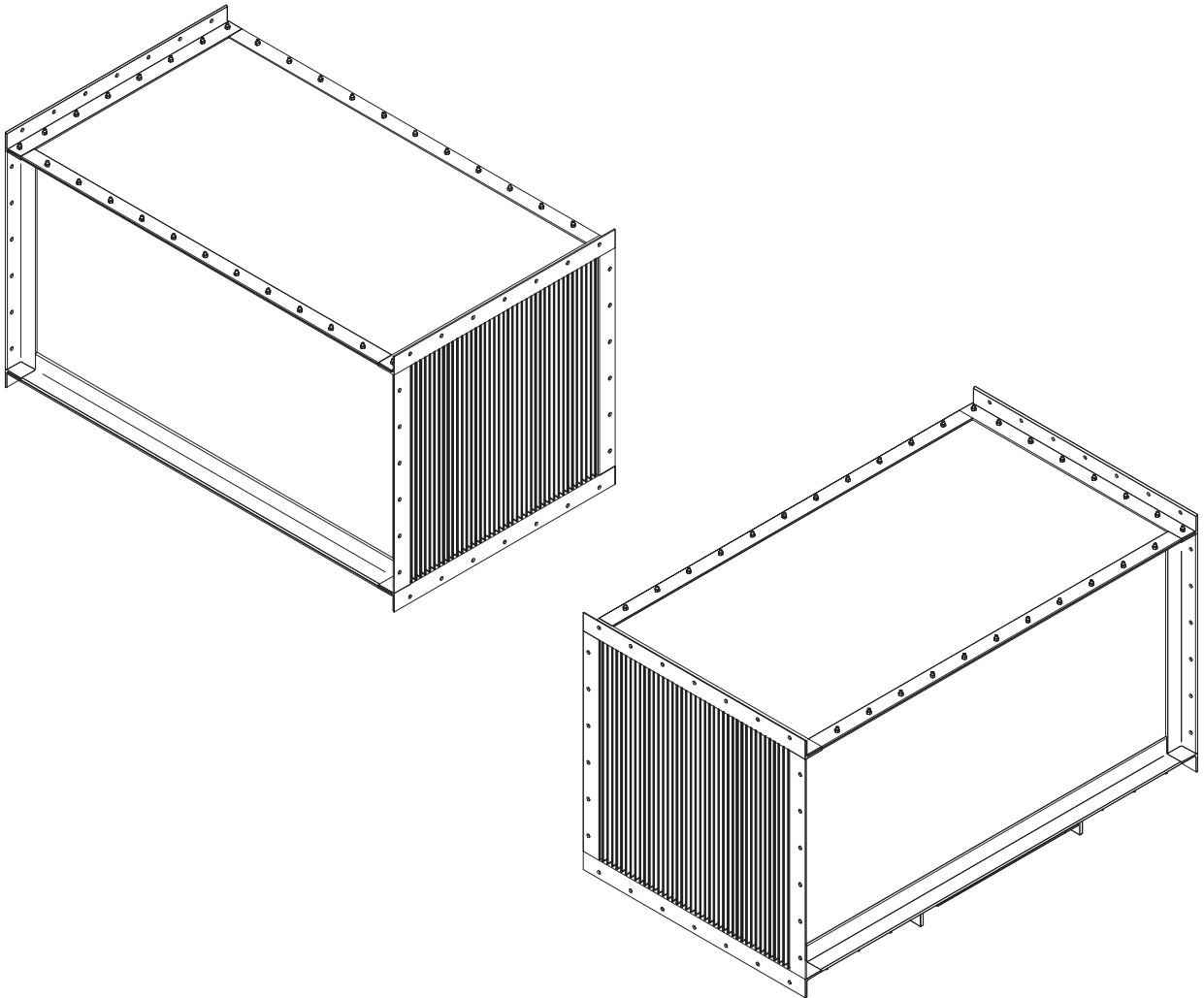


Exothermics Aluminum Heat Exchangers



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There are several special symbols in this document. You must know their meaning and importance.

The explanation of these symbols follows below. Please read it thoroughly.

How To Get Help

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5040 Enterprise Blvd.
Toledo, Ohio 43612 U.S.A.
Phone: 419-729-9726
Fax: 419-729-9705
<http://www.eclipsenet.com>

Please have the information on the product label available when contacting the factory so we may better serve you.



This is the safety alert symbol. It is used to alert you to potential personal injurt hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Is used to address practices not related to personal injury.

NOTE

Indicates an important part of text. Read thoroughly.

Product Information - Startup Record

Model number _____

Serial number _____

Ship Date _____

Exhaust Volume _____ Pressure Drop _____ (" w.c.)

Exhaust Temperature (Inlet) _____ (Outlet) _____

Supply Volume _____ Pressure Drop _____ (" w.c.)

Supply Temperature (Inlet) _____ (Outlet) _____



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Introduction

1

Exothermics is an internationally known manufacturer of aluminum and stainless steel air to air heat exchangers. The Exothermics heat exchanger is a static, plate type exchanger used to reclaim energy normally exhausted to atmosphere from waste air streams of buildings or manufactured processes. The transfer of thermal energy from one mass to the other occurs through the plate or heat transfer media which separates the two air streams.

The Exothermics heat exchanger is principally used in a counter flow fashion to maximize the heat transfer or effectiveness. The two air masses flow through the heat exchanger in opposite directions. The exhaust airstream enters the heat exchanger at the same end that the supply air is discharged. Each airstream is separated into distinct, totally isolated, alternating passages formed by the fixed plates or membrane.

In addition, each plate has a proprietary die formed corrugation and wave pattern which increases the heat transfer coefficient by causing a break-down of the boundary layers. The increased turbulence achieved with the Exothermics design yields a high heat transfer coefficient and high efficiency for the heat exchanger.

The Exothermics heat exchanger is manufactured using stainless steel membrane, side pans and removable covers. This unique design together with 1/2" (12.7 mm) plate spacing or 3/8" (9.5 mm) plate spacing, allows for easily accomplished inspection and maintenance as needed.

Audience

This manual has been written for people who are already familiar with all aspects of industrial heating equipment design.

These aspects are:

- Design/Selection
- Use
- Maintenance

The audience is expected to have previous experience with this type of equipment.

Purpose

The purpose of this manual is to make sure the installation of a safe, effective, and trouble-free system is carried out.

Safety

Important notices which help provide safe operation will be found in this section. To avoid personal injury and damage to the property or facility, the following warnings must be observed. All involved personnel should read this entire manual carefully before attempting to start or operate this system. If any part of the information in this manual is not understood, contact Exothermics before continuing.

Safety Warnings



WARNING

- **The duct sections are likely to have HOT surfaces. Always wear the appropriate protective equipment when approaching the heat exchanger.**
- **Exothermics products are designed to minimize the use of materials that contain crystalline silica. Examples of these chemicals are: respirable crystalline silica from bricks, cement or other masonry products and respirable refractory ceramic fibers from insulating blankets, boards, or gaskets. Despite these efforts, dust created by sanding, sawing, grinding, cutting and other construction activities could release crystalline silica. Crystalline silica is known to cause cancer, and health risks from the exposure to these chemicals vary depending on the frequency and length of exposure to these chemicals. To reduce the risk, limit exposure to these chemicals, work in a well-ventilated area and wear approved personal protective safety equipment for these chemicals.**

NOTICE

- **This manual provides information regarding the use of these heat exchangers for their specific design purpose. Do not deviate from any instructions or application limits described herein without written approval from Exothermics.**

Operator Training

The best safety precaution is an alert and trained operator. Train new operators thoroughly and have them demonstrate an adequate understanding of the equipment and its operation. A regular retraining schedule should be administered to ensure operators maintain a high degree of proficiency. Contact Exothermics for any needed site-specific training.

Installation

Aluminum

Exothermics, Inc. manufactures two models of aluminum heat exchangers: the industrial aluminum heat exchanger (AL-HT) and the top of the line, all welded aluminum heat exchanger (AL-AW).

The industrial aluminum heat exchanger (AL-HT) is manufactured with aluminum membrane and aluminum side pans with aluminum access covers. This unit has the membrane passages sealed with a high temperature sealant and mechanical clips. The primary seal between the membrane and the casing is a welded seal. This heat exchanger is used for industrial applications at temperatures up to 450°F (232°C) and up to 6" w.c. (15 mbar) differential pressure.

The all welded aluminum heat exchanger (AL-AW) is similar to the industrial aluminum heat exchanger except it is of all welded construction in that the membrane end seals are welded and the primary seal between the membrane and casing is welded. The (AL-AW) is our top of the line aluminum heat exchanger. This heat exchanger is designed for light to heavy industrial applications up to 450°F (232°C) and up to 6" w.c. (15 mbar) differential pressure and where maximum segregation of air streams is required.

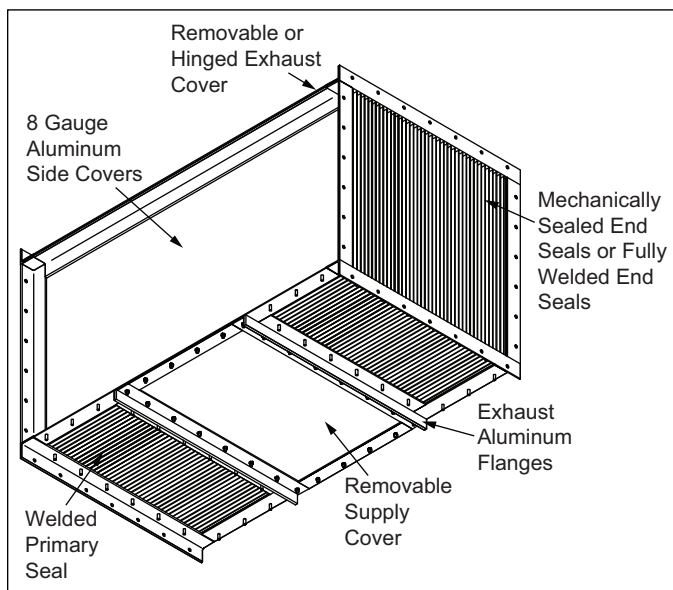


Figure 3.1. Industrial Aluminum Unit

Airflow

Airflow Configuration: The Exothermics heat exchanger is designed for counter flow operation. The standard configuration has the exhaust air on the straight through passage with the supply air flowing through the "U" passage.

Where contaminated exhaust is involved, the straight through passage should be used for the exhaust air. On very high temperature applications, the hot side should be the straight through passage.

The heat exchanger may be used in a blow through or draw through manner. Exothermics recommends blow through on the supply where possible.

Exothermics should be consulted to determine applicability of alternate or optional air flow configuration on any application.

The Exothermics heat exchanger is available in a standard airflow configuration and with optional airflow configurations illustrated herein:

Air Flow Schematics

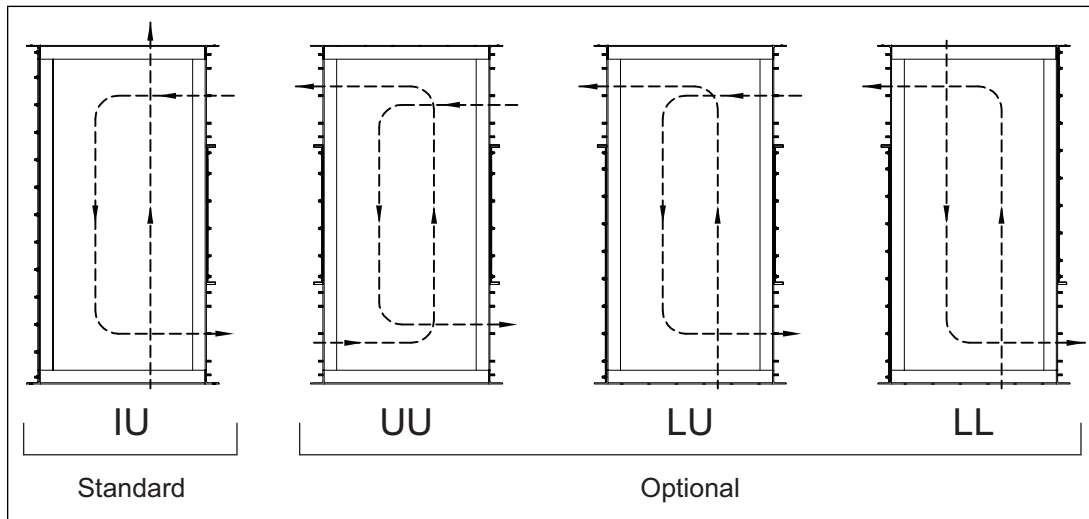


Figure 3.2.

Materials of construction and all dimensions for optional flow arrangement connections are the same as shown on the standard flow (IU) drawing.

Installation Sketches



- The heat exchanger must be installed so that the plates are vertical.

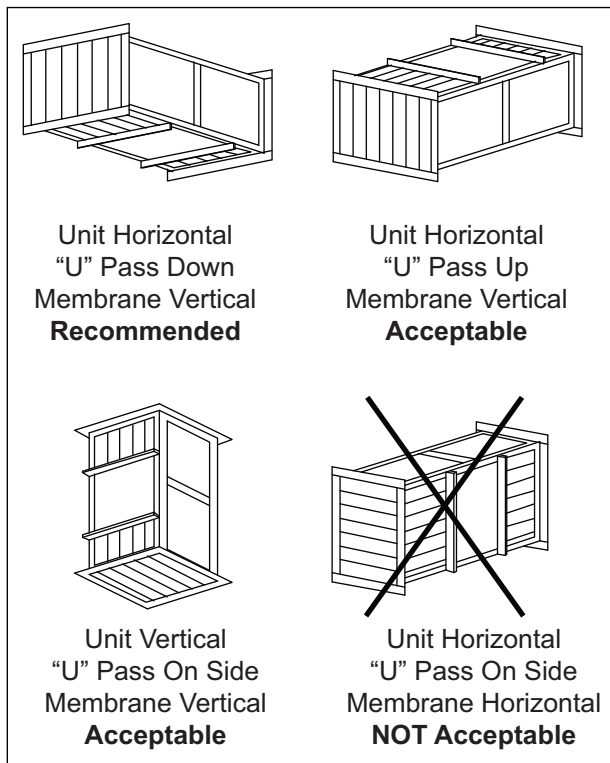


Figure 3.3.

NOTE: Provide drains in ductwork for condensation drainage.

Equipment Operating Limits

Unit	Model	Temp.	Differential Pressure
Aluminum Industrial	AL-AW	450°F (232°C)	6" w.c. (15 mbar)

NOTES:

1. Differential pressure is the maximum pressure measured in the exhaust air stream as compared to the maximum pressure measured in the supply air stream.

Example: Exhaust Air Stream (highest measurement) -6" w.c. (-15 mbar)
 Supply Air Stream (highest measurement) -4" w.c. (-10 mbar)
 Differential Pressure Equals 2" w.c. (5 mbar)

Example: Exhaust Air Stream (highest measurement) -6" w.c. (-15 mbar)
 Supply Air Stream (highest measurement) 4" w.c. (10 mbar)
 Differential Pressure Equals 10" w.c. (25 mbar)

2. Protection is recommended to assure that maximum differential pressure is not exceeded under any conditions.

Receiving the Exothermics Heat Exchanger

Immediately upon receiving shipment, equipment should be inspected for evidence of any damage received in transit. If shipping damage has occurred, a claim should immediately be filed with the transportation company.

Equipment received should also be inspected for compliance with original order.

Handling the Unit Upon Receipt

Exothermics typically ships heat exchangers attached to a wood pallet using metal straps or metal angles bolted securely in place. Check to ensure the straps or metal angles are secure before handling with a forklift. When lifting the unit with a forklift, make certain the forks are aligned to the pallet so no damage occurs to the heat exchanger. If for some reason the heat exchanger must be handled without the wood pallet, lift the unit by inserting the forks in the space between the supply air inlet and the outlet flanged openings (referred to as the "U airflow" passages). Good practice incorporates safety procedures when handling large equipment.



CAUTION

- Use caution when handling or lifting the heat exchanger to avoid causing any damage to the heat transfer membrane.

Uncrating the unit requires that the metal straps and/or bolts, which attach the heat exchanger to the wood pallet, be removed. This should be followed by the removal of the plywood covers on the exhaust inlet and outlet flanges. The plywood covers are held in place with metal clips.

Storage

If the unit is to be stored prior to its installation, Exothermics suggests the plywood end covers be reinstalled and the unit be refastened to its wood pallet.

Pre-Installation

As with any mechanical equipment or component, proper consideration given to arrangement, installation and application will maximize the benefits and results from its use.

Exothermics heat exchangers can be installed indoors or outdoors without need for additional painting or protection. Insulation is beneficial but not necessary on most applications. If insulation is used, it should be protected from the environment.

Exothermics heat exchangers can be installed in a vertical or horizontal position. The choice of installation is at the owners discretion, predicated on space limitations,

options selected, and whether a wash system is included. Exothermics recommends vertical installation when the airstream is heavily laden with contaminants. Under these conditions, the air stream has a considerable amount of liquids entrained which can condense when a wash system is used. Where the unit is installed in a horizontal manner, it should be pitched to allow condensate drainage to the exhaust discharge end and drainage provided in the ductwork connection.

NOTE: Where the Exothermics wash option is used, the heat exchanger must be installed in a vertical position.

Ductwork and Transitions

The efficiency of the heat exchanger can be adversely affected by poor airflow distribution, therefore, Exothermics recommends that proper consideration be given to transitions and/or elbows to assure uniform airflow entering and leaving the heat exchanger. Where space limits transition design or where elbows are attached to the heat exchanger, it is recommended that turning vanes be used. It is important that ductwork connections or elbows be in the same orientation as the heat exchanger plates (membrane). Avoid airflow arrangements that cause air to enter or discharge at right angles (perpendicular) to the plates.

Drainage Considerations

It is recommended that provisions be made in the installation to facilitate drainage if condensation can occur from moist air streams and to allow drainage of wash system fluids. These provisions are to be provided in the exhaust discharge ductwork connection.

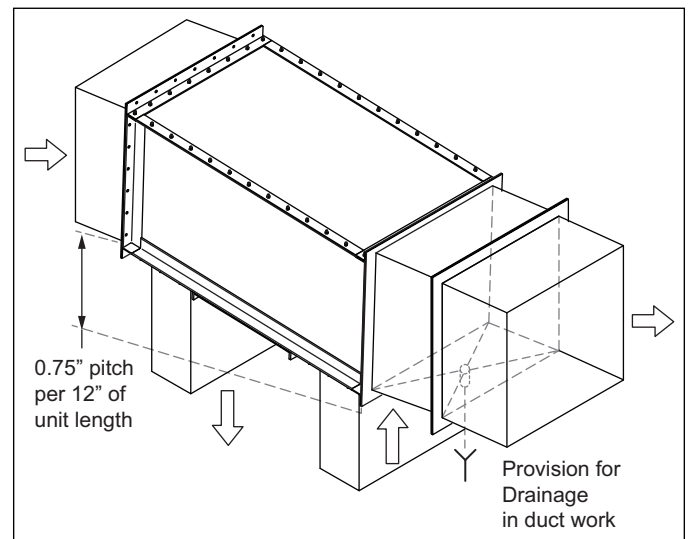


Figure 3.3. Horizontal Unit Showing Pitch

Horizontal Installation

Exothermics recommends that the heat exchanger be pitched 0.75" (19 mm) per 12" (305 mm) of unit length toward the exhaust exiting (cooler) end if the air stream contains a substantial volume of condensibles or is heavily laden with contaminants.

Vertical Installation

Exothermics recommends that where a substantial volume of condensibles or where the air stream is heavily laden with contaminants that the exhaust entering connection to the heat exchanger be made at the top so air flows downward through the heat exchanger.

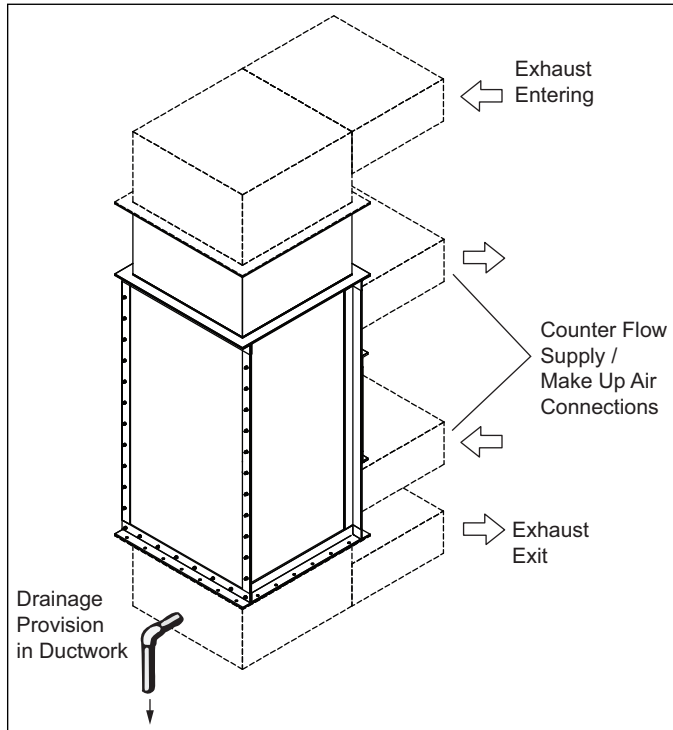


Figure 3.4. Vertical Unit with Airflow Arrows

NOTES:

1. For alternate airflow arrangements, consult factory for recommended drainage provisions.
2. Drain line piping should be sized to handle the condensation that can occur in the unit. If a wash system is incorporated into the unit, drain piping must be sized to handle the volumes specified by the wash system.

3. Icing is not a normal condition seen in Exothermics' heat exchangers when installed in an industrial environment, however, when used in low temperature/ general ventilation installations where icing may become a problem, Exothermics recommends that a pressure switch be installed so the supply air fan is interrupted briefly allowing the frost to melt.

4. Exothermics recommends that the drain piping be constructed using fittings for cleanout purposes. If freezing can occur in the drain system, it is recommended that heat tracing and insulation that is compatible with surrounding environment be used.

Multiple Units

When installing multiple units, be sure that mixing boxes and plenum designs are sufficient to assure even distribution of the air streams.

Filters

The Exothermics heat exchanger is unique in its design in that the combination of the wide plate spacing (up to 1/2" 12.7 mm) and access to the exhaust and supply sides, facilitates total cleanability. On exhaust air streams that are extremely dirty with lint, dust or other particulate, Exothermics recommends the installation of filters to reduce cleaning frequency.

Insulation

Exothermics heat exchangers do not require insulation unless they are in a high temperature application where personal safety is a concern, or if it is desirable to keep heat losses to a minimum.

Temperature Control

Supply air temperature and exhaust air temperature can be controlled with the use of various bypass ducts and control damper assemblies. In some cases an auxiliary heat source is used to elevate supply air stream temperature to required levels.

Hot gas temperatures should never exceed the Maximum Design Temperature that is stated on the general arrangement drawing. Maximum rate of temperature change during the heat up and cool down processes is 25°F (14°C).

Installation

Ductwork may be bolted directly to the heat exchanger flanges for most applications. As mentioned previously, drainage in the supply and exhaust ductwork is recommended. On high temperature applications, provisions for expansion should be allowed using flexible connectors between the heat exchanger and the ductwork.

An appropriate gasket material is recommended for sealing flange connections. In most cases, a high temperature sealant is sufficient.

Exothermics recommends that all duct systems be constructed as leak-free as possible, using an appropriate sealing material where necessary.

Rigging the Heat Exchanger

Horizontal Unit

Rigging this unit requires the use of 2 lifting slings (minimum) and a spreader bar. They should be used in such a manner that the unit is lifted level.

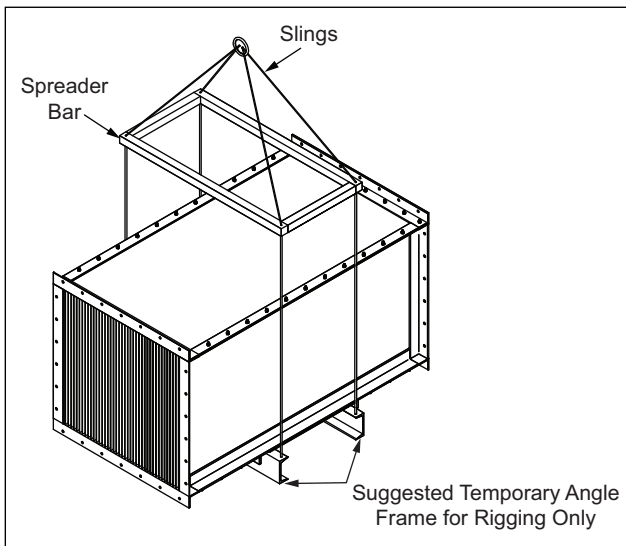


Figure 3.5.

Vertical Unit

For vertical handling, the heat exchanger should be rigged using support frames bolted to the heat exchanger flanges.

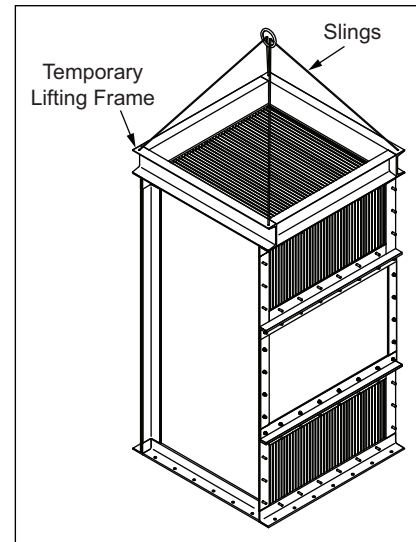


Figure 3.6.

Equipment Support Methods

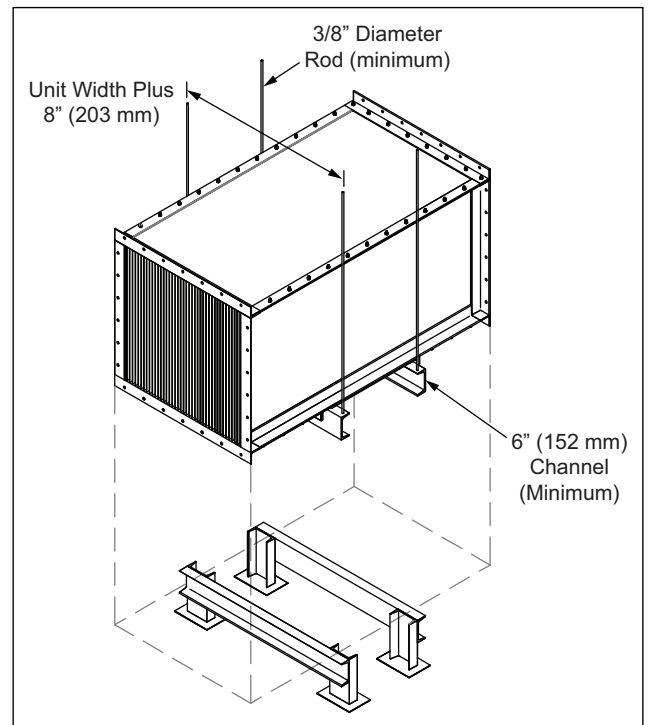


Figure 3.7. Horizontal

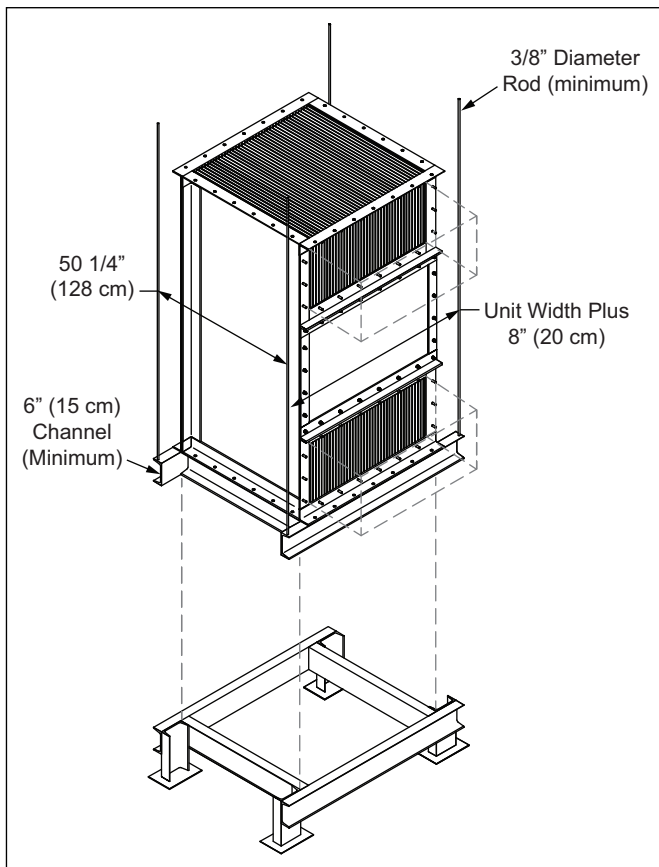


Figure 3.8. Vertical

NOTES:

1. Installation should take the removable access covers into consideration and facilitate their removal.
2. Where a wash system is to be used, the heat exchanger must be installed in the vertical position.

Operation

Startup



- **System fans must be started at the same time and control dampers must be open to assure that excessive pressure differential does not occur at startup.**

The Exothermics heat exchanger has no moving parts so startup is quite simple. We suggest that all mechanically fastened joints be checked for tightness, that gasketing and flexible connectors of the appropriate material be installed, and that drainage considerations be installed for the appropriate volume of fluids. The ductwork should be checked to ensure that the two air streams flow through the unit in a counter flow arrangement.

After the air handling system has been started up, the following operation measurements should be made:

Exhaust:

- Entering exhaust temperature and static pressure
- Exiting exhaust temperature and static pressure
- Exhaust air volume in CFM (Nm³/h).

Supply:

- Entering supply temperature and static pressure
- Exiting supply temperature and static pressure
- Supply air volume in CFM (Nm³/h).

These measurements should be recorded and referred to when initiating a preventative maintenance schedule.

Wash System

Exothermics has designed (optional) wash systems. These systems can be purchased in part or in their entirety. The systems have spray headers, solenoid valves, a pump and a control panel. Their installation will require electrical wiring and plumbing. (For details on wash system installation, refer to the appropriate engineering drawings).

NOTE: When an in-place wash system is installed, the heat exchanger must be installed in the vertical position.

DETERGENTS

Detergents and cleaning solutions are selected at the discretion of the user. Exothermics suggests that the cleaning fluid, be compatible with the materials of construction of the particular heat exchanger, associated ductwork, and piping.

Maintenance

The Exothermics heat exchanger is a high quality, static device with no moving parts and requires little or no electromechanical maintenance. Periodic inspection and cleaning of the heat transfer surface is made easy by Exothermics' unique access cover design. Once installed in accordance with Exothermics recommendations and good ventilation/ engineering practices, periodic inspection and routine preventive maintenance will assure long term satisfaction from the use of the heat exchanger.

Access Cover Removal Replacement

Aluminum Models (HT-AW)

Aluminum heat exchangers have the access covers installed so the ends are tucked under the metal pieces, which provides for the “U” passage ductwork connections and the “I” passage angles. The sides of these covers are reinforced with a 0.125” (3 mm) angle clamping bar and held securely in place with hex head bolts and nuts. The access covers are sealed with a sealant/adhesive material. When these covers are removed, all fasteners must be disassembled and removed. The seals at the “U” passage ductwork connections and the “I” passage angles must then be cut with a knife. Finally, the angle clamping bars must be removed and the cover sheet must be gently removed from the side pans. Care should be observed during this procedure so damage does not occur to the cover sheet, side pans, or the heat transfer membrane. The cover sheet is then separated from the ends where it is tucked under the “U” passage ductwork connections and the “I” passage angles. When the access covers are reinstalled, they must be resealed. Exothermics suggests that a high quality sealant/adhesive be utilized for this seal. With the access covers in place and sealed, the angle clamping bars and fasteners are reinstalled.

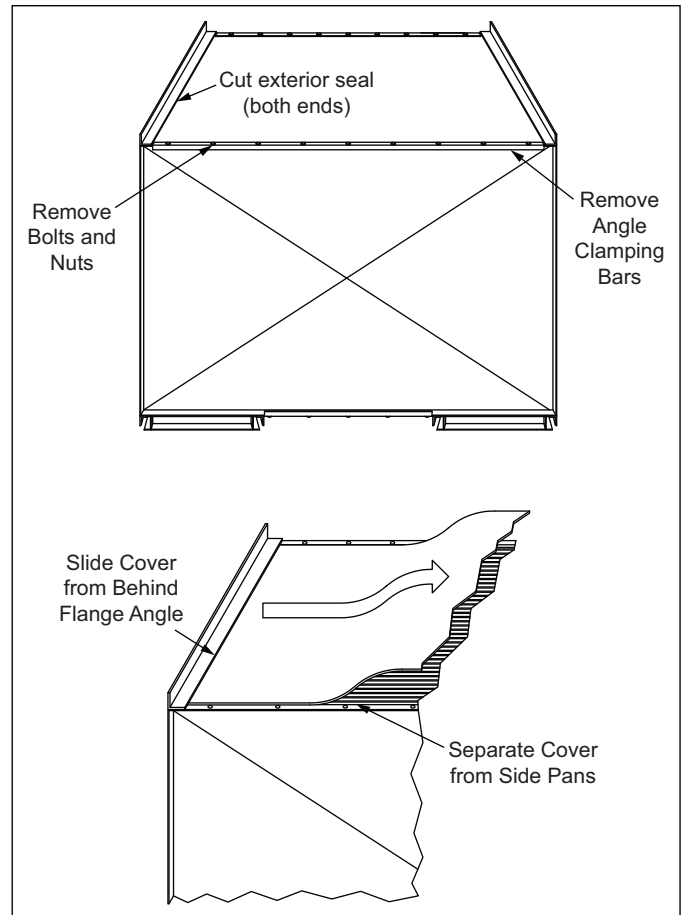


Figure 3.3.

If you require additional information or assistance, please contact your Exothermics representative or our home office at (419) 729-9726.



Product Warranty

3

Material and Workmanship:

Manufacturer warrants that the equipment proposed herein of their manufacture shall be free of defects in workmanship or materials for a period of one year from date of shipment. Should any failure or defect appear within one year of date of shipment, manufacturer shall upon written notification of said failure and substantiation that the equipment has been stored, installed, erected, maintained, and operated in accordance with good industry practice and in accordance with manufacturer's instructions, correct such non-conformity by repair or replacement, F.O.B. factory. This warranty does not cover labor or transportation charges for the removal, exchange, or reinstallation of the equipment.

Manufacturer shall not be responsible, nor shall allowance be made, for work done, equipment furnished, or for repairs or replacements made by the purchaser or others, either with or without purchaser's approval, unless prior written approval is made to the purchaser by the manufacturer. Any unauthorized repairs or parts will void the warranty.

Products or goods manufactured by others, supplied by Exothermics, Inc. as a part of a system, are not covered by this warranty. Exothermics, Inc., however, will give their customer the benefit of any such adjustment as it finally obtains from that respective manufacturer of that component or product.

Freight damage is specifically excluded from this warranty and is the responsibility of the purchaser and the carrier.

Damage as a result of the effect of corrosion, erosion, excessive heat, freezing, dirt, dust or foreign materials, and normal wear for that application are specifically excluded from this warranty.

Performance Warranty:

Performance figures or requirements, if any, must be addressed in the quotation. Performance warranty, if any, must be specifically covered in the quotation. Where no performance figures are specified or warranted the manufacturer assumes no responsibility for compliance or noncompliance.

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Having a policy of continuous product improvement, Exothermics, Inc. reserves the right to change or alter design or specification without notice.



Appendix

Conversion Factors

Metric to English

From	To	Multiply By
actual cubic meter/h (am ³ /h)	actual cubic foot/h (acfh)	35.31
normal cubic meter/h (Nm ³ /h)	standard cubic foot /h (scfh)	38.04
degrees Celsius (°C)	degrees Fahrenheit (°F)	(°C x 9/5) + 32
kilogram (kg)	pound (lb)	2.205
kilowatt (kW)	Btu/h	3415
meter (m)	foot (ft)	3.281
millibar (mbar)	inches water column ("w.c.)	0.402
millibar (mbar)	pounds/sq in (psi)	14.5 x 10 ⁻³
millimeter (mm)	inch (in)	3.94 x 10 ⁻²
MJ/Nm ³	Btu/ft ³ (standard)	26.86

Metric to Metric

From	To	Multiply By
kiloPascals (kPa)	millibar (mbar)	10
meter (m)	millimeter (mm)	1000
millibar (mbar)	kiloPascals (kPa)	0.1
millimeter (mm)	meter (m)	0.001

English to Metric

From	To	Multiply By
actual cubic foot/h (acfh)	actual cubic meter/h (am ³ /h)	2.832 x 10 ⁻²
standard cubic foot /h (scfh)	normal cubic meter/h (Nm ³ /h)	2.629 x 10 ⁻²
degrees Fahrenheit (°F)	degrees Celsius (°C)	(°F - 32) x 5/9
pound (lb)	kilogram (kg)	0.454
Btu/h	kilowatt (kW)	0.293 x 10 ⁻³
foot (ft)	meter (m)	0.3048
inches water column ("w.c.)	millibar (mbar)	2.489
pounds/sq in (psi)	millibar (mbar)	68.95
inch (in)	millimeter (mm)	25.4
Btu/ft ³ (standard)	MJ/Nm ³	37.2 x 10 ⁻³

