, we recommend a warning setting of “slightly rough” for a period of twenty (20) seconds, and a trip-out setting of “rough” for a period of five (5) seconds, as shown on the “General Machinery Vibration Severity Chart”.



Motor Replacement

The following are the standard instructions as recommended by Strobic Air Technologies for the rare event when a motor change of a Tri-Stack fan is required. These guidelines utilize standard lifting, rigging, and assembly procedures.

⚠ **Warning**

Isolate the electrical power supply with use of the disconnect switch and lockout device. Disconnect the electric supply between the fan motor and disconnect switch.

- Remove the stainless steel nuts, bolts, flat, and lock washers holding the fiberglass stack to the vane section (3/8"-16 x 1 1/2"). Mark mating flanges for proper fit up upon assembly.
- Remove the fiberglass stack leaving the windband attached to the stack.
- Remove the stainless steel nuts, bolts, flat, and lock washers holding the vane section to the blade housing (3/8"-16 x 1 1/4").
- Remove the motor, vane section, and fan blade as one unit.
- Stand fan blade assembly in a horizontal position with the motor base resting on the floor. Block the unit with wood under the motor base and outside the vane section to secure the unit, and keep it from rolling.
- Remove the keeper bolt's locking tab and plate that attach the fan blade to the motor shaft (3/4"-10 x 3").
- Remove the impeller and motor key. A hub/ blade puller might be required to remove the impeller.
- Remove the four c-face bolts (5/8"-11 x 2").
- Remove the four motor foot bolts (3/4"-10 x 2 1/2").
- Remove motor.
- Install new motor by securing the four c-face bolts. Place bolts in foot mount, but do not tighten.
- Re-install the impeller, motor shaft key, keeper plate and associated hardware.
- Scrape old gasketing from mating surfaces and lift vane section assembly onto the blade housing with new gasketing pre-installed on blade housing mating flange.
- Align holes to maintain the correct orientation of the motor junction box. Place hardware into holes but do not tighten. Check that the blade spins freely without interfering with the inlet bell. After positive confirmation of clear blade path, tighten all hardware.

- Install new gasketing on vane section and stack mating surfaces. Maintain correct orientation between the cutout of the fiberglass nozzle and the junction box of the motor. Tighten associated hardware.
- Tighten associated hardware in accordance with torque guidance given in Tables 2 and 3 on page 22
- With use of feeler gauges, check for soft bases between the motor foot and the motor base.
- Shim accordingly with paper shims to maintain a 0.002-0.005" tolerance. Tighten the four mounting bolts.
- Using silicone caulk, seal all mating surfaces that have been separated including the connection of inner vane section and the fiberglass stack.
- Re-connect the electrical wiring and conduit from the motor box and disconnect switch.
- Unlock the isolated disconnect switch and “bump” the motor to verify proper fan blade and motor rotation.
- If rotation is correct, start the fan. When the unit is up to speed, check amp, voltage and vibration readings. Consult the factory if unit is not performing to specification.

warranty

STANDARD STATEMENT OF TRI-STACK 7-YEAR WARRANTY AND LIMITATION OF LIABILITY – WHERE OFFERED

At Strobic Air Technologies, we want you to benefit from a well- crafted and highly reliable system that you can utilize for years to come. We use the latest engineering and technical know-how to design and build Strobic fans and control systems. In fact, we are so proud of how we engineer and build our products that we offer one of the most comprehensive warranties around.

Strobic Air Technologies warrants that products shall be shipped free from defects in materials and workmanship, and will operate in accordance with our proposals, specifications and nameplate data under proper conditions, installation, rated load, environment, and usage for a period of 84 months (7 years) from date of shipment from Strobic Air Technologies's location.

Strobic Air Technologies (Seller) is limited to the repair or replacement of the original parts. Buyer shall bear the costs of access (including removal and replacement of systems, structures, or other parts of Buyer's facility), de-installation, installation, de-contamination and transportation of defective Products to Seller. New or refurbished parts will be furnished FOB factory to Buyer's location at Seller's designated shipping point, freight allowed to Buyer's Location or ExWorks for shipments outside the conterminous United States.

These warranties and remedies are conditioned upon (a) the proper storage, installation, operation, and maintenance of products and conformance with the proper operation instruction manuals provided by Seller or its suppliers or subcontractors, (b) Buyer keeping proper records of operation and maintenance during the warranty period and providing Seller access to those records, and (c) modification or repair of products only as authorized by Seller in writing. Seller does not warrant products or any repaired or replacement parts against normal wear and tear or damage caused by misuse, accident or use against the advice of Seller. Any modification or repair of any products not authorized by Seller shall render the warranty null and void.

Electrical components, excluding motors, are warranted only to the extent warranted by the original manufacturer. To the extent that Seller is entitled to pass through a warranty of the original equipment manufacturer of the electrical goods sold, Seller will pass through such warranties to Buyer. Strobic Air Technologies makes every effort to utilize materials that resist rust, but the warranty on Metal and Stainless-Steel Components DOES NOT COVER RUST, OXIDATION, FADING or other BLEMISHES unless it also results in a loss of structural integrity or a failure of these components.

Any repair, replacement or reperformance by Seller hereunder shall not extend the applicable warranty period. The Parties shall mutually agree on the specifications of any test to determine presence of a defect. Seller shall have no liability for defects that arise after the warranty period has expired.

Tri-Stack

USER MANUAL

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