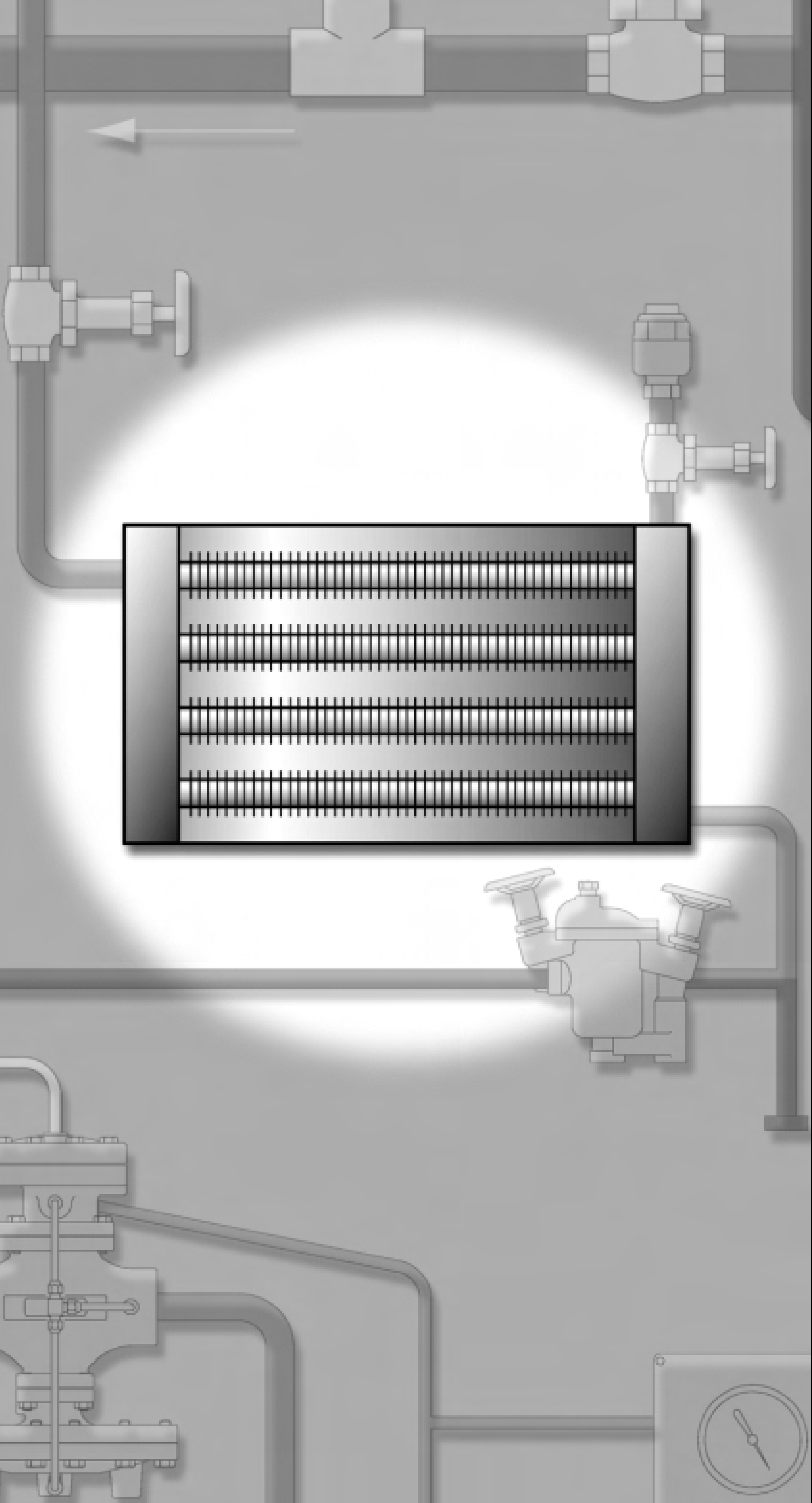


Heating and Cooling Coils

Armstrong

Next

Why Leaky Coils Are a Losing Proposition

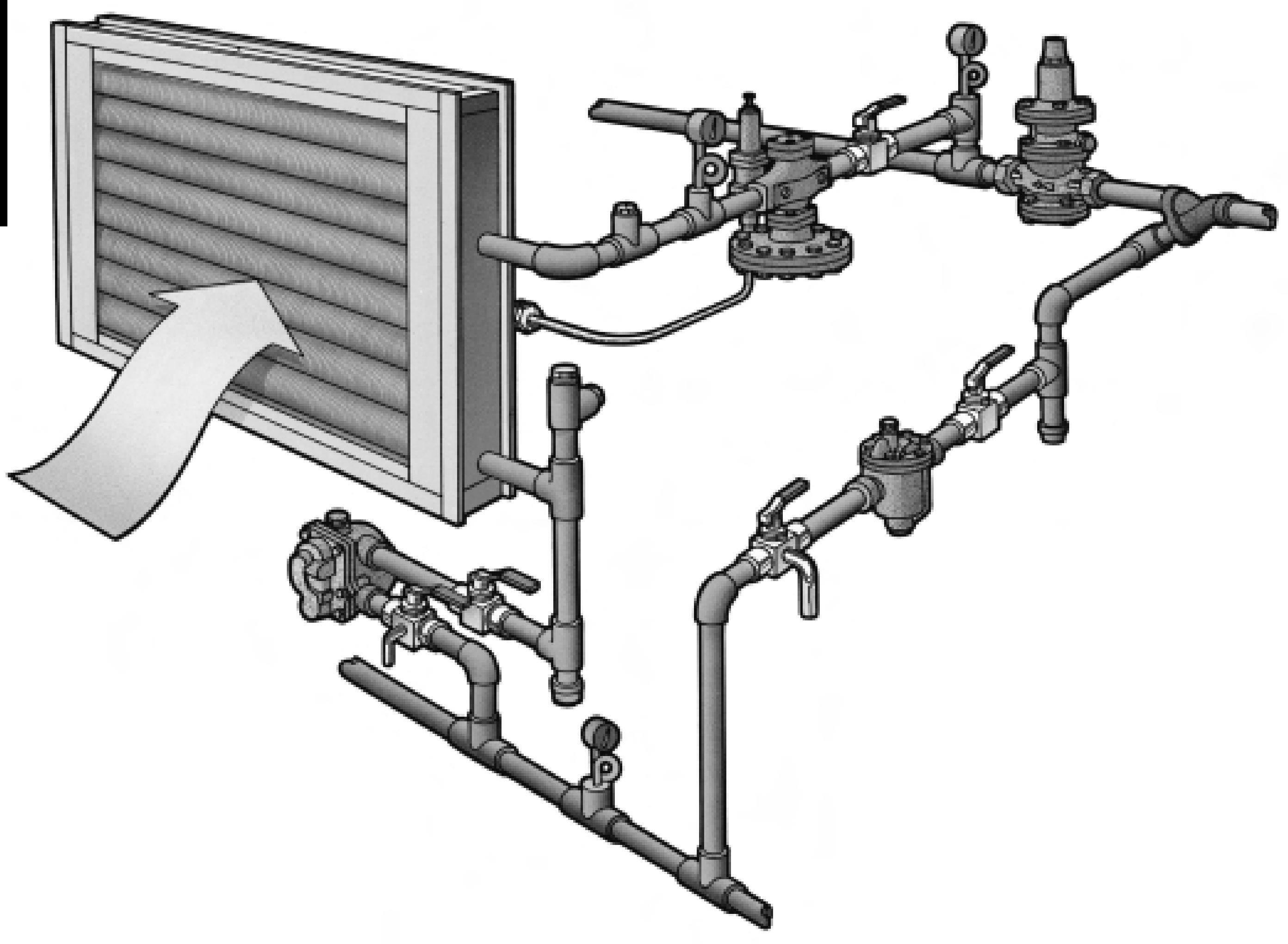
Leaky coils can be the beginning of the end for efficient heat transfer. Although coils may fail for a variety of reasons, mechanical failure and corrosion are the culprits in the majority of cases. When coils corrode, unwanted moisture and contaminants may foul the air stream or exhaust gases. And a steam leak from a badly corroded coil simply blows precious energy off into the atmosphere.

External corrosion. Contaminants in the airstream cause external corrosion. Dirt buildup intensifies corrosive action by trapping contaminants in concentrated pockets. And it's accelerated when dirt becomes strong airborne mist. Factors such as inappropriate fin pitch, fabricating techniques and material selection may also fuel external corrosion.

Internal corrosion. Retention of contaminated condensate or inadequate venting of non-condensable gases are major causes of internal corrosion. When CO_2 gas dissolves in condensate that has cooled below steam temperature, it forms highly corrosive carbonic acid. Likewise, oxygen left to stagnate in the system fosters corrosive action by pitting iron and steel surfaces. Joining pipes/tubes in headers of dissimilar materials may spawn galvanic action. Internal stresses due to improper welding may also hasten corrosion damage.

Armstrong to the Rescue

Armstrong's help in coil selection and design is one of the best defenses against external corrosion. We offer a wide selection of fin pitches to help combat dirt buildup. What's more, sturdy fins lend extra strength to withstand high-pressure cleaning without damage or distortion. As a defense against non-environmental factors, Armstrong fabricates coils in a full range of metals and alloys. You may also specify special coatings to increase external corrosion resistance.



Why Leaky Coils Are a Losing Proposition

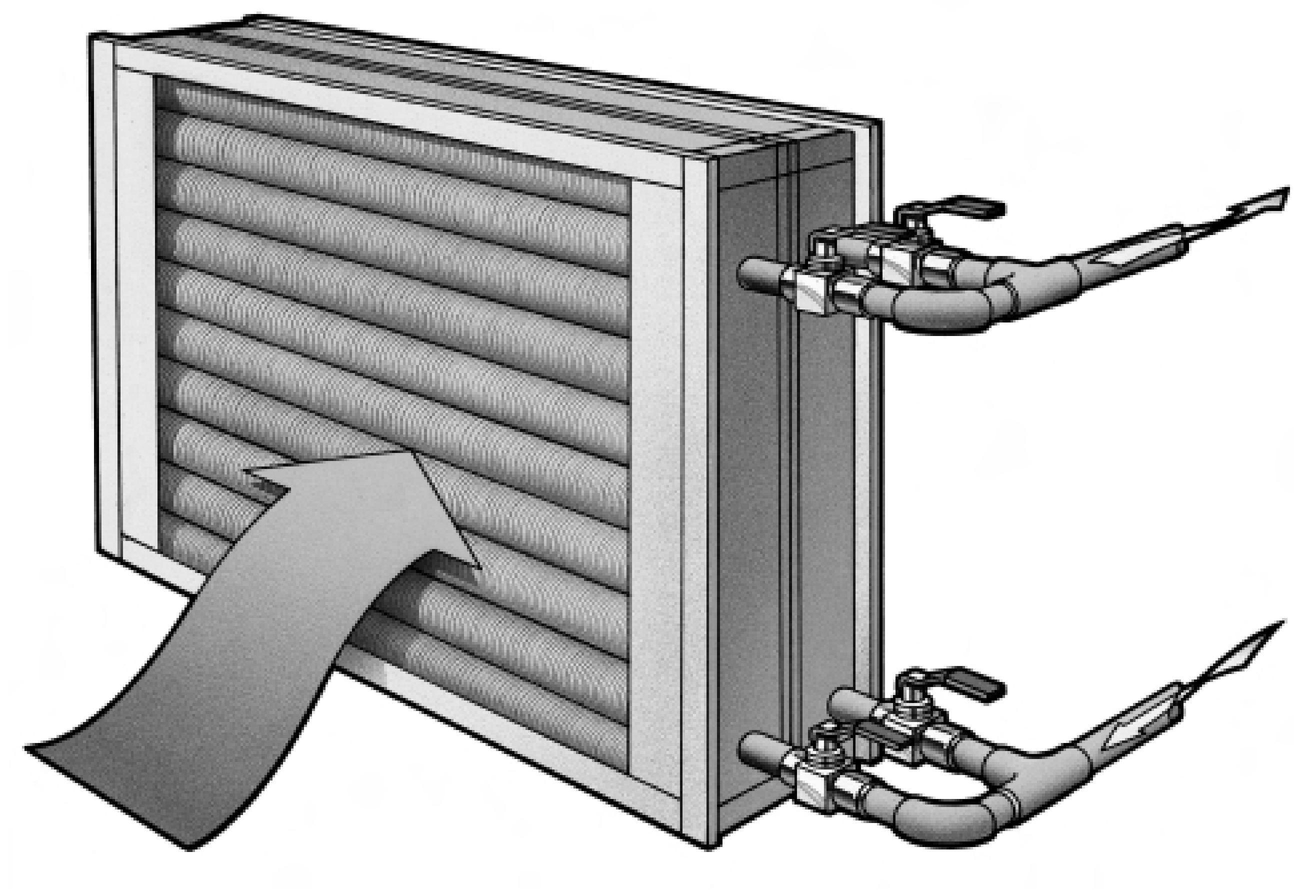
Proper trapping and venting—a specialty of your Armstrong Representative—is where defense against internal corrosion begins. Armstrong reps are steam specialists with more than 75 years of experience in properly sizing, locating and piping steam traps, strainers, vents and related equipment. That's why only Armstrong gives you quality steam coils—plus the installation and trapping help you need to make them work in your total system.

A System to Make Yours More Efficient

Today, the Armstrong "system" merges coil-building experience, practical knowledge and technical know-how from years of trapping coil installations. The result: coils that survive the rigors of high pressures, high temperatures and corrosive conditions.

For example, Armstrong fabricates standard steel heating coils from 1" OD 12 ga ERW Tube (.109" wall) helically wound with 0.024" thick steel fins at varying fin pitches. Each coil is tested during construction, and the completed unit is again tested hydrostatically to not less than 1.5 times the design pressure with a minimum test pressure of 500 psig for steel or stainless steel cores.

It's this simple: It takes one system to improve another. Exactly how the Armstrong system of product and service carefully matches coils to your specs and applications is the subject of the following pages.



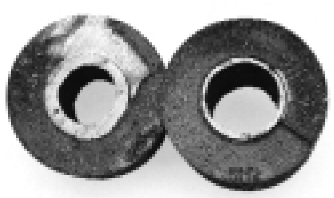
Armstrong® Material Selection for Tubes, Headers and Connections

The choice of tube material depends upon several important factors:

- The corrosive quality of the steam or liquid medium
- The ability to pipe, trap and vent steam coils effectively
- The size and service requirements of the installation
- The external corrosion to which the coils are likely to be subjected

Generally speaking, the heat transfer characteristics of the tube material are of little consequence. The table on the next page illustrates the relative effect of tube materials on overall heat transfer. Because the fin area constitutes the vast majority of the heat transfer surface, it is the most important factor determining heat transfer effectiveness. Therefore, the choice of tube materials should be based on service requirements, not heat transfer efficiency.

Internal corrosion. The base material found in the 6000 Series coils is steel. The minimum wall thickness is .109" for steam coils and liquid coils, which affords both strength and corrosion resistance. All Armstrong coils are of monometallic design, which means that all wetted parts are made of the same materials. This precludes the likelihood of galvanic corrosion often experienced in coils made of dissimilar materials. For most applications, steel will provide very satisfactory service. In order to do this, however, steam coils must be carefully piped, trapped and vented to ensure good condensate and non-condensable gas evacuation.



The cross section of the coil on the right shows how internal corrosion caused by improper piping, trapping and venting may destroy coils from the inside out.

There are many cases where the steam cannot be conditioned enough to be non-corrosive or it is not possible to pipe, trap and vent the coils properly. For those areas, Armstrong recommends stainless steel wetted parts. Choosing which of these is most appropriate depends on the degree and type of problem as well as the steam pressure involved.

External corrosion. In the case of external corrosion, factors concerning the corrosiveness of the airstream enter into the decision. The choice of steel or stainless steel for the wetted parts depends on the compatibility of those materials with the contaminants in the airstream. In addition to the base materials available, Armstrong also offers hot dipped galvanizing, epoxy powder, baked phenolic or Teflon® coatings. These are frequently used when only external corrosion is a consideration.

Service requirements. These may be as important as the above considerations. Coil failures manifest themselves in many forms, but the most prevalent is failure of the tube-to-header joints. This failure occurs as a result of coil design defects, insufficient material at the tube-to-header joints or because of the method of connecting the tubes to the headers.

Armstrong 6000 Series coils are designed to accommodate the service requirements of the particular installation. They are built with enough material at the tube-to-header joints to make them strong. When differential expansion between tubes in steam coils is likely to over-stress the joints, centifeed type coils are recommended. Finally, Armstrong coils are always of welded construction, providing the best method of connecting the two parts together.

Computer-controlled equipment like this simplifies the process of drilling coil headers.

Tube Materials

The best combination of coil materials is the one that delivers maximum heat transfer **and** service life. Tubes, regardless of material, contribute little to heat transfer in extended-surface coils. It is the *fins,* fully exposed to the airstream, that provide the greatest contribution to heat transfer. Therefore, choose tube material on the basis of application.

Relative Heat Transfer Capacities of Identical Coils Using Different Tube Materials	
Tube Material	**Relative HT Capacity**
Copper	1.00
Aluminum	1.00
Steel	.98
Stainless Steel	.95

Material Selection for Fins

The heat transfer coil is essentially a tube on which fins are spirally wound or similarly attached. The fins produce an extended surface to improve heat transfer to or from air or other gases passing over the fins. The effective heat transfer of a coil is based on fin pitch (number of fins per inch), fin height, fin material and method of attachment.

Copper fins offer the best heat transfer, but aluminum fins provide the best overall value. Compared to aluminum fins, steel fins reduce heat transfer. Compared to aluminum and steel, stainless steel fins reduce heat transfer significantly. Fins may be of aluminum, copper, steel, or stainless steel, depending on contaminants, operating conditions and economic considerations.

The selection of fin materials should be based upon several considerations:
- The heat transfer characteristic desired
- The compatibility of the material with the air stream
- The amount and type of particulate matter in the air stream
- The frequency and aggressiveness of coil cleaning

The table below illustrates the heat transfer effectiveness of various fin materials with Armstrong coils. Note that these relative heat transfer capacities are for a specific set of conditions. The factors will vary with different conditions.

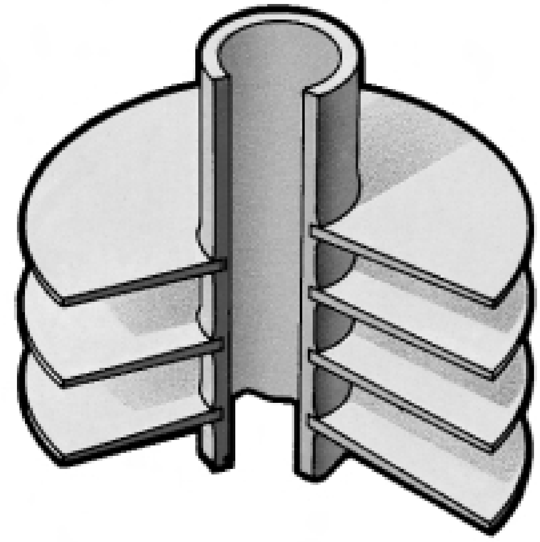
The fin/tube combinations available are listed on page C-6.

Relative Heat Transfer Capacities of Armstrong Coils With Tubes and Fins of Various Materials*		
Tube Material	**Fin Material**	**Relative HT Capacity**
Steel	Copper Keyfin	1.05
Steel	Aluminum Keyfin	1.00
Stainless Steel	Aluminum Keyfin	.94
Steel	Steel L Fin	.92
Stainless Steel	Stainless Steel L Fin	.58

*At 800 ft/min velocity, 7 fins/inch and 300°F steam temperature. Will vary at other conditions.

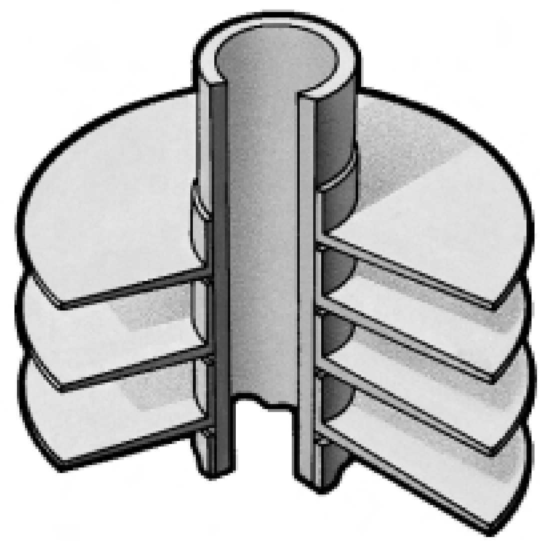
Keyfin

The keyfin is the standard design for Armstrong's most popular coils. Keyfin coils are manufactured by forming a helical groove in the tube surface, winding the fin into the groove and peening the displaced metal from the groove against the fin. This means a tight fit between the fin and the tube, providing for efficient operation over wide temperature ranges. Keyfin is the superior design for dissimilar fin and tube materials.



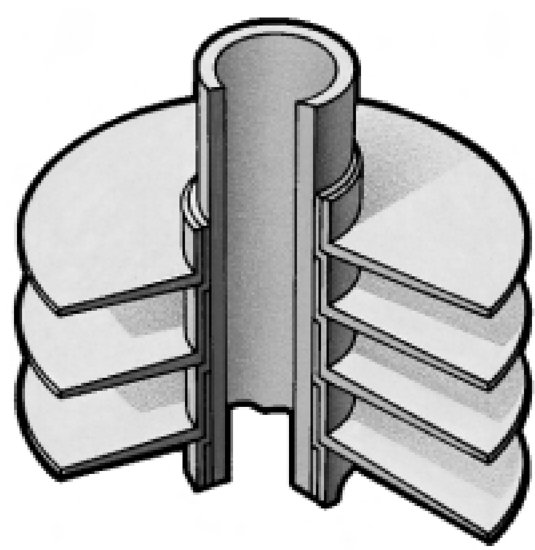
L Fin

The L fin has a "foot" at its base and is tension wound on knurled tube material. The L-shaped base provides a large contact area between the tube and the fin, ensuring effective, long-lasting heat transfer. The L fin is recommended when tubes and fins are of the same material.



Overlap L Fin

The overlap L fin is simply an L fin with an extended base. Each fin overlaps the foot of the previous fin, completely covering the tube surface. The overlap technique makes it possible to create a completely aluminumized coil for applications where exposed steel would be vulnerable to corrosion.



Why Settle for What's "Available" When You Can Specify Exactly What You Need?

Armstrong

Armstrong manufactures heavy-duty industrial coils in a wide range of sizes and materials to meet virtually any application demand. Dimensionally duplicated to fit your exact requirements, Armstrong coils are what you need. Whether it's off the shelf or off the wall. Other materials will be considered upon request.

Construction Features		
Tubes/Pipes		
Carbon Steel Tubes	Standard	12 ga A-214 ERW
	Optional	10 ga A-214 ERW
		12 ga A-179 seamless
		10 ga A-179 seamless
Carbon Steel Pipes	Optional	Sch 80 seamless; A-106 Gr 'B'
Stainless Steel Tubes	Standard	14 ga (1" OD) 12 ga (1-1/2" OD) A-249 type 304L
	Optional	14 ga (1" OD) 12 ga (1-1/2" OD) A-249 type 316L
Fins		
Steel	Standard	0.024" thick on 3/4" NPS pipes
		0.024" thick on 1" OD tubes
		0.036" thick on 1-1/2" OD tubes & 1" NPS & larger pipe
Aluminum	Standard	0.020" thick on all tube sizes
	Optional	0.030" heavy keyfin 1" & 1-1/2" OD steel and stainless steel tube
Stainless Steel		0.020" thick type 304 & 316 on all sizes
Copper		0.016" thick on all sizes
Connections		
Steel		Sch 80 (screwed), Sch 40 (flanged)
Stainless Steel		Sch 40 (screwed), Sch 10 (flanged)
Headers		
All coils have headers of the same material as tubing and are of welded construction.		
Casing		
Galvanized Steel	Standard	Minimum 12 ga galvanized for depth 7-1/2" and Over
		Minimum 14 ga galvanized for depth under 7-1/2"
Stainless Steel	Optional	14 ga type 304 & 316 for all depths
Aluminum	Optional	12 ga for all depths
Other gauge material available on request. All casings have drilled flanges for duct mounting unless specified otherwise.		
Design Pressure		
Standard design pressure for steel coils is 250 psig @ 450°F, stainless steel coils 200 psig @ 400°F. Higher pressure and/or temperature construction is available on request.		
Testing		
All coils are tested hydrostatically to at least 1-1/2 times the working pressure with a minimum test of 500 psi on steel & stainless steel steam coils.		
Options		
Steel tube with steel fin coils can be supplied hot dip galvanized. Steel/steel and steel/aluminum coils can be supplied with baked phenolic, epoxy or Teflon® coatings.		
Coils are available with ASME Section VIII, Division I, "U" stamps or CRN approval.		

Model Number Selection Series 6000 Coils

MODEL NUMBER

S H 2 – A 09 – Q 08 – 30 x 72 x 6 – ▪

TYPE OF COIL

L = Liquid
S = Standard
C = Centifeed
T = Tandem, Opposite-End Conns
P = Tandem, Same-End Conns

PIPE/TUBE/AIRFLOW ORIENTATION

H = Horiz. Tubes/Horiz. Air
V = Vert. Tubes/Horiz. Air
D = Horiz. Tubes/Vert. Down Air
U = Horiz. Tubes/Vert. Up Air

ROWS DEEP IN DIRECTION OF AIRFLOW

FIN TYPE AND METALLURGY

A = Aluminum Keyfin (.020")
B = Aluminum Heavy Keyfin (.030")
D = Aluminum G Fin (.020")
E = Aluminum Overlap L Fin (.020")
F = Copper Keyfin (.016")
G = Steel L Fin (.024") on 3/4" NPS Pipe and 1" OD Tube (.036") on 1-1/2" OD Tube
H = Steel G Fin (.024")
J = 304 Stainless Steel L Fin (.020")
K = 316 Stainless Steel L Fin (.020")

FINS PER INCH (FPI)

PIPE/TUBE TYPE AND METALLURGY

P = Sch 80 Seamless Steel Pipe (A-106 Gr B)
Q = 12 ga Steel Tube (A-214 ERW)
R = 10 ga Steel Tube (A-214 ERW)
S = 12 ga Steel Tube (A-179 SMLS)
T = 10 ga Steel Tube (A-179 SMLS)
W = 14 ga 304L SS Tube (A-249)
X = 12 ga 304L SS Tube (A-249)
Y = 14 ga 316L SS Tube (A-249)
Z = 12 ga 316L SS Tube (A-249)

PIPE NOMINAL BORE SIZE OR TUBE OD IN ONE-EIGHTHS OF AN INCH

CASING WIDTH (INCHES)

CASING LENGTH (INCHES)

CASING DEPTH (INCHES)

LIQUID COILS=NUMBER OF PASSES TH & PH TANDEM STEAM COILS= (L) OR (R) HAND OF COIL*

SPECIFY:

Number, Size and Type of Connections

Also call out non-standard items such as:
- **Headers Outside of Casing**
- **Special Casing Flange Width and Drilling**
- **Airtight Casing**
- **Mounting Plate (removable type)**
- **Coatings, etc.**

*Hand of coil is determined by the position of either the condensate connection or the leaving liquid connection when facing the coil with the airflow to your back.

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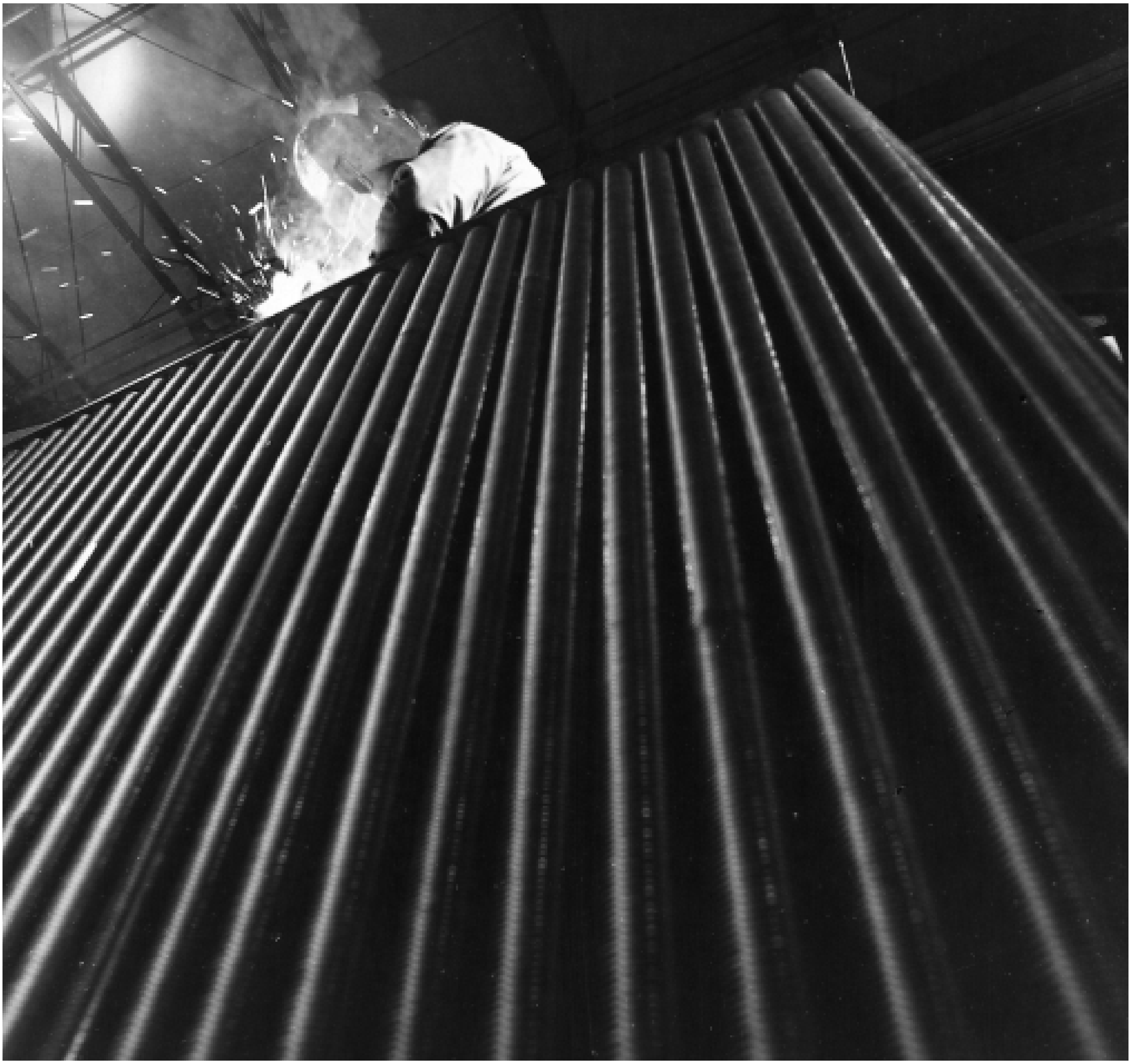
For air heating coils, steam is the preferred medium for heat transfer throughout much of industry. It affords advantages over liquids because it is easy and inexpensive to move from the boiler to the point of use and because it gives up so much energy at a constant temperature when it condenses. Process control is easily and quickly accomplished with essentially no lag time as is experienced with liquids.

The selection of coil construction and materials is a multi-step process that must take a number of factors into consideration. Armstrong's line of heavy-duty steam coils is designed and manufactured to provide the long life and efficient heat transfer that pays dividends over a long period of time.

Selection of Steam Coil Circuitry

The following pages show the four types of coil circuits offered by Armstrong and discuss the application parameters of each. The return bend type circuit is not covered because Armstrong feels that one of the four listed circuits is a better choice for most applications.



Armstrong can build coils to a wide variety of material and performance specifications and dimensionally duplicate replacement coils to fit your exact requirements.

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Series 6000 Steam Coil Types

Standard Coils (Type S)

This type of coil is used for most applications where entering air temperatures are above 35°F and steam is at constant pressure. It is used extensively in high-temperature process applications and for "reheat" in HVAC systems. It is not, however, recommended where even outlet air temperatures are required immediately after the coil, such as in multi-zone heating systems, or where a modulating steam control valve is used to control temperature.

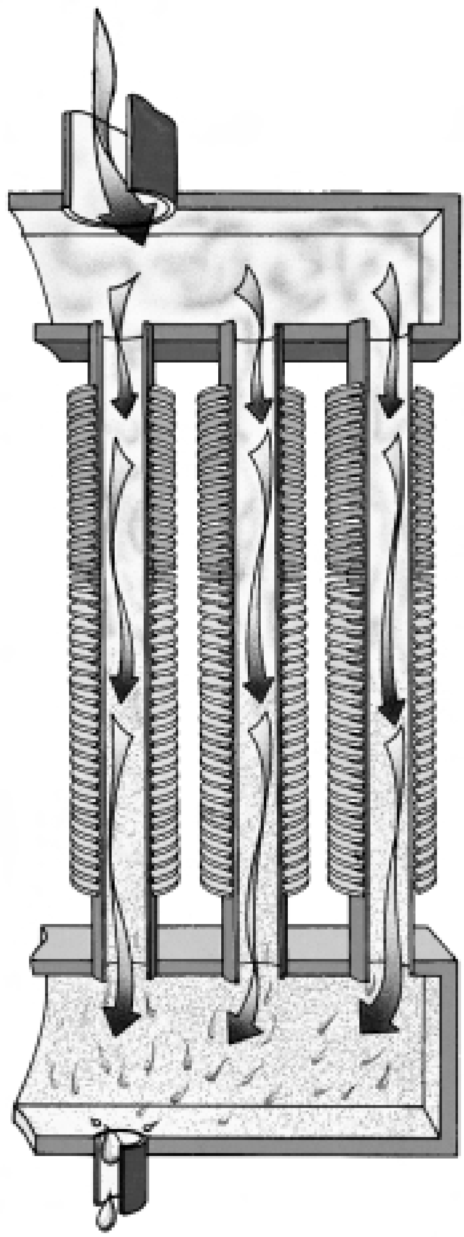
Centifeed Coils (Type C)

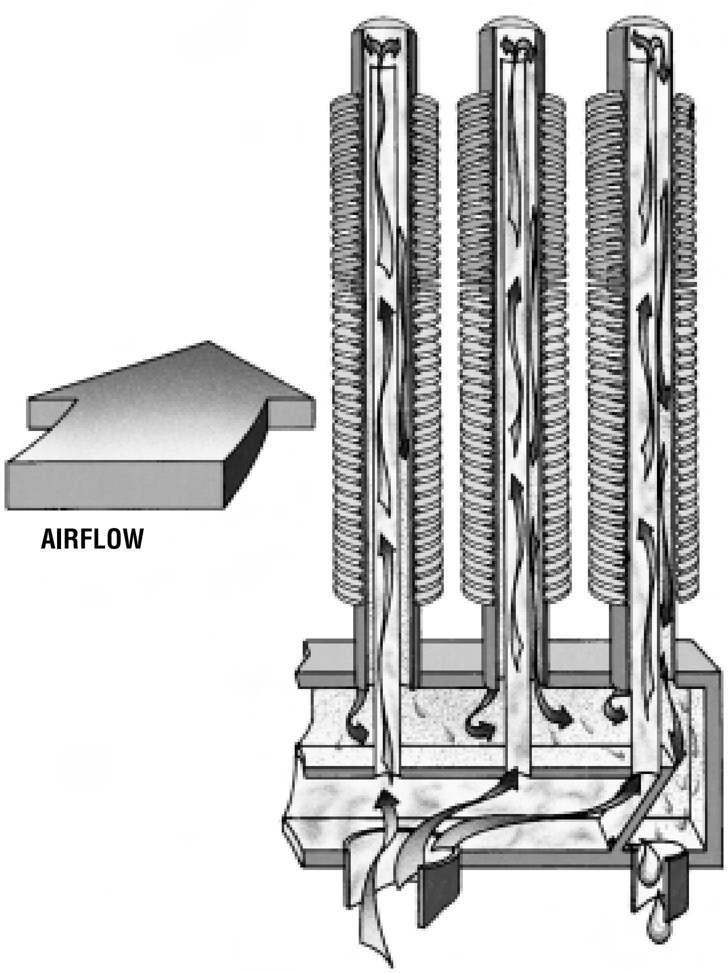
The single-row centifeed coil can be used where air is below freezing and/or modulating control is used. Recommended where:

- **A** A single row delivers the required performance
- **B** A modulating steam control valve is used
- **C** Even outlet air temperatures are required over the whole coil face
- **D** Stainless steel tubes are used

Two-row centifeed coils are available where (B) and (C) are required, but tandem type coils are a better choice with freezing air temperatures.

A centifeed coil is one plain tube—called the inner steam distribution tube—inserted inside an outer finned tube. The center tube is fed with steam, which travels up this distribution tube and is then discharged into the outer tube. It then travels back between the outside wall of the distribution tube and the inside wall of the finned tube to the condensate header. The inner tube acts as a steam tracer to keep the finned tube warm along its total length.





Type S coils are available with opposite-end connections only.

Type C coils are available with same-end connections only.

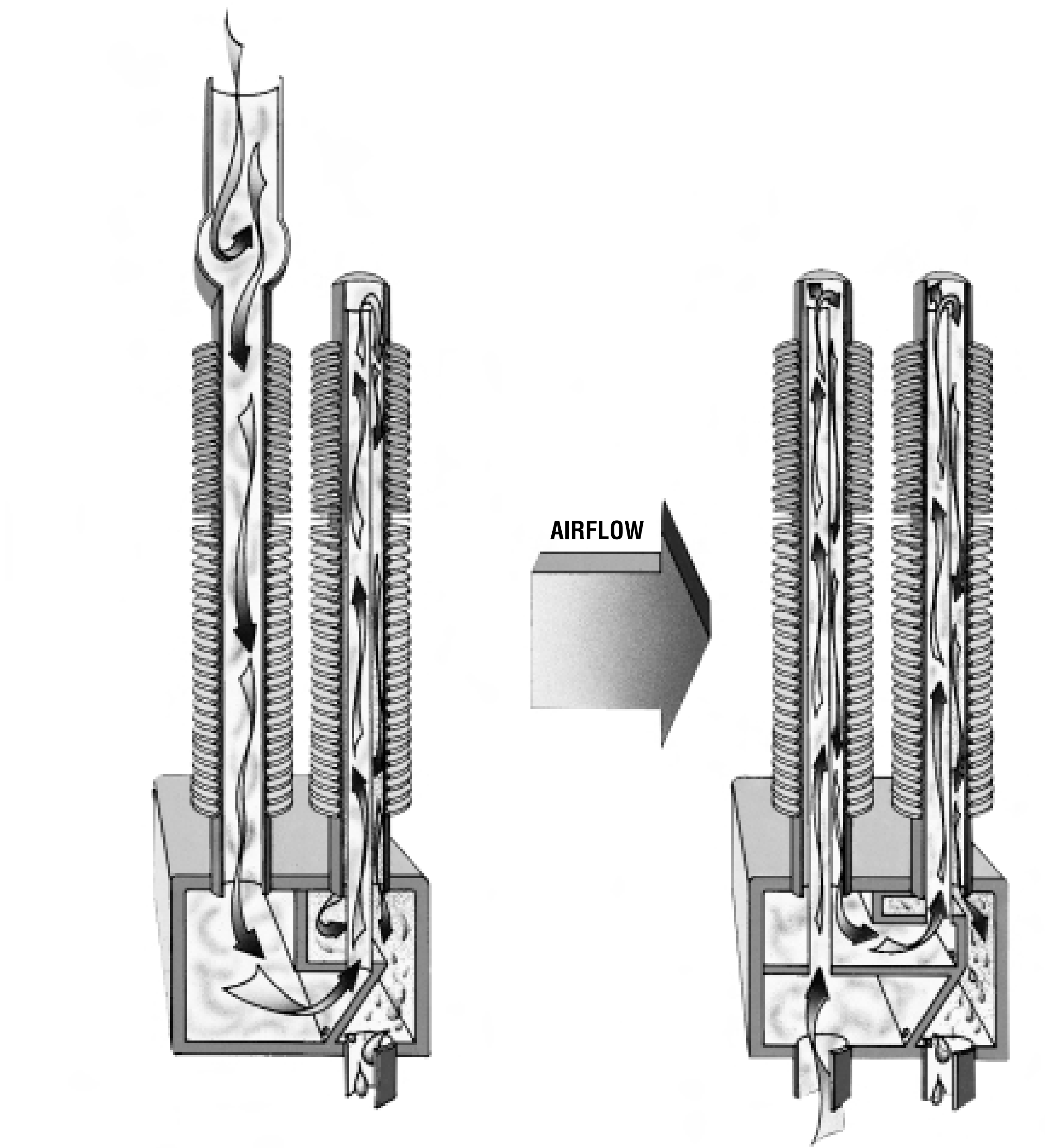
Tandem Coils (Types T and P)

Freezing applications requiring more than one row to achieve the desired final air temperature demand this type of coil.

The coil is designed so that the total amount of steam to be condensed by the whole coil is fed into the first row in the direction of airflow. This purges non-condensable gases and droplets of condensate from that part of the coil exposed to the coldest air. Channeling the steam from the header to the other rows in series has the same purging effect. This design ensures that air passing over the last row is at least 35°F.

The coldest part of the coil will always have steam in sufficient quantity to overcome unequal distribution and "backfeeding" due to differing steam loads and pressure drops in adjacent tubes. This eliminates freezing problems caused by condensate holdup.

The "series" feed characteristic of the tandem coil, as opposed to the "parallel" feed of the two-row centifeed coil, makes it the ideal choice for multi-row coils in freezing applications. If you want a stainless steel tube tandem, specify a P type.



Type T coils have opposite-end connections.

Type P units have same-end connections.

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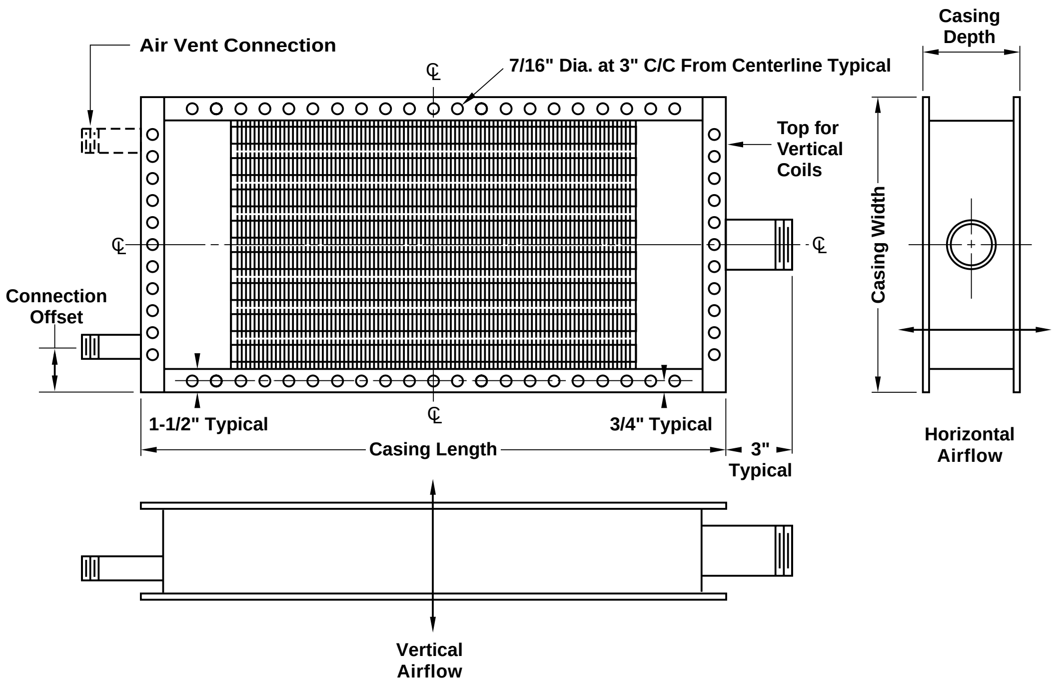
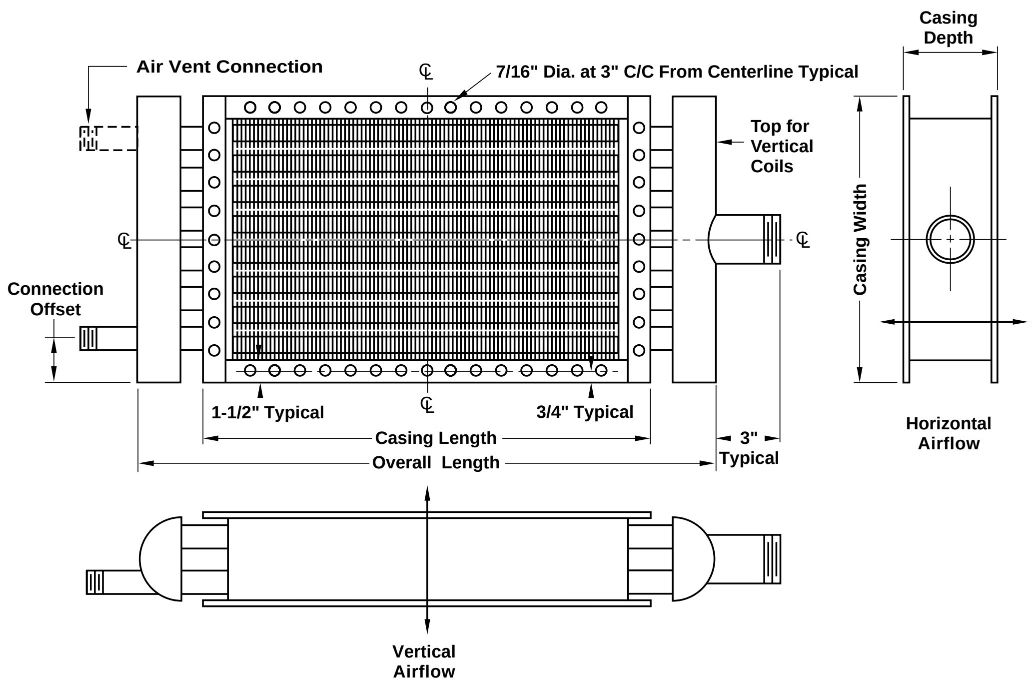
- Standard Coils (Type S)
- Tandem Coils (Type T)
- For Vertical or Horizontal Airflow
- With Headers Inside the Casing



- Standard Coils (Type S)
- Tandem Coils (Type T)
- For Vertical or Horizontal Airflow
- With Headers Outside the Casing



NOTES:
Always specify airflow directions and tube orientation when ordering coils.
Specify all dimensions for replacement coils, especially those varying from typicals above.
If coils are to be Tandem type, specify coil hand by facing the coil with airflow at your back and pointing to the condensate connection.

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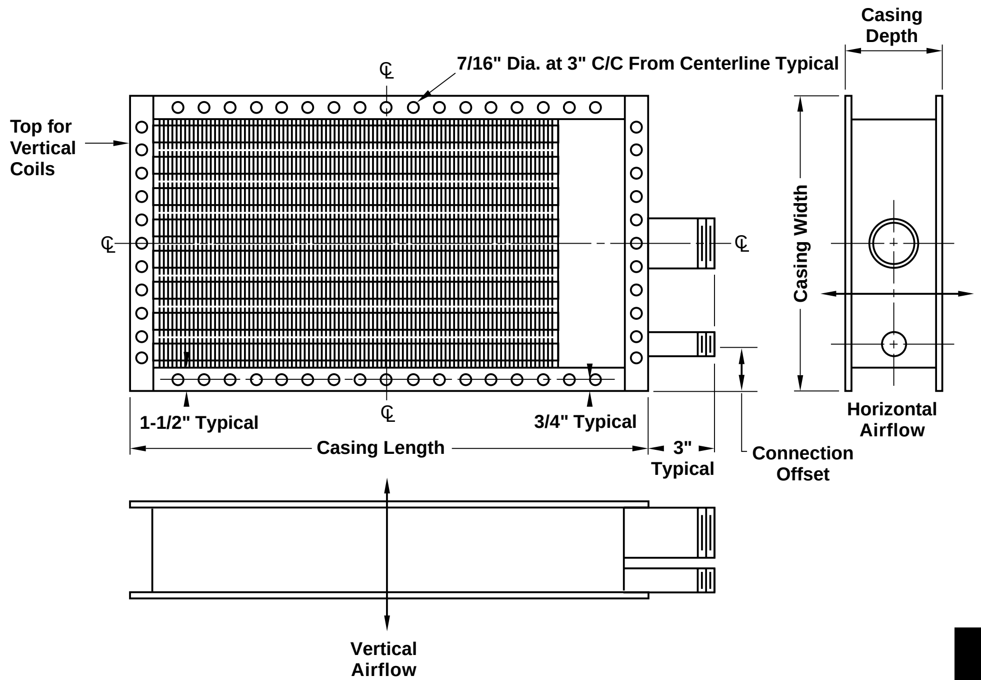
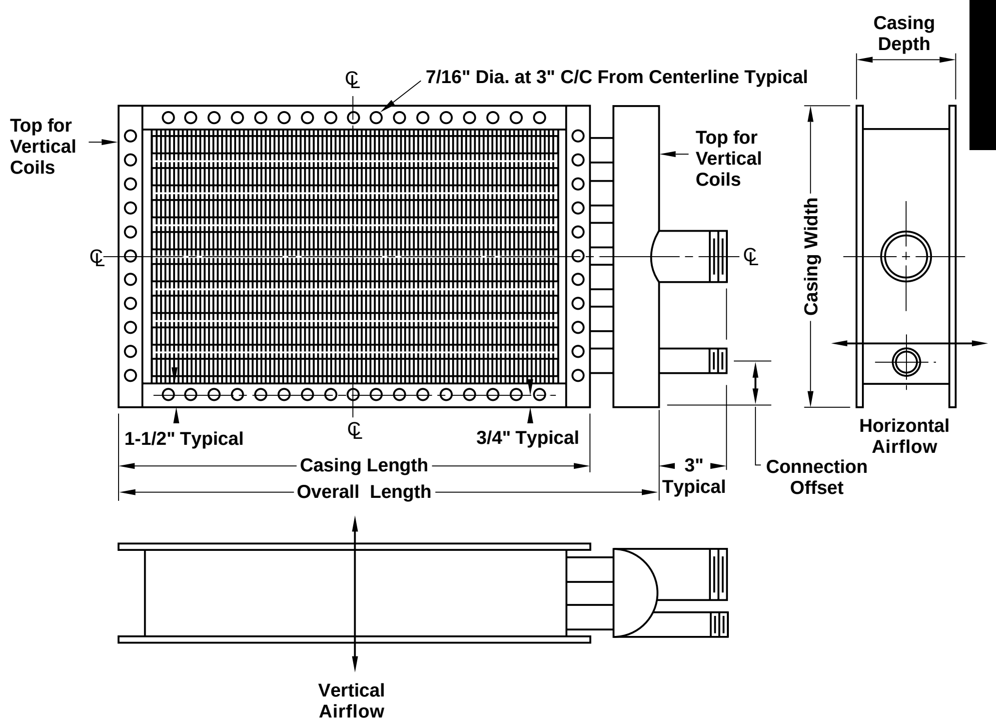
Steam Coil Typical Arrangements

Armstrong®

- Centifeed Coils (Type C)
- Centifeed Tandem Coils (Type P)
- For Vertical or Horizontal Airflow
- With Headers Inside the Casing



- Centifeed Coils (Type C)
- Centifeed Tandem Coils (Type P)
- For Vertical or Horizontal Airflow
- With Headers Outside the Casing

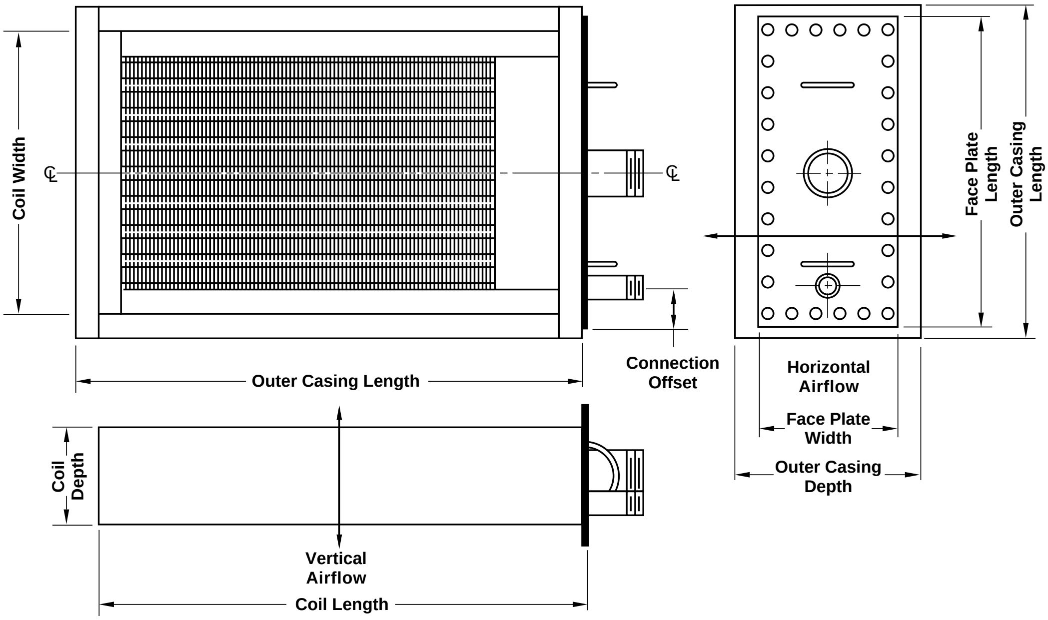


Heating and Cooling Coils

NOTES:
Always specify airflow directions and tube orientation when ordering coils.
Specify all dimensions for replacement coils, especially those varying from typicals above.
If coils are to be Tandem type, specify coil hand by facing the coil with airflow at your back and pointing to the condensate connection.

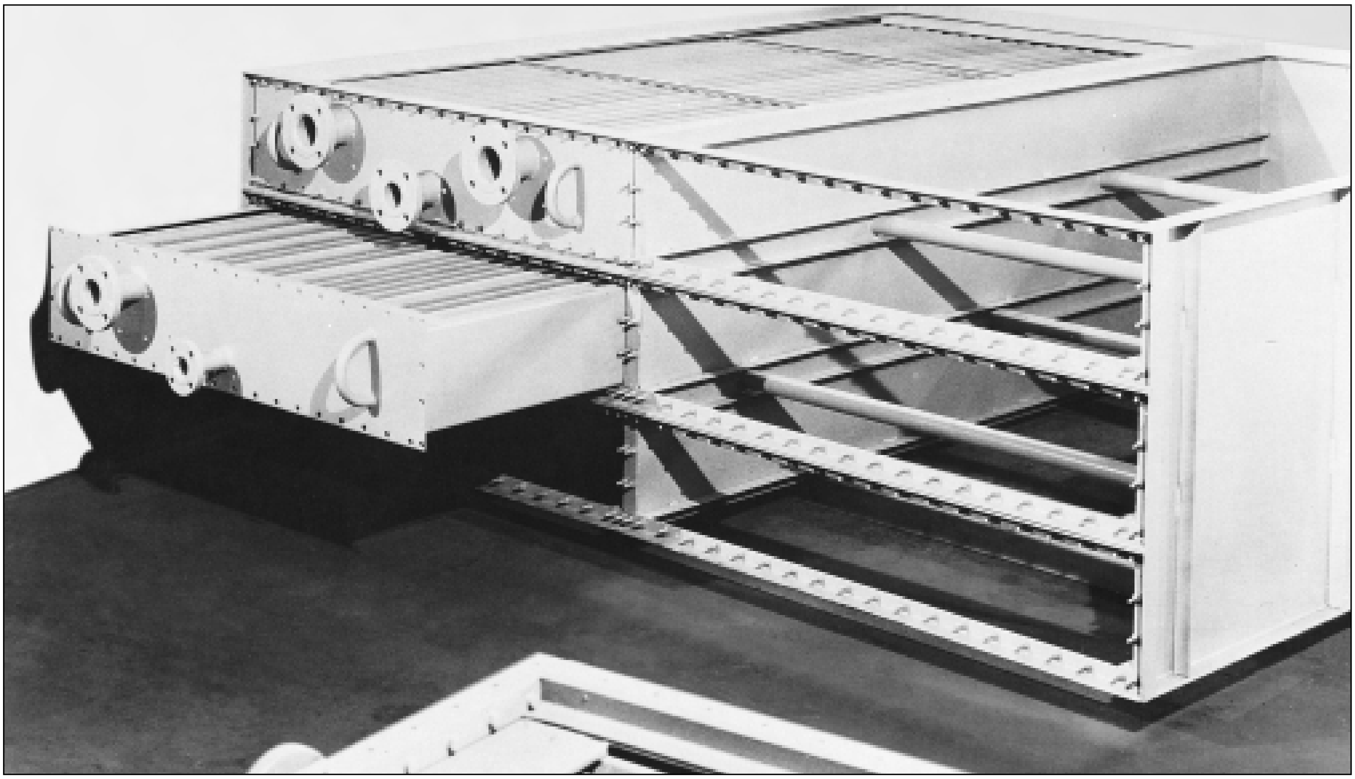
Steam Coil Typical Arrangements

- Removable Coils
- Centifeed Coils (Type C)
- Centifeed Tandem Coils (Type P)
- For Vertical or Horizontal Airflow
- With Headers Inside the Casing



Heating and Cooling Coils

NOTES: Always specify airflow directions and tube orientation when ordering coils.
Specify all dimensions for replacement coils, especially those varying from typicals above.
If coils are to be Tandem type, specify coil hand by facing the coil with airflow at your back and pointing to the condensate connection.
Removable coils can be designed for removal from either connection end or end opposite connections.



Removable coils with outer casing.

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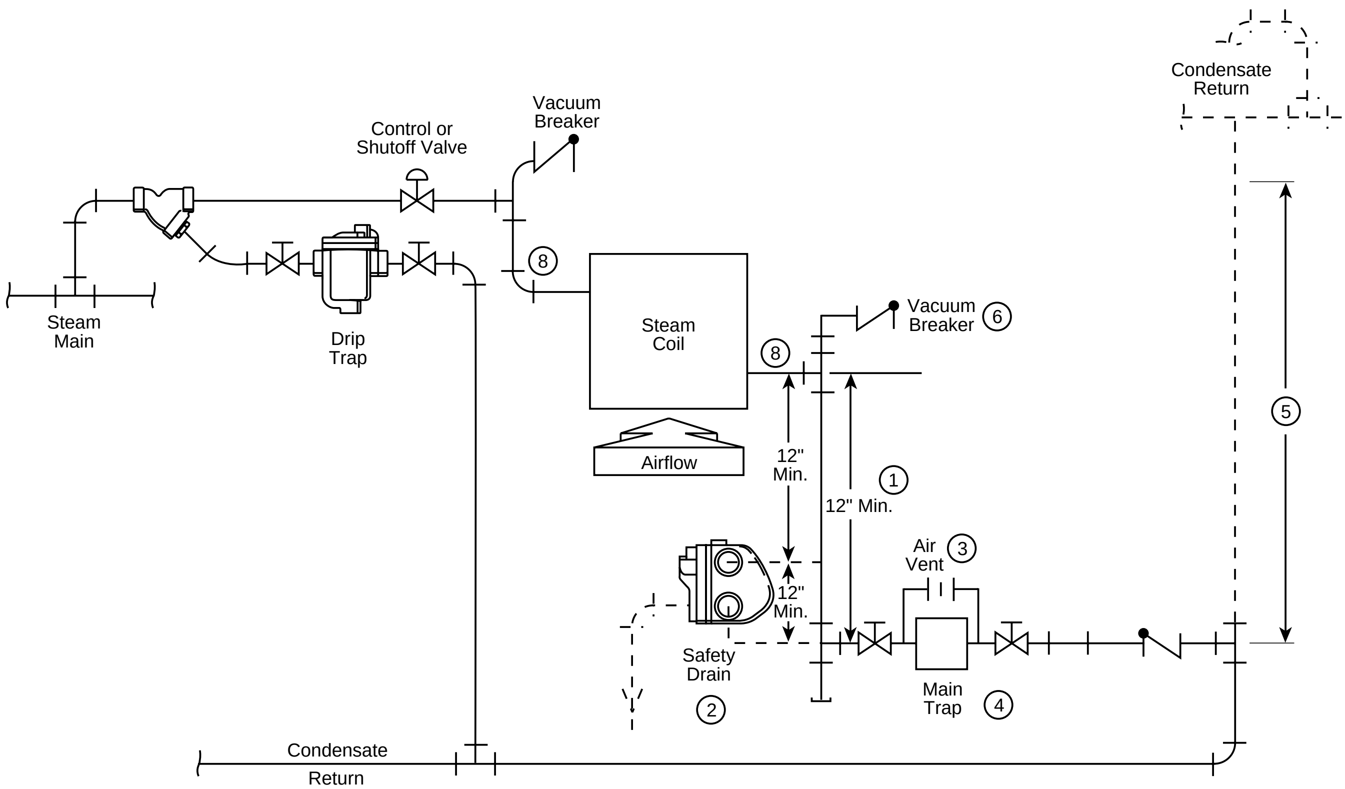

1. 24" minimum if safety drain is used.
2. Safety drain is used if steam supply is modulated and the condensate system is pressurized or overhead. Armstrong's pumping traps or Posi-Pressure Control system provides additional protection or may substitute for the safety drain, especially if condensate conservation is desired.
3. Air venting must be provided on all steam coils except those using low-pressure Posi-Pressure Control systems. The air vent may either be an orifice bleed or a thermostatically operated element, with the orifice bleed being the preferred choice. The air vent or orifice bleed should be piped so that it cannot be valved out independently of the trap.
4. The main trap may be either an inverted bucket or a float & thermostatic type depending upon the service conditions. See the chart below for recommendations. Inverted bucket type steam trap required with Posi-Pressure Control system.
5. Overhead condensate return system.
6. Required only on a modulated system.
7. See Bulletin A-H 825 for detailed operation and maintenance procedures.
8. Provide a flexible connection or swing joint at the coil inlet and outlet connections to isolate the coil from vibration, piping stresses and differential expansion within the coil.

Armstrong Steam Trap Selection Guide

Equipment	Selections	Constant Pressure		Modulated Pressure	
		0 - 30 psig	Above 30	0 - 30 psig	Above 30
Unit Heaters	1st Choice 2nd Choice	IBLV F&T	IBLV F&T	F&T IBLV	F&T IBLV
Air Handlers	1st Choice 2nd Choice	IBLV F&T	IBLV F&T	F&T IBLV	F&T IBLV
		0 - 250 psig	Above 250	0 - 30 psig	Above 30
Process Coils	1st Choice 2nd Choice	IBLV F&T	IBLV IBLV	F&T IBLV	F&T IBLV

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In steam coils, successful operation and a long, trouble-free service life depend on:

1. The manner of installation, including the design of coil mounting and piping—with particular emphasis on trapping and air venting.
2. Operating conditions that are within design parameters.
3. The method of operation.
4. The thoroughness and frequency of cleaning required.

Following these simple guidelines will help you achieve maximum coil performance.

Receipt and Storage

1. Upon receipt, inspect coils and notify carrier immediately of any damage sustained in transit.
2. If coils are not installed immediately, store under cover in a heated area free of potential damage from personnel and/or equipment.

Installation

1. **Support coils and piping individually** to prevent undue strains on the steam and condensate connections. Use swing joints or flexible connections for freedom of movement.
2. Steam and condensate pipes should be the same size as coil connections. Maintain connection size from the coil back to the steam main and from the coil to the steam trap takeoff.
3. **Install a drip trap** prior to the coils (and before a control valve if there is one) to prevent the introduction of condensate.
4. **Install strainers** with blowdown valves before all control valves and traps.
5. To avoid hunting and maintain control, use only modified linear or equal percentage (vee-port) valves when a modulating control valve regulates the steam supply. Consult Armstrong for proper applications.
6. **Never oversize control valves. Bigger is *not* better.**
7. **Install a vacuum breaker** in the steam piping prior to the coil to prevent retention of condensate during shutdown. Also install a vacuum breaker on the downstream side of the coil when steam pressure is to be modulated. If you use check valves as vacuum breakers, they should be 15-degree swing checks.
8. Provide venting of non-condensable gases individually on each coil to ensure maximum heat transfer and minimum internal corrosion. In order of effectiveness, venting can be with a fixed orifice bleed, independent thermostatic vent or by using a float and thermostatic steam trap.
9. Trap all coils individually. Locate trap as close to coil as possible. Otherwise, inadequate drainage may damage the coil and/or interfere with effective heat transfer.
10. Use only traps such as the inverted bucket or float and thermostatic which drain continuously. When steam to the coils is modulated, a float and thermostatic trap is preferred. See the previous page for selection guidelines.
11. **Install a dirt pocket** prior to the steam trap. You may also install a gate valve at the bottom of the dirt pocket to facilitate drainage during shutdown periods.
12. Use the same size trap on all coils when they are in parallel across the duct opening. Coils mounted in series (one behind the other in the direction of the airflow) typically have lower condensing rates at the downstream end of the system. Size traps to handle the maximum calculated load for individual coils. Avoid oversizing. Consult your Armstrong Representative if you need assistance.
13. Modulating control valves are best used with gravity flow vented condensate return systems. If the condensate return system is overhead or pressurized, the use of pumps, Armstrong pumping traps or the Armstrong Posi-Pressure Coil Controller System is highly recommended. If this is not possible a safety drain as illustrated on page C-14 should be installed.
14. **Install filters** at the coil inlet if possible. Simple filter systems permit easy cleaning or replacement and ensure efficient operation.
15. Refer to the previous page for an illustration of piping practices for steam heating coils.

Operation

Once coils are installed properly, their performance and service life depend on a few simple guidelines for maintenance and operation.

1. To prevent plugging of tubes, clean the piping system and blow down all strainers prior to initial startup.
2. On startup, feed steam to the coils slowly to avoid thermal shock loadings.
3. Make sure the steam has been on for a minimum of 15 minutes prior to starting fans or opening dampers.
4. Make sure operating pressures are kept within design limits.
5. During initial startup, tighten all bolted connections once the system stabilizes at operating temperature.
6. To provide maximum freeze protection, maintain a minimum steam pressure of 5 psig to coils exposed to air temperature below 40°F (5°C). If this is impossible, consult your Armstrong Representative.
7. Drain during shutdown to prevent internal corrosion.

Maintenance

1. If filters are installed, clean regularly to maintain adequate airflow across the coils and to keep fan loadings at design.
2. If filters are not used, inspect and clean coils periodically. Clogged filters and plugged coils have the same result.

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Liquid Coils

Although steam may be the preferred heating medium for coils, liquids such as water, glycol solutions and high temperature heat transfer fluids are coming into wide use. Some of the reasons for the popularity of water and glycol systems are:

- Heat recovery systems are becoming more popular, and hot water or glycol solutions are ideal for that duty
- Hot water may be readily available from such sources as condensate systems or other processes, and it makes sense to use the available heat from those sources
- Users have a preference for liquids over steam

The use of high temperature heat transfer fluids has a number of practical advantages over water and steam when process air has to be heated to high temperatures. These fluids can operate in the 500°F to 750°F range at or near atmospheric pressure as opposed to steam, which would have to be over 1,500 psig in order to achieve a saturation temperature of 600°F.

Systems capable of operating at high pressures are expensive to construct and maintain. Corrosion caused by steam and water and the need for water treatment to minimize scale formation result in high maintenance costs. The absence of any need for supervisory staff to be on constant duty is a further advantage of the high temperature heat transfer fluid system.

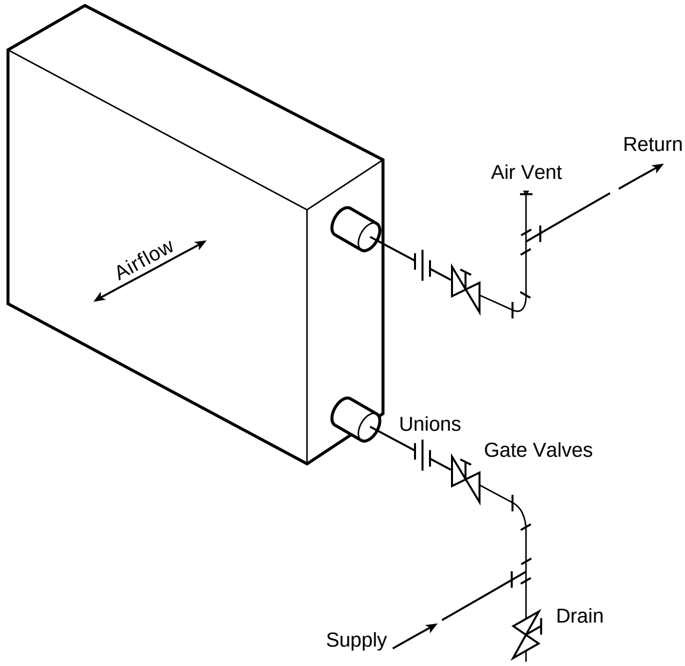
To meet the needs of industry for heavy duty liquid coils, Armstrong has introduced a line of standardized sizes in seven widths from 16-3/4" to 57-3/4" in 21 lengths from 24" to 144". These are available with fin pitches from 5 to 11 FPI and in 2 or 3 rows. Many circuiting options are available.

As with all Armstrong coils, liquid coils are built to withstand the rigors of tough industrial applications in contrast to the commercial grade coils frequently misapplied in industrial environments.

In addition to the standardized line, custom coils in sizes to fit existing installations and in materials to fit particular applications are also available.

Materials of Construction	
Tubes	1" OD 12 ga (.109" wall thickness) A-214 ERW carbon steel tubes (seamless tubes optional)
Fins	.020" or .030" thick aluminum keyfin (imbedded)
Headers	Schedule 40 steel or fabricated
Connections	Water and glycol solutions: • Schedule 80 steel screwed MPT (flanges optional)—same end High temperature heat transfer fluids: • Seamless Schedule 40 steel with 300 lb raised face weld neck flanges—same end
Assembly	All wetted parts are welded into a monometallic structure, affording the greatest strength and corrosion resistance.
Design	250 psig at 750°F. Hydrostatically tested to 500 psig.
Casing	Minimum 14 ga galvanized steel primed after manufacture
Coatings	Special coatings such as baked phenolic, epoxy powder and Teflon are available as options. These coatings are suitable for temperatures up to 400°F.

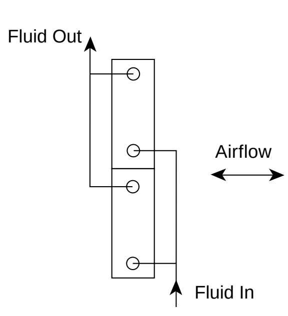
Piping Diagram for Water and Ethylene Glycol



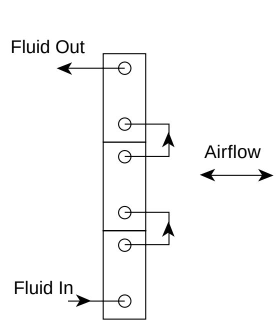
1. Install coils level to assure complete drainage.
2. Supply water to the bottom connection and return through the top connection.
3. Carefully vent coils, either individually or through an air manifold.
4. Armstrong recommends that coil isolation valves be fitted to take out coils without disturbing the whole system.
5. Ensure that water supply to coils is as clean as possible to avoid potential blockage and excessive fouling. Settling tanks and strainers can be used for this purpose.
6. Do not support piping from the coils. Install adequate hangers and expansion joints to prevent undue stresses.
7. Armstrong recommends the use of low pressure air or flushing with ethylene glycol to prevent freeze damage when draining.
8. Do not use throttling controls in hot water heating service if there is a possibility of below-freezing air passing through the coil. Use an air by-pass system at full water flow rate for control.

NOTE: Keep finned tube surface clean and free of all foreign matter in order to maintain the design heat transfer and pressure drop ratings. Install filters upstream of the coils to keep actual coil maintenance to a minimum.

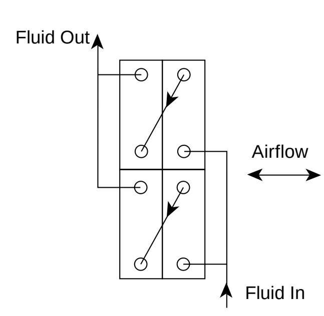
Examples of Multi-Coil Arrangements



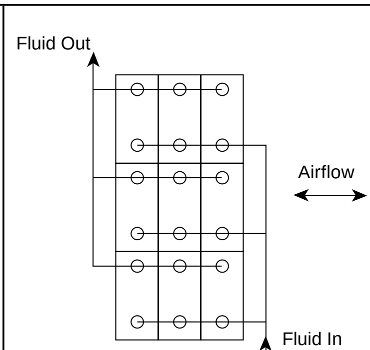
Airflow: 2 in Parallel
Fluid Flow: 2 in Parallel



Airflow: 3 in Parallel
Fluid Flow: 3 in Series



Airflow: 2 in Parallel x 2 in Series
Fluid Flow: 2 in Parallel x 2 in Series



Airflow: 3 in Parallel x 3 in Series
Fluid Flow: 9 in Parallel

How to Specify Armstrong Series 6000 Steam Coils

Heavy-duty construction/fabrication is why Armstrong Series 6000 coils last longer, saving maintenance and frequent replacement costs.

Think about it. Less expensive coils are also *less durable* and are commonly misapplied in heavy industrial service. As a result, they actually become *more expensive* when measured by down time, maintenance and replacement over a period of time. It's really a very simple fact: Higher initial costs are justified when they secure a lower life cycle cost.

The sample specifications below will help you in detailing coil construction for your heavy-duty application. These samples cover the most popular of the various material combinations. For assistance with other options, consult your Armstrong Representative.

Steel Tube/Aluminum Keyfin

- Tubes—minimum 12 ga carbon steel
- Fins—minimum 0.020" thick aluminum (imbedded type)
- Headers—minimum Sch 40 carbon steel pipe
- Connections—minimum Sch 80 carbon steel pipe
- Casings—minimum 14 ga galvanized steel
- Tubes, headers and connections shall be welded together to form monometallic joints.

Steel Tube/Steel Fin

- Tubes—minimum 12 ga carbon steel
- Fins—minimum 0.024" thick carbon steel ("L" fin)
- Headers—minimum Sch 40 carbon steel pipe
- Connections—minimum Sch 80 carbon steel pipe
- Casings—minimum 14 ga galvanized steel
- Tubes, headers and connections shall be welded together to form monometallic joints.

Stainless Steel Tube/Aluminum Fins

- Tubes—minimum 14 ga 304L stainless steel
- Fins—minimum 0.020" thick aluminum (imbedded type)
- Headers—minimum Sch 10 304L stainless steel pipe
- Connections—minimum Sch 40 304L stainless steel pipe
- Casings—minimum 14 ga galvanized steel
- Tubes, headers and connections shall be welded together to form monometallic joints.

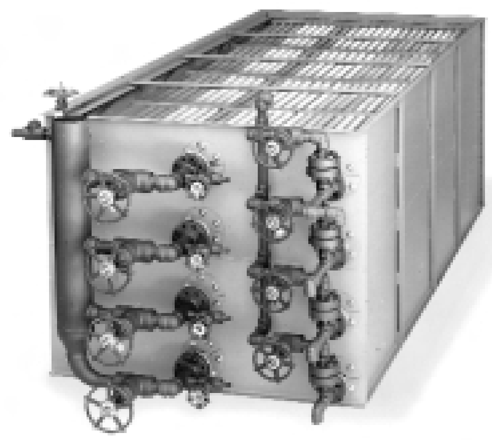
NOTE: 0.030" thick aluminum keyfin is an available option for imbedded type only.

Typical Coil Applications

Armstrong can manufacture coils in any configuration necessary to meet your requirements.

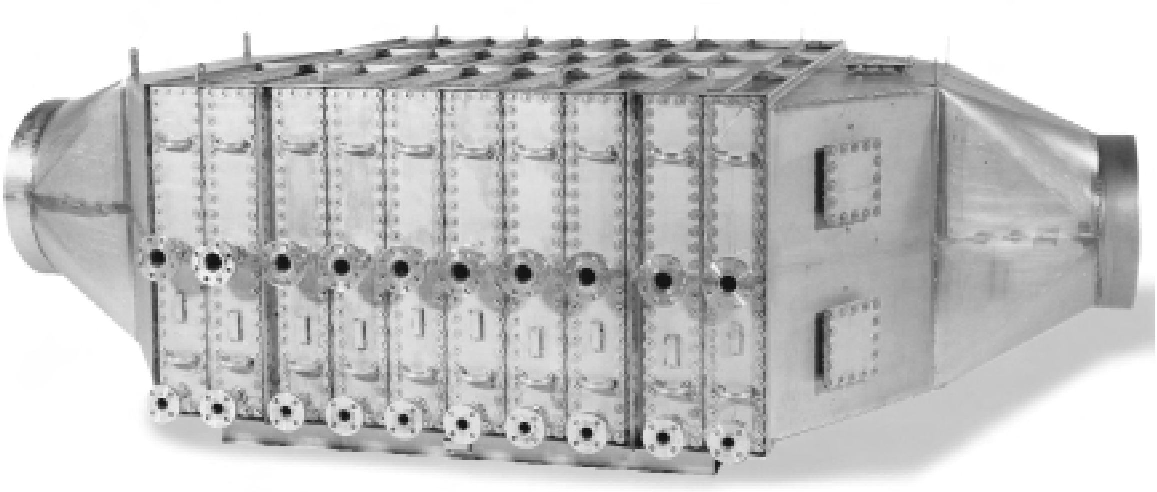
- Pulp dryer coils
- Veneer dryer coils
- Pocket ventilation coils
- Smokehouse coils
- Yankee hood drying coils
- Pasteurizer coils
- Air makeup coils for comfort heating
- Char coolers
- Carpet dryer coils
- Boiler air preheater coils
- Grain dryer coils
- Boiler feedwater runaround systems
- Starch dryer coils
- Textile dryer coils
- Dry kiln coils
- Paint spray booth coils
- Drying ovens
- Steam condenser coils
- Unit heaters for comfort heating
- Door heaters
- Tank heating coils
- Unit coolers and condensers

Armstrong® Coil Packages Engineered to Your Specifications

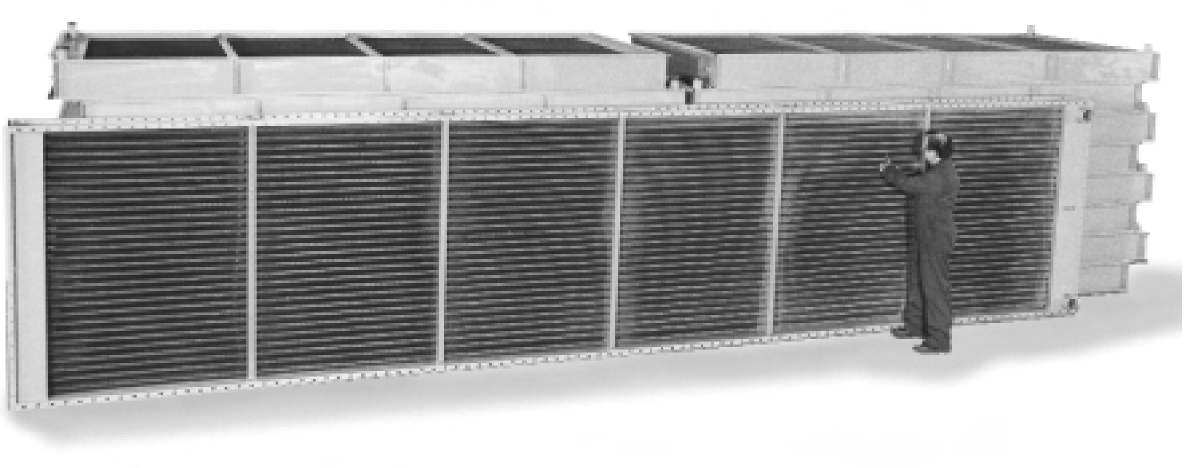


Air heaters using high pressure steam.

Blast air coolers and heaters.



Stainless steel boiler air preheaters used in the pulp and paper industry.



Air heaters using thermal oils.

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Notes

Armstrong Duralite™ Plate Fin Coils

Armstrong is a full-line coil supplier with application knowledge and experience you'll find nowhere else in the industry. For nearly half a century, our heavy-duty industrial coils have been serving the process needs of heavy industry. Building on that tradition of quality and dependability, our plate fin coils meet the diverse needs of the HVAC and light industrial markets.

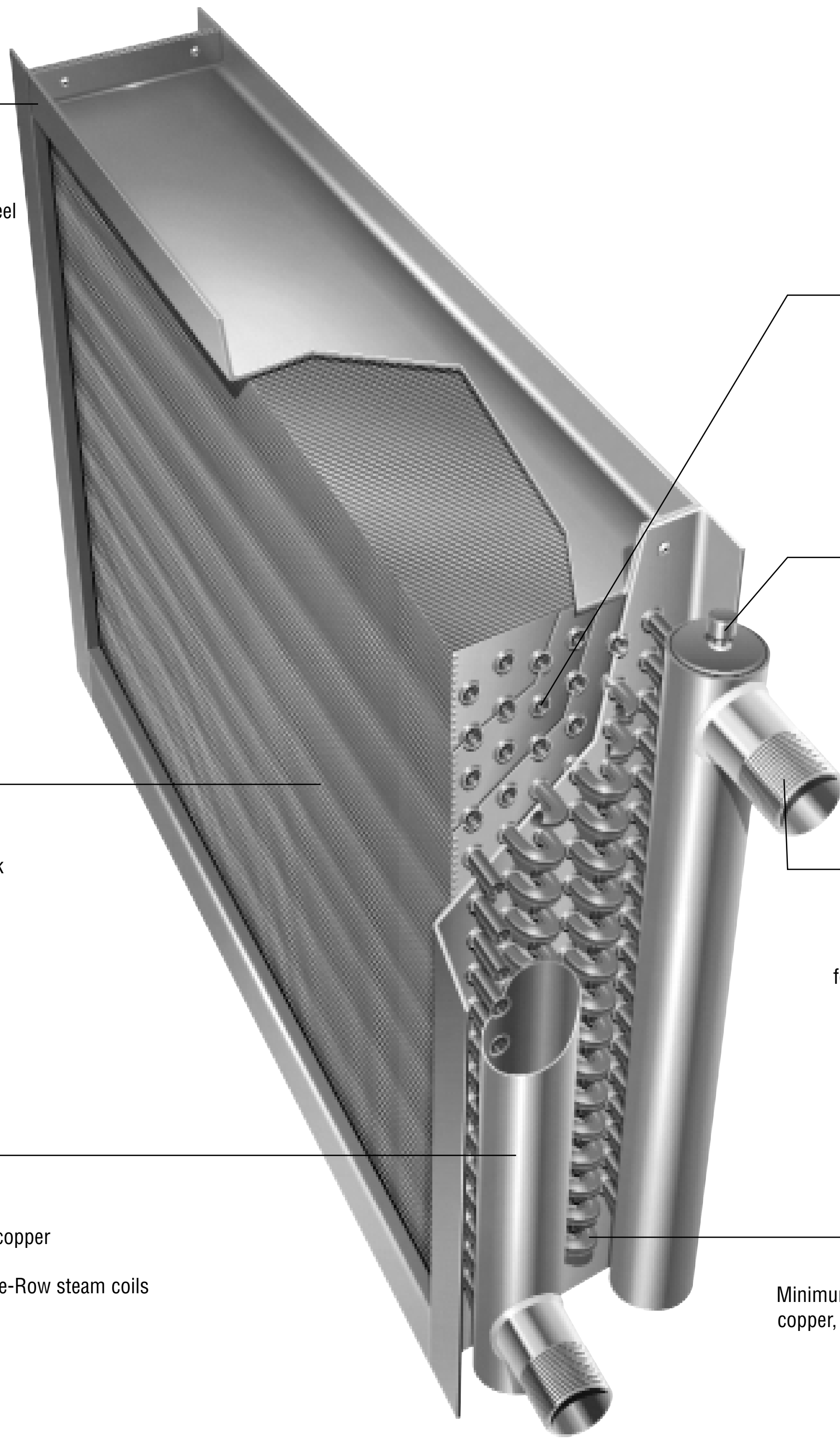

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Plate Fin Coil Model Numbers

MODEL NUMBER

HH2 - AA11 - C05 - 36X72X5 - F - L

Coil Type

H = Liquid Heating Coil
K = Liquid Cooling Coil
S = Standard Steam Coil
C = Centifeed Steam Coil
R = Return Bend Steam Coil
N = Serpentine
E = Centifeed Coil, steam fed from both ends

Fin Tube/Air Direction

H = Horizontal Tubes/Horizontal Air
V = Vertical Tubes/Horizontal Air
D = Horizontal Tubes/Vertical Down Air
U = Horizontal Tubes/Vertical Up Air

Number of Rows in Direction of Airflow

Fin Type and Metallurgy

AA = Aluminum V-waffle (.008")
AB = Aluminum V-waffle (.010")
AC = Aluminum V-waffle (.012")
AD = Aluminum Flat (.008")
AE = Aluminum Flat (.010")
AF = Aluminum Flat (.012")
CA = Copper V-waffle (.009")
CB = Copper Flat (.009")

Number of Fins/Inch

Pipe/Tube Type and Metallurgy

A = Copper (.020")
B = Copper (.028")
C = Copper (.032")
D = Copper (.035")
E = Copper (.049")

Tube OD in 1/8" Increments

Casing Width

Casing Length

Casing Depth

Circuiting if Liquid Coil

D = Double
F = Full
H = Half
Q = Quarter
T = 3/4
U = 1-1/2

Hand of Coil if a Liquid or Horizontal Return Bend Steam Coil

L = Left Hand
R = Right Hand

How to Identify the Circuiting of a Return Bend Coil

1. Identify the inlet header and count the number of tubes fed from it.
2. Count the number of tubes in the face of the coil.
3. Divide the number of tubes fed from the header by the number of tubes in the face.
4. The result is the identification of the coil's circuit.

How to Identify the Hand of a Return Bend Coil

1. Face the coil with the airflow at your back (or imagine this).
2. Point to the outlet connection (it will be at the top of a liquid coil and should be closest to you). On a return bend steam coil, it will be the condensate return connection and should be farthest from you. If the reverse of the above exists, the coil may be installed incorrectly.
3. The connection on your right indicates a right-hand coil.
4. The connection on your left indicates a left-hand coil.

Coil-Aware Sizing Program

Armstrong coils, both heavy duty and plate fin, are available on a Windows*-based computer program that is extremely user friendly. To obtain a copy through your Armstrong Representative, visit our web site at www.armstrong-intl.com and supply the requested information. Your local representative will personally deliver it to you. Updates will be available and downloadable from the web site.

*Windows is a registered trademark of Microsoft.

Armstrong® How To Order Armstrong Duralite™ Plate Fin Steam Coils

Heating and Cooling Coils

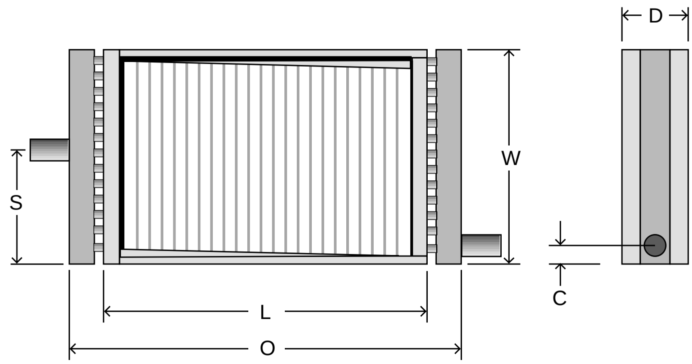
Armstrong Duralite™ Plate Fin Steam Coils are available in Centifeed (Steam Distributing Tube Type), Standard (Opposite End Connections) and Two-Row Return Bend Construction.

Centifeed, Standard and Return Bend coils are made of 5/8'' OD tubes as a standard.

One-Row coils are available optionally with 1'' OD tubes.

Depending upon steam flow, long Centifeed coils may require steam to be fed from both ends to eliminate cold tube ends and subsequent freezing potential.

To ensure that a replacement coil will fit in the same location, and that it will perform the same as the coil it replaces, the dimensions and other data requested below must be obtained prior to sizing and pricing.

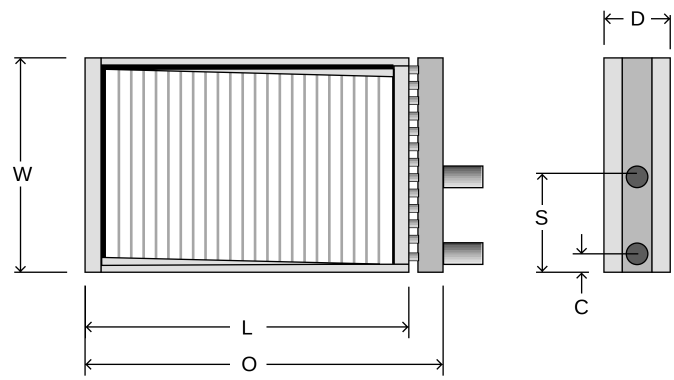


Standard Steam Coils

Dimensions

W	L	D	O	S*	C*

*Not required if Armstrong Standard Dimensions are acceptable.



Centifeed Steam Coils

Performance Information

Airflow rate: ____________________

❐ Fan CFM ❐ SCFM ❐ lb/hr

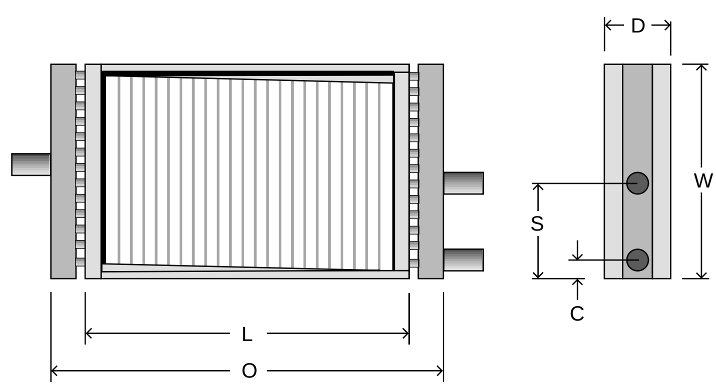
Fan location: ❐ before coil(s) ❐ after coil(s)

Steam pressure: ____________ psig

Entering air temperature: ____________ ° F

Leaving air temperature: ____________ ° F

Altitude: ________ ft. above MSL



Centifeed Steam Coils Fed From Both Ends

Coil Information

Coil type (specify): ____________

Fin type: ❐ flat ❐ V-waffle ❐ HTE

Fin material: ____________

Fin thickness: ____________ in.

Fins per inch: ____________

Tube material: ____________

Tube OD: ____________ in.

Tube wall: ____________ in.

Steam connection size: ____________ in.

Condensate connection size: ____________ in.

Casing material: ____________

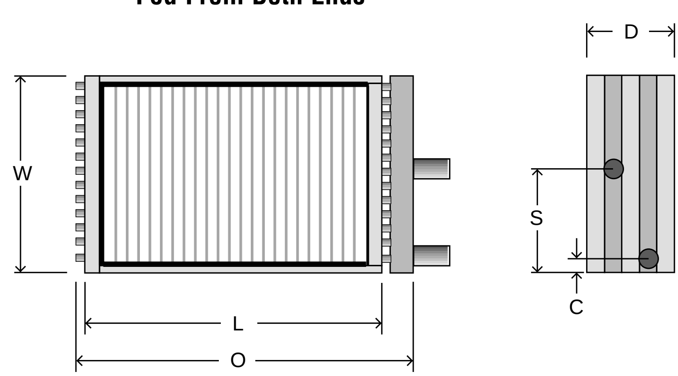
Number of tubes in coil face: ____________

Number of tubes fed by each header: ____________

Number of rows of tubes in direction of airflow: ____________

Hand of coil if Return Bend: ❐ left ❐ right

Special features: ____________



Return Bend Steam Coils

Reset

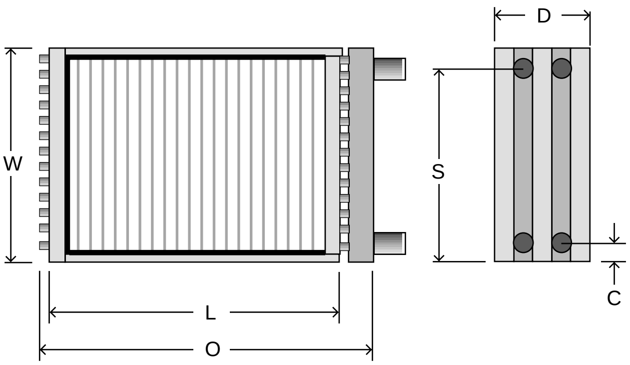
How To Order Armstrong Duralite™ Plate Fin Liquid Coils

Armstrong

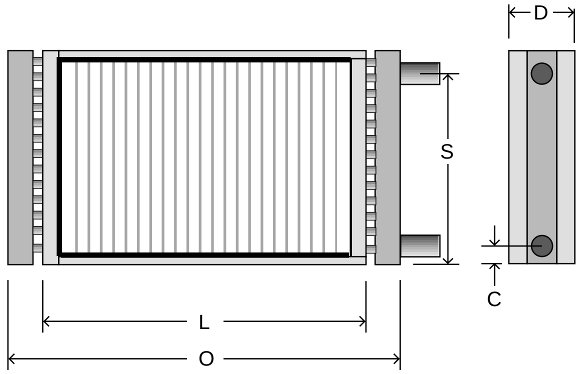
Armstrong Duralite™ Plate Fin Heating Coils are available in Return Header design in one- or two-row configurations and Return Bend design in two or more rows. Liquid coils are made of 5/8'' OD copper tube.

Cooling coils can be built from 2 to 12 rows and with double, full or 1/2 circuits. Custom circuits are also available.

To ensure that a replacement coil will fit in the same location, and that it will perform the same as the coil it replaces, the dimensions and other data requested below must be obtained prior to sizing and pricing.



Return Bend Heating & Cooling Coils



Return Header Heating Coils

Dimensions

W	L	D	O	S*	C*

*Not required if Armstrong Standard Dimensions are acceptable.

Performance Information

Airflow rate: ______________________________

❐ Fan CFM ❐ SCFM ❐ lb/hr

Fan location: ❐ before coil(s) ❐ after coil(s)

Entering air temperature: ____________ ° F

Wet bulb or RH (if cooling): ____________

Leaving air temperature: ____________ ° F

Heating or cooling medium: ____________

Entering liquid temperature: ____________ ° F

Leaving liquid temperature: ____________ ° F

or liquid flow rate: ____________GPM

Altitude: ________ft. above MSL

Coil Information

Coil type (specify): ____________

Fin type: ❐ flat ❐ V-waffle ❐ HTE ____________

Fin material: ____________

Fin thickness: ____________ in.

Fins per inch: ____________

Tube material: ____________

Tube OD: ____________ in.

Tube wall: ____________ in.

Inlet connection size: ____________ in.

Outlet connection size: ____________ in.

Casing material: ____________

Number of tubes in coil face: ____________

Number of tubes fed by each header: ____________

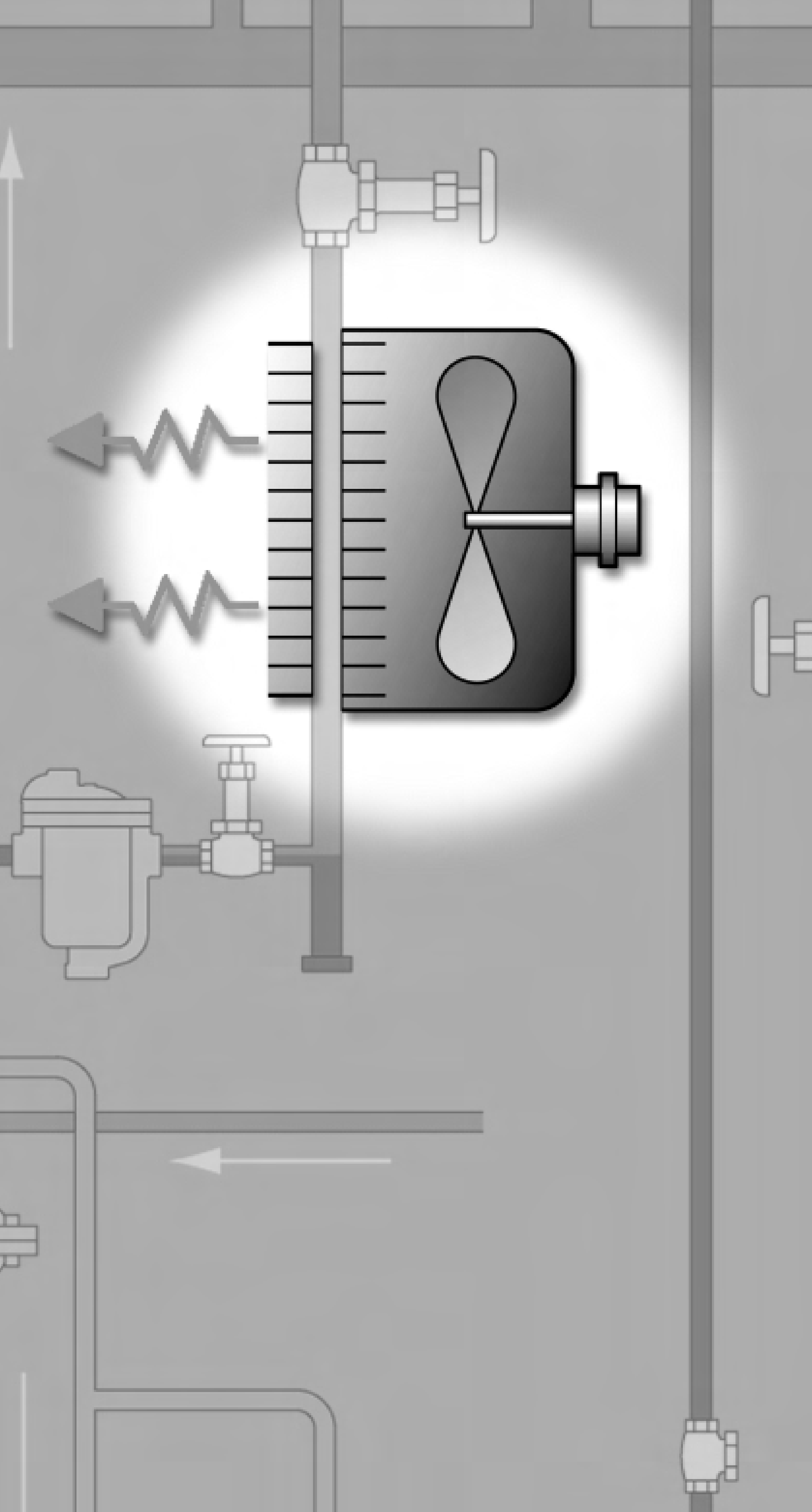
Number of rows of tubes in direction of airflow: ____________

Hand of coil if Return Bend: ❐ left ❐ right

Special features: ____________

____

Reset



Unit Heaters

Armstrong

Next

Armstrong® Longer Life in the Harshest Environments

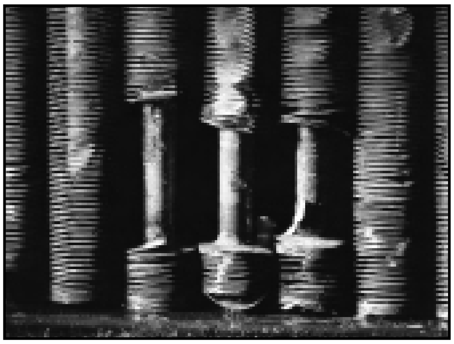
When it comes to long life under tough industrial conditions, Armstrong is all you need to know about unit heaters. Even in the most severe environments, where coil leaks and corrosion are costly problems, Armstrong coils maintain high efficiency and output.

Armstrong: Why and How

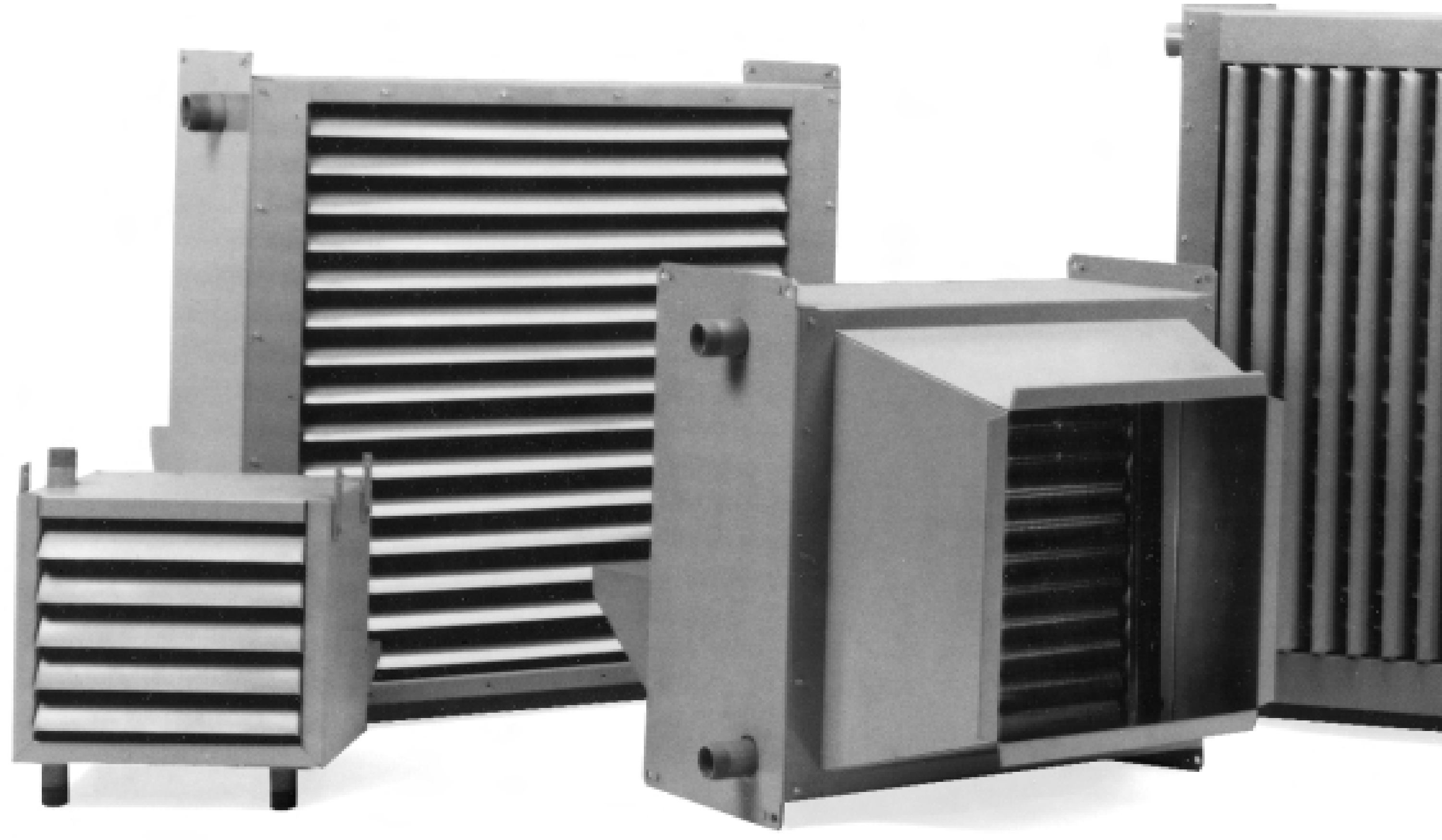
The ability to maintain heat transfer efficiency and resist corrosion—both internally and externally—is why Armstrong unit heaters are uniquely dependable. *How* we construct them is your assurance of lasting performance, even in severe operating environments.

Consider these measurable benefits at work in your facility:

- *Heavy gauge enclosures:* Fabricated from 14-gauge steel for protection and durability.
- *Corrosion-resistant heating cores:* Cores are fabricated in a full range of materials, including steel, stainless steel, copper and others. Special coatings may be applied to increase resistance to external corrosion. Cores feature all-welded construction for durability and ease of repair. Cores can be steam or liquid compatible and can be used for steam, hot water or glycol heating mediums.
- *Standard NEMA frame TEFC ball bearing motors:* Supplied on all sizes, these heavy-duty motors are totally enclosed to lock out dirt for smooth performance. Quick access to the motor permits easy replacement.
- *Thick fins and tubes:* Constructed of high-strength, corrosion-resistant materials. Fins are available in a wide variety of thicknesses and pitches to withstand high pressure cleaning without damage or distortion.
- *Customizing to your needs:* Fans range in size from 10" to 48", and the wide selection of component materials means long, trouble-free service life.



Lightweight coils don't stand a chance in harsh environments. Armstrong coils survive because they're built as tough as your meanest application.



Heating and Cooling Coils

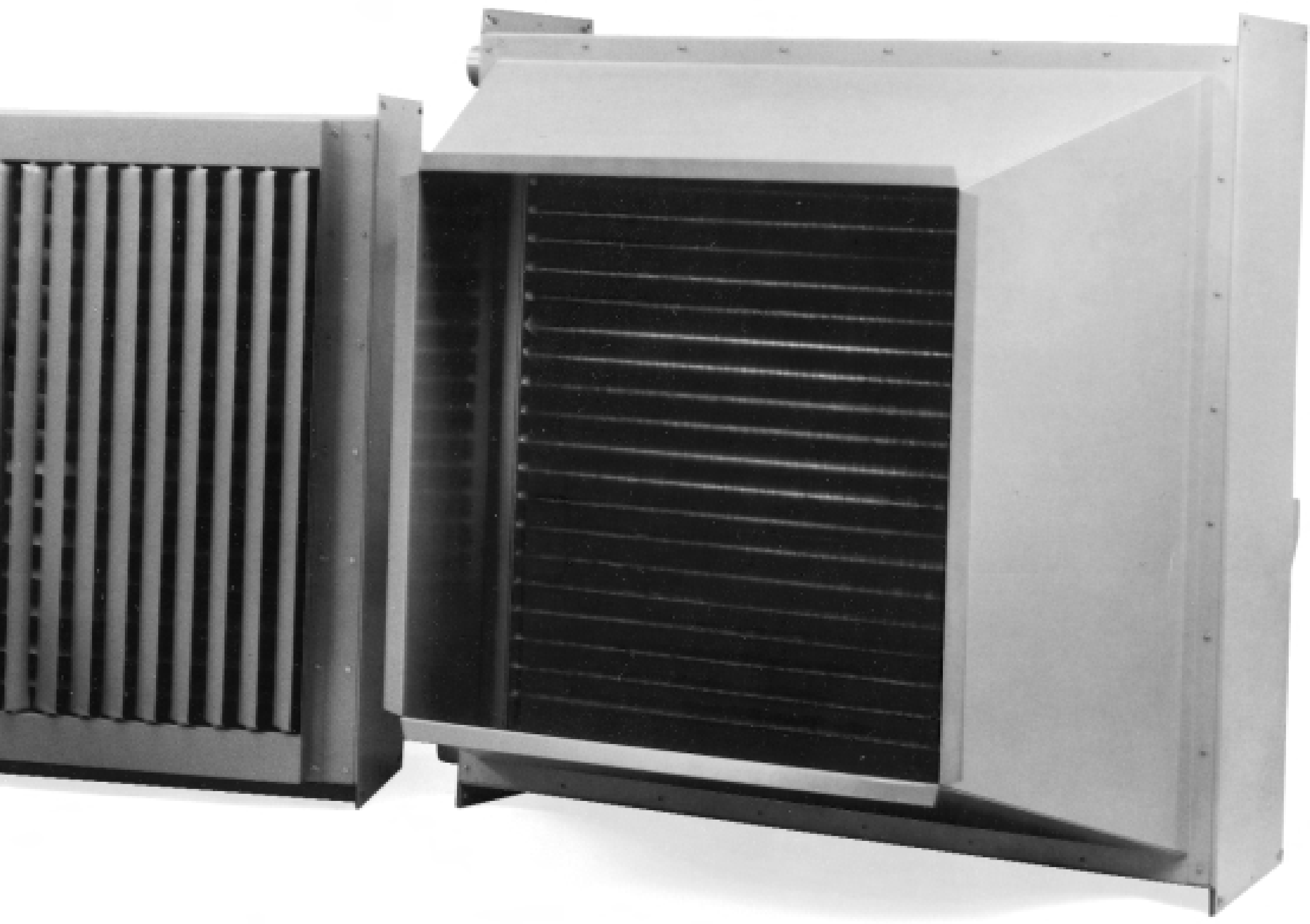
Armstrong®

Your Steam Specialist

The first step toward ensuring trouble-free operation is proper unit selection. Your Armstrong Representative will help you select the right unit heater or door heater for any given application.

Our expertise as a manufacturer of unit heaters and door heaters is backed by over 70 years' experience in steam trapping, venting and condensate removal. To you, that means a superior product *and* an Armstrong Representative who understands how to make it work in your steam system.

If you're losing heat transfer due to deteriorating coils, contact your Armstrong Representative for a complete application analysis. You'll receive top-quality, reliable products from experts who know how to maximize your steam system efficiency.

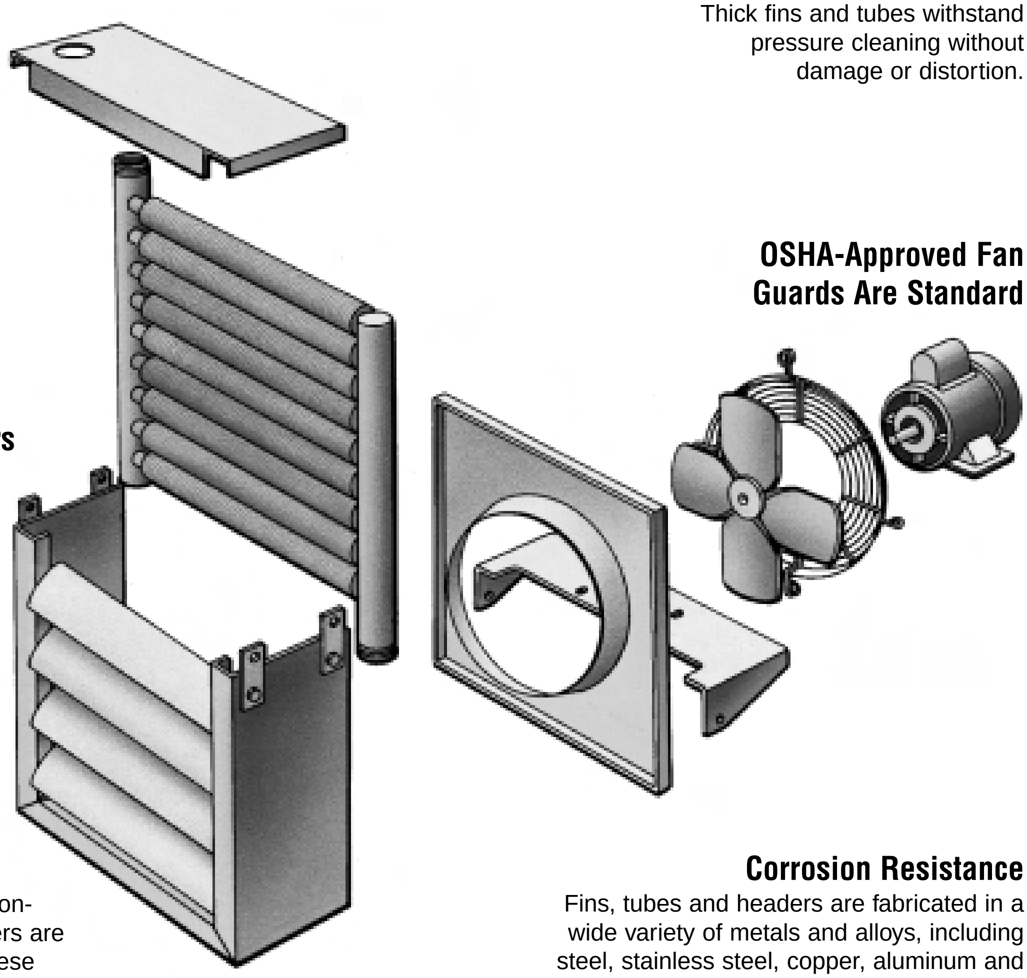


Compare the Benefits You Can't See

Many of the best reasons to insist on Armstrong unit heaters and door heaters are ones you never even see. Components like motors, bearings, tubes, enclosures and fins are built heavy-duty to ensure lasting performance.

Armstrong's options for fin material, pitch, height and type, for example, help explain why our heating cores last longer and perform with greater efficiency. These factors all have a bearing on heat transfer. Knowing how to balance these and other factors is the key to a cost-effective solution. That knowledge is perhaps the most important of Armstrong's many hidden benefits.

10" - 20" Size



Sturdy Enclosures

Heavy-duty enclosures of 14-gauge steel provide a rigid structure. Aluminum, stainless steel and specially coated enclosures are also available as options.

Standard NEMA Frame TEFC Ball Bearing Motors

Supplied on all sizes, this rugged motor is built to last in tough industrial environments. If replacement is ever needed, motors are readily available from industrial supply dealers, and are easy to install.

Application Versatility

Because of their heavy-duty construction Armstrong unit heaters are used in many applications. These include product coolers, lube oil coolers, flash steam condensers, hot oil heaters and many others.

Cost-Reducing Strength

Thick fins and tubes withstand pressure cleaning without damage or distortion.

OSHA-Approved Fan Guards Are Standard

Corrosion Resistance

Fins, tubes and headers are fabricated in a wide variety of metals and alloys, including steel, stainless steel, copper, aluminum and others. Tubes and headers are of the same material to enhance strength and reduce the chance of leakage due to galvanic corrosion.

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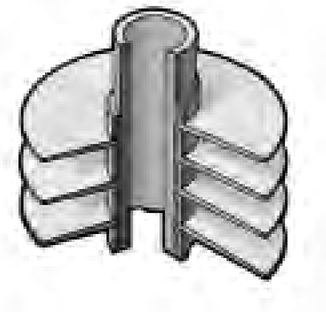
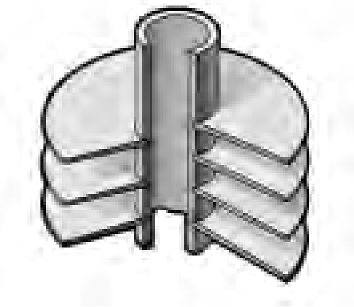
The L fin has a foot at its base and is tension wound on knurled tube material. The L-shaped base provides a large contact area between the tube and the fin, ensuring effective, long-lasting heat transfer. The L fin is recommended when tubes and fins are of the same material.

L Fin



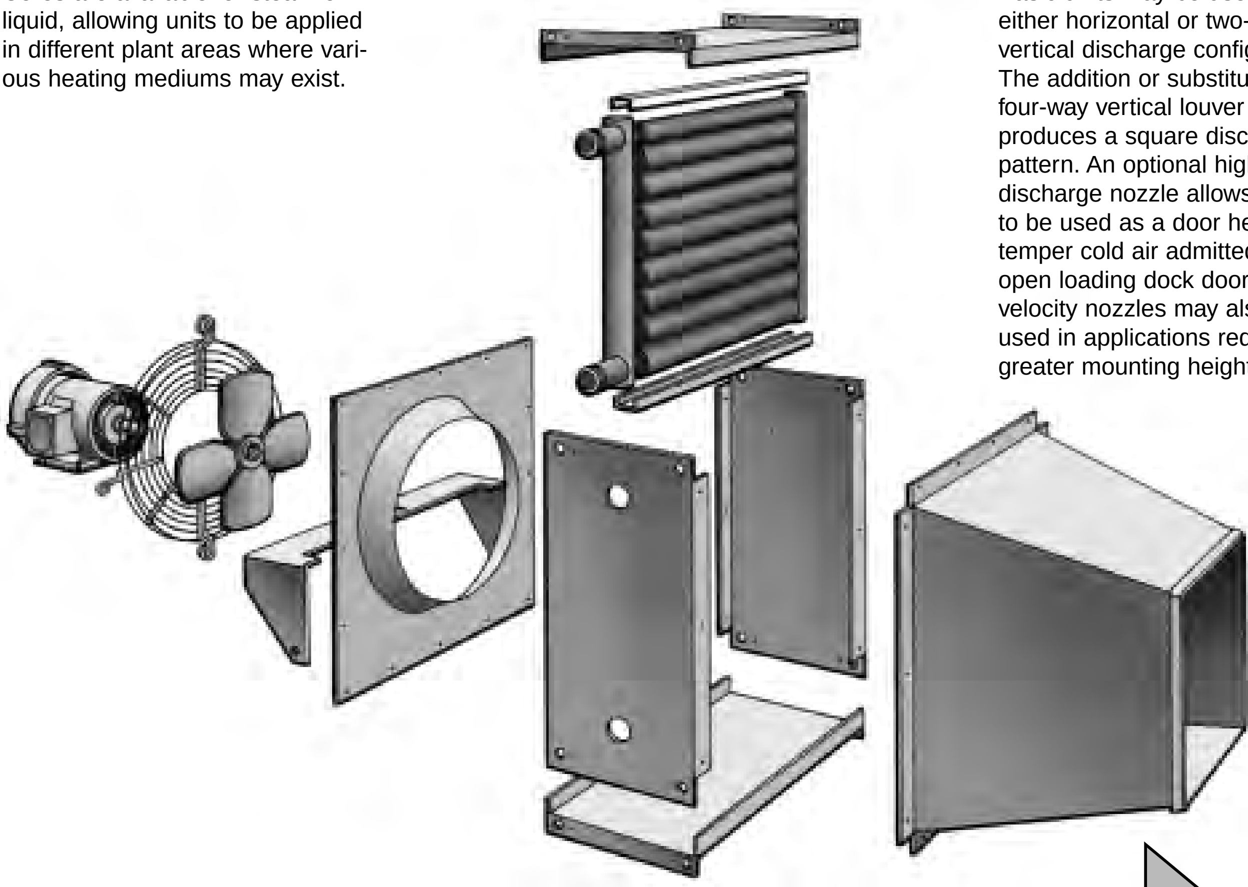
The keyfin is manufactured by forming a helical groove in the tube surface, winding the fin into the groove and peening the displaced metal from the groove against the fin. This means a tight fit between the fin and the tube. The keyfin is the superior design for dissimilar tube and fin material.

Keyfin



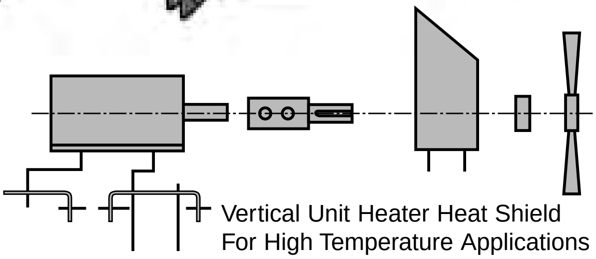
Steam or Liquid Compatible
Cores are available for steam or liquid, allowing units to be applied in different plant areas where various heating mediums may exist.

24" - 48" Size



Mounting Flexibility
Basic units may be used in either horizontal or two-way vertical discharge configurations. The addition or substitution of a four-way vertical louver section produces a square discharge pattern. An optional high-velocity discharge nozzle allows the unit to be used as a door heater to temper cold air admitted through open loading dock doors. High-velocity nozzles may also be used in applications requiring greater mounting heights.

Fan Size Flexibility
Armstrong unit heaters and door heaters are available in fan sizes ranging from 10" to 48".



Vertical Unit Heater Heat Shield
For High Temperature Applications

Model Number Selection

MODEL NUMBER

A [ ] Q – 182 – HS – T 58

FIN TYPE

- A = Aluminum Keyfin
- B = Heavy Aluminum Keyfin
- F = Copper Keyfin
- G = Steel L Fin
- J = 304 Stainless L Fin
- K = 316 Stainless L Fin
- P = Aluminum Platefin

NO. FINS/INCH (SEE NOTE 1)

TUBE MATERIAL

- Q = 12 Ga Steel Tube
- R = 10 Ga Steel Tube
- W = 14 Ga 304L SS Tube (See note 3)
- Y = 14 Ga 316L SS Tube (See note 3)

MODEL SIZE

- Fan Diameter (in)
- No. Rows of Tubes in Core

MOTOR ELECTRICAL CHARACTERISTICS (SEE NOTE 2)

- 12 = 115-230/1/60
- 20 = 208/1/60
- 21 = 208/3/60
- 23 = 230-460/3/60
- 58 = 575/3/60

MOTOR TYPE

- T = Totally Enclosed Fan Cooled
- X = Explosion-Proof
- M = Mill & Chemical

CORES

- S = Steam Core
- L = Liquid Core

DISCHARGE TYPE

- H = 2 Way Louver (Usually Hor. Discharge)
- V = 4 Way Louver (Usually Vert. Discharge)
- N = High Velocity Nozzle (Std on Door Heaters)

Notes:
1. If the number of fins/inch is standard, the numbers between fin type and tube material will be missing.

2. If dual or triple voltage motors are supplied, the voltage shown on the model number will be the lowest specified. It is the responsibility of the installer to ensure that the motor is wired correctly in accordance with the motor manufacturer's instructions to preclude damage.

3. May be substituted with Sch. 10 SS pipe.

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Next

Material Specifications

Unit Heater Core Material Specifications									
1" OD Tubes		Fins				Headers		Connections	
Material	Min. Wall Thickness	Material	Type	FPI	Minimum Thickness	Material	Minimum Thickness	Material	Minimum Thickness
Standard Materials									
Steel	.109"	Steel	L-Foot	11	.024"	Steel	.145"	Steel	.133"
Steel	.109"	Aluminum	Keyfin	11	.020"	Steel	.145"	Steel	.133"
Special Order Materials									
Steel	.109"	Copper	Keyfin	11	.016"	Steel	.145"	Steel	.133"
Stainless	.083"	Steel	L-Foot	11	.024"	Stainless	.109"	Stainless	.109"
Stainless	.083"	Stainless	L-Foot	10	.020"	Stainless	.109"	Stainless	.109"
Stainless	.083"	Aluminum	Keyfin	11	.020"	Stainless	.109"	Stainless	.109"
Stainless	.083"	Copper	Keyfin	11	.016"	Stainless	.109"	Stainless	.109"

NOTE: Stainless tubes available in either 304L or 316L.

Options:
- Special coatings such as powder coat epoxy, baked phenolic or hot dip galvanizing.
- Thicker tube walls.

Design Pressures and Testing Specifications

Core design pressure is 250 psig @ saturated steam temperature.
Standard testing is hydrostatic for 10 minutes at 500 psig. Higher pressure ratings are available upon request.

Enclosures

Enclosures, louvers and high-velocity nozzles are fabricated from 14 ga galvanized steel, finished in gray enamel. Available material options include stainless steel or aluminum. Epoxy coatings and other protective finishes are available.

Fans

Fans are of stamped aluminum with steel hubs and spiders on unit sizes 30" and smaller. Cast aluminum fans are furnished on unit sizes 36" and larger.

Fan guards are OSHA-approved and constructed of bright zinc plated steel wire.

Motor Specifications

Standard Motors

Construction:
TEFC, NEMA frame, rigid mount, continuous duty, NEMA B design, Class B insulation, 1.0 service factor, sealed ball bearings and steel frame.

Electrical Characteristics:
Single Phase (standard through 3/4 HP—optional extra cost 1-1/2 HP) 115, 208 & 230 volts. Three Phase (all sizes)—208, 230, 460 & 575 volts.

Special Purpose Motors

1. Explosion-proof motors are available in all horsepowers and voltages. They are suitable for Class I Group D and Class II Groups F & G service.

2. Environmentally Protected. Known as “Mill & Chemical,” “Severe” and “Hostile” duty motors.

   a. Single phase fractional HP. Available with 1.15 service factor, Class F insulation and protective coating of motor housing.

   b. Three phase 1/2 & 3/4 HP. Available with 1.15 service factor, Class F insulation, steel frame, cast iron end bells and conduit box, phosphatized or stainless steel shaft, shaft flingers and stainless steel nameplate.

   c. Three phase integral HP. Available with 1.15 service factor, Class F insulation, cast iron frame, end bells, fan cover and conduit box, stainless steel shaft, shaft flingers and stainless steel nameplate, epoxy coated.

3. High Temperature Applications

   a. For horizontal discharge applications where high ambient temperatures are encountered (typically 140°F - 150°F, 165°F maximum), motor HP or insulation class must be increased. Consult factory.

   b. For vertical units with on/off fan operation:

Heating Medium Temperature
300°F - 375°F
Class F Insulation & Heat Shield

375°F & Over
Class H Insulation & Heat Shield

Heating and Cooling Coils

Selecting Unit Heaters

A multi-step process is required to select the proper size, type and number of unit heaters to adequately heat a particular building. The process consists of the following steps:

1. Estimate the building heat loss.
2. Preliminarily select the number and type(s) of heaters to properly cover the area to be heated.
3. Select specific models and calculate the actual performance of equipment selected using actual heating medium conditions and inlet air temperatures.
4. Calculate actual throws, spreads and mounting heights and check to see that they will allow for complete coverage of the area to be heated.
5. If necessary, adjust selection and repeat steps 2 through 4.

Estimating Heat Loss

The ASHRAE Handbook of Fundamentals should be consulted to determine heat losses, taking into account specific building features. However, for an approximation of the heat loss from a typical modern industrial building, the following formula may be used.

With heated area size and outside design temperatures given:

A. Calculate the volume of the building in cubic feet:

Volume (cu ft) = floor length (ft) x floor width (ft) x average ceiling height (ft)

B. Calculate the area of walls and roofs that are exposed to outside temperature:

Exposed area (EA) = wall length (ft) x average ceiling height (ft) + floor area (sq ft)

C. Total heat load (MBH) =

$$\left(\frac{V}{25} + \frac{EA}{4}\right) = \frac{\Delta T}{1000}$$

Where
- V = Building Volume
- EA = Exposed Wall & Roof Area
- ΔT = Inside Design Temperature – Outside Design Temperature

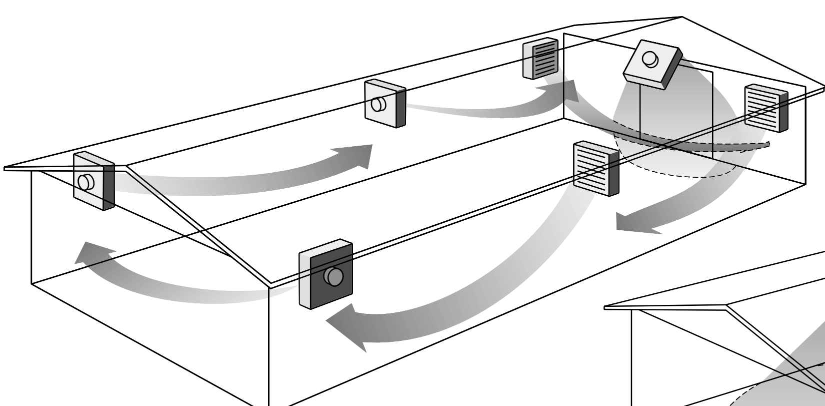
Selection of Number, Type(s), and Location of Unit Heaters

With the total heat loss calculated, the next step is to determine the number, type(s) and location of unit heaters. First, look at the layout of the building. From that, determine the general arrangement of the unit heaters. Some typical layouts are shown below, but any given arrangement should be tailored to the particular building. Some general rules to consider follow:

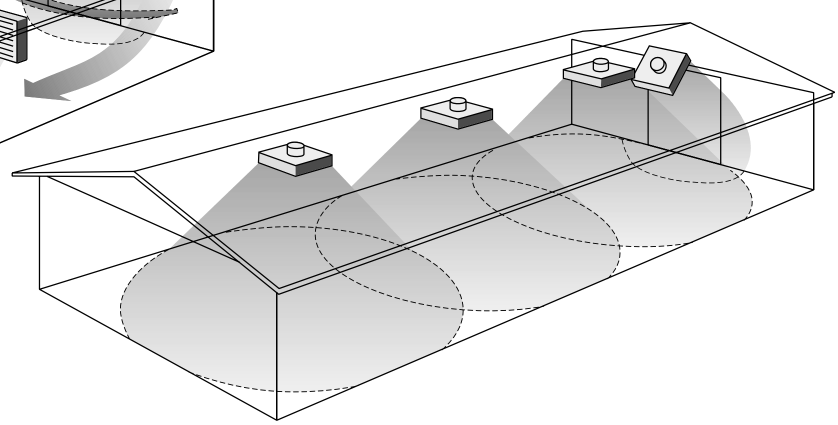
1. Horizontal unit heaters are used as a means to heat outside walls and should be directed to discharge toward or along walls to provide a wiping effect. Horizontal discharge units are generally sufficient to adequately heat most buildings except those with very large central floor areas or very high ceilings.

Heating and Cooling Coils

Typical Arrangements



Horizontal unit heaters provide a sweeping effect over outside walls and are sufficient to heat most buildings except those with large central floor areas.



Four-way vertical discharge units are used to heat large central areas and buildings with high ceilings or buildings with large heat loss through the ceiling.

2. Vertical unit heaters are used when a direct downward discharge to heat large central areas is needed. They may also be used if the mounting heights and throws allow for wiping of the walls with their discharge air. The discharge may be arranged for two-way airflow or four-way airflow with the addition or substitution of a four-way discharge section. A rectangular building might only need two-way discharge, whereas a square building would be better covered with a four-way arrangement.

   Vertical units are also used in buildings with high ceilings or where roof heat losses are exceptionally high. Hot air from the roof area is drawn into the units and directed down to floor level, minimizing temperature gradients and reducing fuel consumption.

   If fitted with a high-velocity discharge nozzle, units can be used at higher than normal mounting heights.

3. Door heaters simply use a high-velocity discharge nozzle to increase the air velocity to reach those areas that are hard to heat. These heaters can provide blankets of warm air to heat large open-loading doorways or busy entryways. They are also ideal for heating wide open plant areas. If door heater fans are activated only when doors are open their Btu output should not be considered as part of the heat loss makeup. See page C-35 for door heater selection guidelines.

4. Units should be directed toward the areas of greatest heat loss. Outside doorways and exposed windows require more careful consideration.

5. Unit heater airstreams should be minimally obstructed to allow for greatest heat distribution.

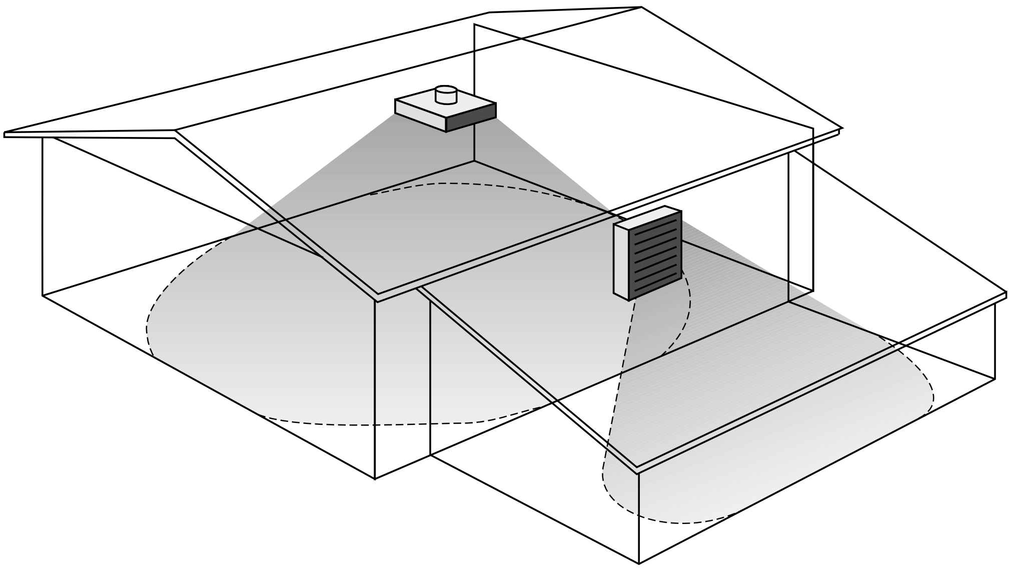
6. Unit heaters should be located to blow into open spaces such as aisles and along exterior walls rather than directly at personnel.

7. The mounting heights and throws specified on page C-43 and corrected for outlet air temperature should be followed. Improper mounting height distance will result in poor heat distribution and reduced comfort.

Once the general layout has been determined, you can begin selecting the type of model required. First, select any door heaters that may be required. Then, select any vertical unit heaters. If the vertical unit heaters are to be directed toward center floor areas and used in conjunction with horizontal units, calculate the percentage of the total area it is intended to cover and divide that by 2. That will give you the percentage of the total heat that is required from the vertical units.

Lastly, select the horizontal units. The remaining heat load to be provided is divided by the number of units desired. Here your choice may be between a number of smaller units or fewer larger units. Notice that as the units increase in size and heating capacity their throw also increases. Generally, fewer larger units will result in the most economical installation as long as full coverage is provided.

After completing this preliminary selection process, you can calculate the actual throws, spreads and mounting heights to ensure the area will be adequately heated. If you find that the required coverage cannot be met with your initial selections, recalculate coverage by adjusting unit size or number of units.



High-velocity vertical unit heaters and door heaters are used to reach hard-to-heat areas or to provide blankets of warm air to large open areas such as loading dock doors.

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Door heaters are identical in design to unit heaters with the addition of a high-velocity nozzle. This nozzle helps direct airflow precisely to heat the door area required.

Door Heater Model Size Selection Chart

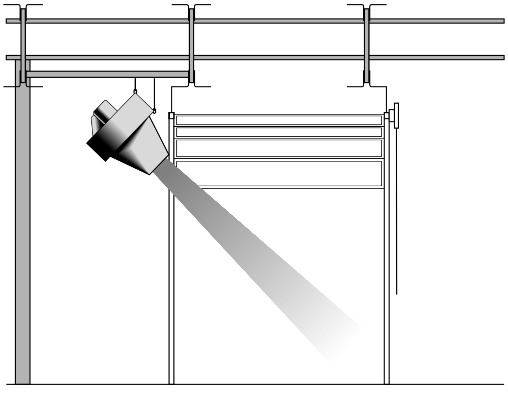
Door Size Width x Height (ft)	Outside Design Temperature							
	-40°F	-30°F	-20°F	-10°F	0°F	10°F	20°F	30°F
6 x 8	30	24	24	20	18	18	16	14
8 x 8	36	30	30	24	20	20	18	16
8 x 10	42	36	30	30	24	20	20	18
10 x 12	48	48	42	36	30	30	24	20
12 x 14	Two 42	Two 36	48	42	36	36	30	30
14 x 16	Two 48	Two 42	Two 36	48	42	42	36	30
16 x 18	Two 48	Two 48	Two 42	Two 36	48	48	42	36
18 x 20	Three 48	Three 42	Two 48	Two 42	Two 42	48	48	42
20 x 22	Three 48	Three 48	Three 42	Two 48	Two 42	Two 36	48	48
22 x 24	Four 48	Four 48	Three 48	Three 42	Two 48	Two 42	Two 36	48
24 x 26	Four 48	Four 48	Three 48	Three 48	Two 48	Two 42	Two 42	Two 36

How to Use This Model Size Chart:

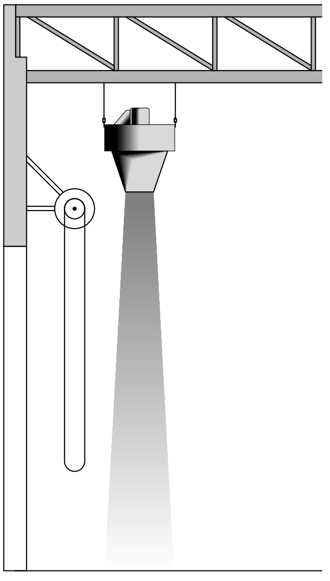
This chart gives the recommended size of door heaters. Select either a single- or double-row heating core from the appropriate performance chart (pages C-36 to C-43) to give a final air temperature within the 100°F to 130°F range.

- For roll-up or sliding doors, mount unit(s) to discharge vertically with the bottom of the discharge directly above the top of the door. For overhead doors, mount unit(s) back into the building at a distance to give sufficient clearance from the door in the open position. Aim the discharge toward the bottom of the door.
- For doors facing prevailing winds, select one size larger.
- If negative pressure exists in the building, consult factory.

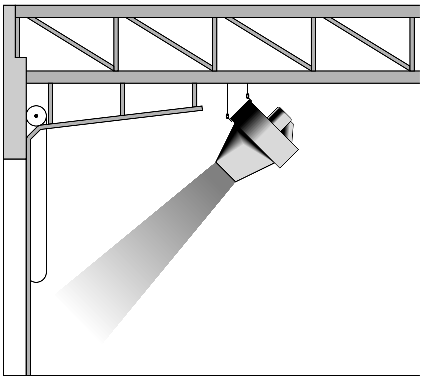
Typical Door Heater Arrangements



Side-mounted 45° discharge for low ceiling applications.



Vertical discharge for roll-up or sliding doors.



Front-mounted 45° discharge for overhead doors.

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Next

Performance Data With 2 psig① Steam, 60°F Entering Air Temperature

	Model Size	Common Data			Steel Tube / Aluminum Fin 11 FPI			Steel Tube / Steel Fin Stainless Tube / Steel Fin 11 FPI			Stainless Tube / Stainless Fin 10 FPI		
		Motor		CFM ②									
		HP	RPM		MBH ③	Leaving Air (°F)	Cond. (lb/hr)	MBH ③	Leaving Air (°F)	Cond. (lb/hr)	MBH ③	Leaving Air (°F)	Cond. (lb/hr)
Standard Models	101	1/3	1,725	810	36	102	38	29	93	30	17	80	18
	121	1/3	1,725	1,350	53	97	55	42	89	44	25	77	26
	141	1/3	1,725	2,590	80	89	83	64	83	66	37	73	39
	161	1/2	1,725	3,330	102	88	105	87	84	90	51	74	53
	181	3/4	1,725	4,420	128	87	133	109	83	113	64	73	66
	201	3/4	1,725	5,430	156	87	161	131	82	136	77	73	79
	241	1-1/2	1,125	7,020	205	87	212	179	84	185	105	74	108
	301	2	1,125	10,660	322	88	333	276	84	286	162	74	168
	361	2	1,125	13,440	406	88	420	351	84	363	206	74	213
	421	3	870	16,530	536	90	555	444	85	459	261	75	270
	481	3	870	22,110	692	89	716	593	85	614	349	75	361
High Outlet Air Temperature Models	102	1/3	1,725	700	55	133	57	45	119	47	28	98	29
	122	1/3	1,725	1,320	88	122	91	71	110	74	44	91	45
	142	1/3	1,725	1,980	122	117	126	100	107	103	61	88	63
	162	1/2	1,725	2,910	166	113	171	143	106	148	87	88	90
	182	3/4	1,725	3,900	212	110	219	182	103	189	110	86	114
	202	3/4	1,725	4,560	253	111	262	217	104	224	131	87	136
	242	1-1/2	1,125	6,000	343	113	355	304	107	315	186	89	192
	302	2	1,125	9,400	548	114	567	477	107	494	291	89	301
	362	2	1,125	12,160	722	115	747	622	107	643	380	89	393
	422	3	870	15,160	950	118	983	802	109	830	492	90	509
	482	3	870	20,040	1,234	117	1,277	1,063	109	1,100	652	90	675

NOTES:

① Steam pressure as supplied to unit heater. Valve and line losses must be subtracted from steam main pressure.
② Standard CFM measured at 70°F with density of .075 lb/cu ft.
③ Heat load in thousands of Btu/hr.

NOTE:
Leaving air temperature and MBH from table above must be corrected for steam pressures other than 2 psig and entering air temperatures other than 60°F.

Table below lists the correction factors. To determine correction factors falling between those shown, use the next lowest steam pressure and the next highest air temperature shown.

MBH (corrected) = MBH (above) x Correction Factor
LAT (corrected) = EAT + (MBH (corrected) x 926/CFM)
Condensate Load = MBH (corrected) x 1,000/Latent Heat of Steam

Correction Factors Based on 2 psig① Steam, 60°F Entering Air

Steam① Pressure (psig)	Temperature of Entering Air (°F)												Saturated Steam Temp. (°F)	Steam Latent Heat (Btu/lb)
	-10	0	10	20	30	40	50	60	70	80	90	100		
2	—	—	—	—	—	1.16	1.08	1.00	0.93	0.85	0.78	0.71	219	966
5	1.64	1.55	1.46	1.37	1.29	1.21	1.13	1.05	0.97	0.90	0.83	0.76	227	960
10	1.73	1.64	1.55	1.46	1.38	1.29	1.21	1.13	1.06	0.98	0.91	0.84	239	953
15	1.80	1.71	1.61	1.53	1.44	1.34	1.28	1.19	1.12	1.04	0.97	0.90	250	945
20	1.86	1.77	1.68	1.58	1.50	1.42	1.33	1.25	1.17	1.10	1.02	0.95	259	939
30	1.97	1.87	1.78	1.68	1.60	1.51	1.43	1.35	1.27	1.19	1.12	1.04	274	929
40	2.06	1.96	1.86	1.77	1.68	1.60	1.51	1.43	1.35	1.27	1.19	1.12	286	920
50	2.13	2.04	1.94	1.85	1.76	1.67	1.58	1.50	1.42	1.34	1.26	1.19	298	912
60	2.20	2.09	2.00	1.90	1.81	1.73	1.64	1.56	1.47	1.39	1.31	1.24	307	906
70	2.26	2.16	2.06	1.96	1.87	1.78	1.70	1.61	1.53	1.45	1.37	1.29	316	898
75	2.28	2.18	2.09	1.99	1.90	1.81	1.72	1.64	1.55	1.47	1.40	1.32	320	895
80	2.31	2.21	2.11	2.02	1.93	1.84	1.75	1.66	1.58	1.50	1.42	1.34	324	891
90	2.36	2.26	2.16	2.06	1.97	1.88	1.79	1.71	1.62	1.54	1.46	1.38	331	886
100	2.41	2.31	2.20	2.11	2.02	1.93	1.84	1.75	1.66	1.58	1.50	1.42	338	880
125	2.51	2.41	2.31	2.21	2.11	2.02	1.93	1.84	1.76	1.68	1.59	1.51	353	868
150	2.60	2.50	2.40	2.30	2.20	2.11	2.02	1.93	1.84	1.76	1.67	1.59	366	857
200	2.75	2.65	2.55	2.45	2.35	2.25	2.16	2.07	1.98	1.89	1.81	1.72	388	837
250	2.87	2.77	2.67	2.57	2.46	2.36	2.27	2.18	2.09	2.01	1.92	1.81	408	820

Performance Data With 200°F① Water, 60°F Entering Air Temperature

	Model Size	Common Data			Steel Tube / Aluminum Fin 11 FPI					Steel Tube / Steel Fin Stainless Tube / Steel Fin 11 FPI					Stainless Tube / Stainless Fin 10 FPI				
		Motor																	
		HP	RPM	CFM ②	Water Temp. Drop	MBH ③	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)	Water Temp. Drop	MBH ③	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)	Water Temp. Drop	MBH ③	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)
Standard Models	102	1/3	1,725	700	10	45	119	8.9	2.01	10	33	104	6.7	1.02	10	25	93	5.0	.54
					20	39	112	3.9	.39	20	29	99	2.9	.20	20	22	89	2.2	.10
					30	34	106	2.3	.13	30	25	93	1.7	.07	30	19	86	1.3	.04
	122	1/3		1,320	10	62	103	12.4	4.01	10	52	96	10.4	1.87	10	38	87	7.6	.95
					20	55	99	5.5	.79	20	46	92	4.6	.37	20	34	84	3.4	.19
					30	49	94	3.2	.27	30	40	88	2.7	.13	30	30	81	2.0	.07
	142	1/3		1,980	10	90	102	18.0	1.95	10	76	96	15.2	.94	10	55	86	11.0	.46
					20	78	97	7.8	.37	20	66	91	6.6	.18	20	48	82	4.8	.09
					30	67	92	4.5	.12	30	57	87	3.8	.06	30	42	79	2.8	.03
	162	1/2		2,910	10	119	98	23.9	2.77	10	97	91	19.3	1.24	10	70	82	14.0	.62
					20	105	94	10.5	.54	20	85	87	8.5	.24	20	61	80	6.1	.12
					30	92	89	6.1	.18	30	75	84	5.0	.08	30	54	77	3.6	.04
	182	3/4		3,900	10	156	97	31.2	3.89	10	132	91	26.5	1.77	10	94	82	18.9	.85
					20	137	93	13.7	.75	20	116	88	11.6	.34	20	83	80	8.3	.17
					30	121	89	8.1	.26	30	102	84	6.8	.12	30	74	78	4.9	.06
	202	3/4		4,560	10	190	99	38.0	4.88	10	161	93	32.2	2.25	10	115	83	23.1	1.08
					20	170	95	17.0	.97	20	144	89	14.4	.45	20	103	81	10.3	.22
					30	150	91	10.0	.34	30	127	86	8.4	.15	30	91	79	6.1	.08
	242	1-1/2	1,125	6,000	10	284	104	56.8	8.39	10	237	97	47.4	3.87	10	169	86	33.7	1.82
					20	258	100	25.8	1.73	20	214	93	21.4	.79	20	153	84	15.3	.37
					30	232	96	15.5	.62	30	196	90	13.1	.29	30	137	81	9.2	.13
	302	2		9,400	15	437	103	58.2	4.10	10	380	97	75.9	6.36	10	267	86	53.4	2.94
					20	416	101	41.6	2.79	20	345	94	34.5	1.31	20	245	84	24.5	.62
					30	381	98	25.4	1.04	30	315	91	21.0	.49	30	222	82	14.8	.23
	362	2		12,160	15	575	104	76.7	5.84	10	491	97	98.2	9.20	10	352	87	70.4	4.41
					20	552	102	55.2	4.19	20	452	95	45.3	1.96	20	324	85	32.4	.94
					30	506	99	33.7	1.56	30	419	92	27.9	.74	30	297	83	19.8	.35
	422	3	870	15,160	10	748	106	149.7	3.05	10	612	97	122.5	1.43	10	452	88	90.4	.70
					20	675	101	67.5	.62	20	552	94	55.2	.29	20	406	85	40.6	.14
					30	603	97	40.2	.22	30	490	90	32.6	.10	30	364	82	24.2	.05
	482	3		20,040	10	989	106	197.8	4.36	10	820	98	164.1	1.97	10	547	88	119.5	.98
					20	892	101	89.2	.89	20	745	94	74.5	.41	20	539	85	53.9	.20
					30	801	97	53.4	.32	30	667	91	44.4	.14	30	487	83	32.5	.07
Low Outlet Air Temperature Models	101	1/3	1,725	810	10	28	92	5.6	3.80	10	21	84	4.2	2.09	10	16	78	3.1	.86
					20	25	88	2.5	.74	20	19	82	1.9	.43	20	14	76	1.4	.17
					30	22	85	1.5	.26	30	17	79	1.1	.15	30	12	74	.8	.06
	121	1/3		1,350	10	41	88	8.2	6.20	10	32	82	6.3	3.54	10	23	76	4.6	1.4
					20	36	85	3.7	1.24	20	29	80	2.9	.73	20	20	74	2.0	.28
					30	32	82	2.2	.44	30	25	77	1.7	.25	30	18	73	1.2	.10
	141	1/3		2,590	10	60	81	12.0	3.13	10	47	77	9.5	1.85	10	33	72	6.6	.68
					20	52	79	5.2	.58	20	41	75	4.1	.35	20	29	70	2.9	.13
					30	45	76	3.0	.20	30	36	73	2.4	.12	30	25	69	1.7	.04
	161	1/2		3,330	10	76	81	15.3	4.15	10	63	78	12.7	2.19	10	45	73	9.0	.84
					20	67	79	6.7	.80	20	57	76	5.7	.44	20	40	71	4.0	.16
					30	58	76	3.9	.27	30	49	74	3.3	.15	30	35	70	2.3	.06
	181	3/4		4,420	10	97	80	19.5	5.62	10	81	77	16.1	3.03	10	57	72	11.4	1.15
					20	86	78	8.6	1.09	20	73	75	7.3	.61	20	50	71	5.0	.22
					30	75	76	5.0	.37	30	64	74	4.3	.21	30	45	69	3.0	.08
	201	3/4		5,430	10	119	80	23.8	7.14	10	98	77	19.6	3.85	10	69	72	13.7	1.44
					20	106	78	10.6	1.40	20	88	75	8.8	.78	20	62	71	6.2	.29
					30	94	76	6.3	.49	30	79	74	5.3	.28	30	55	69	3.7	.10
	241	1-1/2	1,125	7,020	15	160	81	21.4	4.47	10	136	78	27.1	4.76	10	95	73	19.0	2.16
					20	153	80	15.3	2.28	20	123	76	12.3	.97	20	86	71	8.6	.45
					30	137	78	9.1	.80	30	111	75	7.4	.36	30	78	70	5.2	.16
	301	2		10,660	15	249	82	33.2	6.66	10	208	78	41.7	7.22	10	149	73	29.7	3.41
					20	236	81	23.6	3.37	20	190	77	19.0	1.50	20	137	72	13.7	.74
					30	215	79	14.4	1.25	30	173	75	11.5	.55	30	124	71	8.3	.27
	361	2		13,440	15	327	83	43.6	9.87	10	269	79	53.7	10.43	10	190	73	38.0	4.88
					20	312	82	31.2	5.07	20	247	77	24.7	2.20	20	177	72	17.7	1.06
					30	285	80	19.0	1.87	30	226	76	15.1	.82	30	161	71	10.7	.39
	421	3	870	16,530	10	425	84	85.0	3.74	10	337	79	67.5	1.66	10	234	73	46.8	.74
					20	380	81	38.0	.75	20	300	77	30.0	.33	20	211	72	21.1	.15
					30	336	79	22.4	.26	30	266	75	17.7	.11	30	186	70	12.4	.05
	481	3		22,110	10	559	83	111.8	5.33	10	451	79	90.3	2.30	10	315	73	63.0	1.03
					20	502	81	50.2	1.07	20	406	77	40.6	.46	20	284	72	28.4	.21
					30	451	79	30.1	.39	30	365	75	24.4	.17	30	253	71	16.9	.07

NOTES:

① Water temperature at the unit heater.
② Standard CFM measured at 70°F with density of .075 lb/cu ft.
③ Heat load in thousands of Btu/hr.

NOTE:
Leaving air temperature and MBH from table on previous page must be corrected for water temperatures other than 200°F and entering air temperatures other than 60°F. Liquid flow rates and pressure drops are not corrected.

Table below lists the correction factors. To determine correction factors falling between those shown, use the next lowest water temperature and the next highest entering air temperature shown.

MBH (corrected) = MBH (from page C-37) x Correction Factor

LAT (corrected) = EAT + (MBH (corrected) x 926/CFM)

Water ΔT = MBH (corrected) x 2.00/USGPM

Correction Factors Based on 200°F① Entering Water, 60°F① Entering Air

Entering Water Temp. (°F)	Temperature of Entering Air (°F)										
	0	10	20	30	40	50	60	70	80	90	100
160	1.23	1.14	1.05	0.96	0.88	0.80	0.72	0.63	0.57	0.48	0.41
170	1.31	1.21	1.12	1.04	0.95	0.87	0.79	0.70	0.63	0.55	0.48
180	1.38	1.29	1.20	1.11	1.02	0.94	0.86	0.77	0.70	0.62	0.55
190	1.46	1.36	1.27	1.18	1.10	1.01	0.93	0.85	0.77	0.69	0.62
200	1.54	1.44	1.35	1.26	1.17	1.09	1.00	0.92	0.84	0.76	0.68
210	1.61	1.52	1.42	1.33	1.25	1.16	1.07	0.99	0.91	0.83	0.75
220	1.69	1.59	1.50	1.41	1.32	1.23	1.14	1.06	0.98	0.90	0.82
230	1.77	1.67	1.57	1.48	1.39	1.30	1.22	1.13	1.05	0.97	0.89
240	1.84	1.75	1.65	1.55	1.47	1.37	1.29	1.20	1.12	1.04	0.96
250	1.92	1.82	1.72	1.63	1.54	1.45	1.36	1.27	1.19	1.11	1.03

Performance Data With 300°F[1] Water, 60°F Entering Air Temperature

	Model Size	Common Data – Motor HP	Common Data – Motor RPM	Common Data – CFM [2]	Steel Tube / Aluminum Fin 11 FPI					Steel Tube / Steel Fin Stainless Tube / Steel Fin 11 FPI					Stainless Tube / Stainless Fin 10 FPI				
					Water Temp. Drop	MBH [3]	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)	Water Temp. Drop	MBH [3]	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)	Water Temp. Drop	MBH [3]	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)
Standard Models	102	1/3	1,725	700	40	69	151	3.4	.30	40	51	127	2.5	.15	40	38	111	1.9	.08
					60	64	145	2.1	.16	60	45	119	1.5	.05	60	34	106	1.2	.03
					80	60	140	1.5	.06	80	40	113	1.0	.02	80	30	99	.7	.01
	122	1/3		1,320	40	96	128	4.8	.61	40	79	116	4.0	.25	40	59	101	2.9	.14
					60	86	120	2.9	.21	60	71	110	2.4	.10	60	53	97	1.8	.05
					80	75	113	1.9	.09	80	62	104	1.6	.04	80	47	93	1.2	.02
	142	1/3		1,980	40	137	124	6.8	.28	40	116	114	5.8	.14	40	84	99	4.2	.07
					60	120	116	4.0	.10	60	101	107	3.4	.05	60	74	95	2.5	.02
					80	103	108	2.6	.04	80	86	100	2.1	.02	80	63	90	4.6	.01
	162	1/2		2,910	40	185	119	9.2	.41	30	148	107	7.4	.18	40	108	94	5.4	.09
					60	162	112	5.4	.14	60	131	102	4.4	.06	60	94	90	3.1	.03
					80	140	105	3.5	.06	80	114	96	2.8	.03	80	82	86	2.1	.01
	182	3/4		3,900	40	240	117	12.0	.58	40	203	108	10.2	.26	40	146	95	7.3	.13
					60	213	111	7.1	.20	60	179	103	6.0	.09	60	129	91	4.3	.04
					80	185	104	4.6	.09	80	158	97	3.9	.04	80	113	87	2.8	.02
	202	3/4		4,560	40	296	120	14.8	.74	40	251	111	12.5	.34	40	178	96	8.9	.16
					60	264	114	8.8	.26	60	224	106	7.5	.12	60	161	93	5.4	.06
					80	233	107	5.8	.11	80	197	100	4.9	.05	80	141	89	3.5	.03
	242	1-1/2	1,125	6,000	40	444	129	22.2	1.00	40	373	118	18.6	.60	40	264	101	13.2	.28
					60	405	123	13.5	.37	60	336	112	11.2	.22	60	238	97	7.9	.10
					80	363	116	9.1	.17	80	301	107	7.5	.10	80	214	93	5.4	.05
	302	2		9,400	40	721	131	36.0	1.57	40	596	119	29.8	.98	40	421	102	21.1	.46
					60	660	125	22.0	.59	60	543	114	18.1	.36	60	383	98	12.8	.17
					80	599	119	15.0	.27	80	493	109	12.3	.17	80	348	94	8.7	.08
	362	2		12,160	40	950	132	47.5	2.24	40	781	120	39.1	1.46	40	557	102	27.8	.69
					60	873	127	29.1	.84	60	714	114	23.8	.54	60	511	99	17.0	.26
					80	799	121	20.0	.40	80	654	110	16.4	.25	80	465	95	11.6	.12
	422	3	870	15,160	40	1,167	131	58.4	.32	40	956	118	47.8	.22	40	704	103	35.2	.11
					60	1,048	124	34.9	.12	60	856	112	28.5	.08	60	632	99	21.1	.04
					80	933	117	23.3	.05	80	763	107	19.1	.03	80	560	94	14.0	.02
	482	3		20,040	40	1,543	131	77.2	.45	40	1,294	120	64.7	.31	40	939	103	47.0	.15
					60	1,392	124	46.4	.16	60	1,158	114	38.6	.11	60	848	99	28.3	.05
					80	1,255	118	31.4	.07	80	1,045	108	26.1	.05	80	753	95	18.8	.02
Low Outlet Air Temperature Models	101	1/3	1,725	810	40	43	109	2.1	.56	40	33	98	1.7	.32	40	24	88	1.2	.13
					60	38	104	1.3	.20	60	30	94	1.0	.11	60	21	85	.7	.05
					80	34	98	.8	.09	80	26	90	.7	.05	80	19	82	.5	.02
	121	1/3		1,350	40	63	103	3.2	.93	40	49	94	2.5	.53	40	35	84	1.8	.21
					60	57	99	1.9	.33	60	45	91	1.5	.20	60	32	82	1.1	.08
					80	50	95	1.3	.15	80	39	87	1.0	.08	80	28	79	.7	.03
	141	1/3		2,590	40	91	93	4.6	.45	40	71	86	3.6	.26	40	50	78	2.5	.10
					60	80	89	2.7	.15	60	63	83	2.1	.09	60	44	76	1.5	.03
					80	69	85	1.7	.06	80	55	80	1.4	.04	80	38	74	1.0	.01
	161	1/2		3,330	40	117	93	5.8	.61	30	98	87	4.9	.33	40	69	79	3.5	.13
					60	103	89	3.4	.21	60	87	84	2.9	.12	60	61	77	2.0	.04
					80	89	85	2.2	.09	80	77	81	1.9	.05	80	54	75	1.4	.02
	181	3/4		4,420	40	150	91	7.5	.83	40	126	86	6.3	.46	40	87	78	4.4	.17
					60	133	88	4.4	.29	60	112	83	3.7	.16	60	78	76	2.6	.06
					80	117	84	2.9	.18	80	99	81	2.5	.07	80	69	74	1.7	.03
	201	3/4		5,430	40	185	92	9.2	1.07	40	153	86	7.6	.58	40	107	78	5.4	.22
					60	164	88	5.5	.38	60	138	84	4.6	.21	60	96	76	3.2	.08
					80	144	85	3.6	.16	80	122	81	3.1	.09	80	84	74	2.1	.03
	241	1-1/2	1,125	7,020	40	263	95	13.2	1.68	40	214	88	10.7	.74	40	149	80	7.4	.33
					60	239	92	8.0	.62	60	192	85	6.4	.26	60	135	78	4.5	.12
					80	212	88	5.3	.27	80	173	83	4.3	.12	80	121	76	3.0	.05
	301	2		10,660	40	408	96	20.4	2.53	40	329	89	16.7	1.13	40	234	80	11.7	.54
					60	372	92	12.4	.93	60	298	86	9.9	.41	60	213	79	7.1	.20
					80	334	89	8.4	.42	80	269	83	6.7	.19	80	192	77	4.8	.09
	361	2		13,440	40	537	97	26.9	3.75	40	425	89	21.3	1.64	40	302	81	15.1	.77
					60	494	94	16.5	1.41	60	389	87	13.0	.61	60	276	79	9.2	.29
					80	447	91	11.2	.65	80	356	85	8.9	.29	80	250	77	6.2	.13
	421	3	870	16,530	40	661	97	33.0	.57	40	528	90	26.4	.25	40	362	80	18.1	.11
					60	586	93	19.5	.20	60	466	86	15.5	.09	60	323	78	10.8	.04
					80	520	89	13.0	.09	80	411	83	10.3	.04	80	286	76	7.1	.02
	481	3		22,110	30	876	97	43.8	.82	40	700	89	35.0	.35	40	492	81	24.6	.16
					60	783	93	26.1	.29	60	630	86	21.0	.12	60	442	79	14.7	.06
					80	693	89	17.3	.13	80	564	84	14.1	.06	80	392	76	9.8	.02

Next

NOTES:

① Water temperature at the unit heater.
② Standard CFM measured at 70°F with density of .075 lb/cu ft.
③ Heat load in thousands of Btu/hr.

NOTE:
Leaving air temperature and MBH from table on previous page must be corrected for water temperatures other than 300°F and entering air temperatures other than 60°F. Liquid flow rates and pressure drops are not corrected.

Table below lists the correction factors. To determine correction factors falling between those shown, use the next lowest water temperature and the next highest entering air temperature shown.

MBH (corrected) = MBH (from page C-39) x Correction Factor

LAT (corrected) = EAT + (MBH (corrected) x 926/CFM)

Water ∆T = MBH (corrected) x 2.08/USGPM

Correction Factors Based on 300°F① Entering Water, 60°F Entering Air

Entering Water Temp. (°F)	Temperature of Entering Air (°F)										
	0	10	20	30	40	50	60	70	80	90	100
260	1.15	1.10	1.04	0.99	0.94	0.88	0.83	0.78	0.73	0.69	0.64
270	1.19	1.14	1.08	1.03	0.98	0.93	0.88	0.82	0.78	0.73	0.68
280	1.23	1.18	1.13	1.08	1.02	0.97	0.92	0.87	0.82	0.77	0.72
290	1.27	1.22	1.17	1.12	1.07	1.01	0.96	0.91	0.86	0.81	0.76
300	1.31	1.26	1.21	1.16	1.11	1.05	1.00	0.95	0.90	0.85	0.80
310	1.35	1.30	1.25	1.21	1.15	1.10	1.04	0.99	0.94	0.89	0.84
320	1.41	1.36	1.30	1.26	1.19	1.14	1.09	1.03	0.98	0.93	0.88
330	1.45	1.40	1.34	1.30	1.23	1.18	1.13	1.07	1.02	0.97	0.92
340	1.49	1.44	1.39	1.34	1.27	1.22	1.17	1.11	1.06	1.01	0.95
350	1.54	1.48	1.43	1.38	1.33	1.26	1.21	1.15	1.10	1.05	1.00
360	1.58	1.52	1.47	1.42	1.36	1.30	1.25	1.20	1.14	1.09	1.04
370	1.62	1.57	1.51	1.46	1.40	1.35	1.29	1.24	1.18	1.13	1.08
380	1.66	1.61	1.55	1.50	1.44	1.39	1.33	1.28	1.22	1.17	1.12
390	1.71	1.65	1.60	1.54	1.49	1.43	1.37	1.32	1.27	1.21	1.16
400	1.74	1.69	1.63	1.57	1.53	1.47	1.42	1.36	1.31	1.25	1.20

Heating and Cooling Coils

Performance Data With 200°F① 50% Ethylene Glycol, 60°F Entering Air Temperature

	Model Size	Common Data			Steel Tube / Aluminum Fin 11 FPI					Steel Tube / Steel Fin Stainless Tube / Steel Fin 11 FPI					Stainless Tube / Stainless Fin 10 FPI				
		Motor HP	Motor RPM	CFM ②	Temp. Drop	MBH ③	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)	Temp. Drop	MBH ③	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)	Temp. Drop	MBH ③	Leaving Air (°F)	USGPM	Pressure Drop (ft wg)
Standard Models	102	1/3	1,725	700	10	33	104	7.6	13.03	10	30	99	6.8	8.66	10	22	89	5.0	3.72
					20	29	98	3.3	2.42	20	26	94	2.9	1.65	20	20	86	2.3	.76
					30	26	94	2.0	.87	30	24	91	1.8	.62	30	18	84	1.4	.29
	122	1/3		1,320	10	53	97	12.2	20.10	10	47	93	10.8	13.60	10	35	84	7.9	5.67
					20	45	92	5.2	3.68	20	41	89	4.6	2.55	20	31	81	3.5	1.10
					30	40	88	3.1	1.30	30	37	86	2.8	.92	30	28	80	2.1	.42
	142	1/3		1,980	10	72	94	16.4	6.68	10	63	89	14.3	4.47	10	46	82	10.5	1.85
					20	60	88	6.8	1.17	20	54	85	6.1	.82	20	41	79	4.6	.36
					30	54	85	4.1	.41	30	48	83	3.7	.30	30	38	78	2.9	.14
	162	1/2		2,910	10	100	92	22.8	9.08	10	84	87	19.1	5.73	10	61	79	13.9	2.31
					20	82	86	9.3	1.54	20	71	83	8.1	1.03	20	53	77	6.1	.45
					30	72	83	5.5	.54	30	64	80	4.9	.37	30	49	76	3.8	.17
	182	3/4		3,900	10	131	91	29.8	11.60	10	113	87	25.9	7.17	10	82	80	18.8	2.89
					20	107	85	12.2	1.95	20	97	83	11.0	1.31	20	72	77	8.2	.55
					30	94	82	7.2	.68	30	86	80	6.5	.46	30	66	76	5.0	.21
	202	3/4		4,560	10	160	92	36.5	13.30	10	138	88	31.6	8.40	10	100	80	22.7	3.33
					20	132	87	15.1	2.32	20	117	84	13.3	1.51	20	87	78	10.0	.64
					30	115	83	8.7	.78	30	104	81	8.0	.54	30	80	76	6.1	.24
	242	1-1/2	1,125	6,000	15	220	94	33.6	7.08	10	204	91	46.5	11.67	10	145	82	33.2	4.57
					20	203	91	23.2	3.43	20	173	87	19.8	2.15	20	128	80	14.7	.90
					30	179	88	13.6	1.19	30	156	84	11.8	.78	30	117	78	8.9	.34
	302	2		9,400	15	366	96	55.7	10.42	10	330	93	75.4	16.89	10	236	83	53.8	6.64
					20	338	93	38.6	5.08	20	284	88	32.5	3.23	20	208	81	23.8	1.32
					30	296	89	22.6	1.76	30	254	85	19.3	1.16	30	189	79	14.4	.49
	362	2		12,160	15	494	98	75.2	14.48	10	439	93	100.2	22.85	10	314	84	71.7	9.07
					20	456	95	52.1	7.06	20	381	89	43.5	4.49	20	278	81	31.8	1.83
					30	401	91	30.5	2.47	30	342	86	26.0	1.62	30	255	79	19.4	.69
	422	3	870	15,160	10	639	99	145.9	4.24	10	535	93	122.3	2.63	10	390	84	89.02	1.06
					20	534	93	61.0	.76	20	462	88	52.7	.50	20	346	81	39.5	.21
					30	472	88	35.9	.27	30	413	85	31.4	.18	30	318	79	24.2	.08
	482	3		20,040	10	844	99	192.8	5.69	10	714	93	163.2	3.53	10	517	84	118.2	1.42
					20	714	93	81.6	1.06	20	613	88	70.0	.67	20	457	81	52.2	.28
					30	628	89	47.8	.37	30	552	86	42.0	.24	30	420	79	32.0	.11
Low Outlet Air Temperature Models	101	1/3	1,725	810	15	22	85	3.3	7.06	10	19	82	4.3	12.33	10	14	76	3.2	5.03
					20	20	83	2.3	3.40	20	16	79	1.9	2.30	20	12	74	1.4	.99
					30	18	80	1.4	1.20	30	15	77	1.1	.84	30	11	73	.9	.37
	121	1/3		1,350	15	32	82	4.9	10.11	10	28	79	6.5	17.62	10	20	77	4.6	6.86
					20	29	80	3.4	4.77	20	24	77	2.8	3.22	20	18	72	2.0	1.35
					30	26	78	2.0	1.67	30	22	75	1.6	1.15	30	16	71	1.2	.51
	141	1/3		2,590	10	50	78	11.3	10.25	10	40	74	9.1	6.71	10	29	70	6.5	2.62
					20	40	74	4.6	1.72	20	34	72	3.8	1.19	20	25	69	2.8	.50
					30	35	73	2.7	.59	30	30	71	2.3	.42	30	23	68	1.7	.19
	161	1/2		3,330	10	64	78	14.6	12.51	10	55	75	12.7	7.63	10	39	71	9.0	2.94
					20	52	74	5.9	2.08	20	46	73	5.3	1.35	20	35	70	3.9	.57
					30	45	73	3.5	.71	30	42	72	3.2	.49	30	31	69	2.4	.21
	181	3/4		4,420	10	83	77	18.9	15.80	10	71	75	16.1	9.63	10	50	70	11.3	3.66
					20	67	74	7.6	2.64	20	59	72	6.8	1.71	20	43	69	5.0	.71
					30	58	72	4.4	.89	30	53	71	4.0	.60	30	40	68	3.0	.26
	201	3/4		5,430	15	92	76	13.9	6.90	10	87	75	19.8	11.59	10	61	70	13.9	4.4
					20	83	74	9.5	3.22	20	72	72	8.2	2.04	20	53	69	6.0	.83
					30	72	72	5.5	1.06	30	64	71	4.9	.71	30	48	68	3.7	.31
	241	1-1/2	1,125	7,020	15	135	78	20.6	9.67	10	121	76	27.7	15.18	10	86	71	19.6	5.84
					20	124	76	14.1	4.61	20	103	74	11.8	2.81	20	74	70	8.5	1.11
					30	106	74	8.1	1.53	30	91	72	6.9	.98	30	68	69	5.1	.41
	301	2		10,660	15	212	78	32.3	13.15	10	193	77	44.2	21.64	10	136	72	31.0	8.26
					20	196	77	22.4	6.41	20	165	74	18.8	4.06	20	119	70	13.5	1.61
					30	169	75	12.9	2.16	30	146	73	11.1	1.44	30	107	69	8.2	.59
	361	2		13,440	15	285	80	43.3	18.11	10	251	77	57.4	28.27	10	174	72	39.8	10.54
					20	261	78	29.8	8.77	20	215	75	24.6	5.42	20	152	71	17.4	2.08
					30	228	76	17.4	3.02	30	190	73	14.5	1.91	30	138	70	10.5	.76
	421	3	870	16,530	10	366	81	83.6	5.28	10	293	76	66.9	3.13	10	207	72	47.31	1.20
					20	302	77	34.5	.93	20	245	74	28.0	.56	20	180	70	20.6	.23
					30	262	75	20.0	.32	30	218	72	16.6	.20	30	164	69	12.5	.09
	481	3		22,110	10	490	81	111.8	7.29	10	399	77	91.1	4.21	10	279	72	63.8	1.54
					20	404	77	46.1	1.29	20	334	74	38.2	.76	20	244	70	27.8	.31
					30	351	75	26.7	.44	30	299	73	22.7	.27	30	222	69	16.9	.11

NOTES:

① Glycol temperature at the unit heater.
② Standard CFM measured at 70°F with density of .075 lb/cu ft.
③ Heat load in thousands of Btu/hr.

NOTE:
Leaving air temperature and MBH from table on previous page must be corrected for water temperatures other than 300°F and entering air temperatures other than 60°F. Liquid flow rates and pressure drops are not corrected.

Table below lists the correction factors. To determine correction factors falling between those shown, use the next lowest glycol temperature and the next highest entering air temperature shown.

MBH (corrected) = MBH (from page C-41) x Correction Factor

LAT (corrected) = EAT + (MBH (corrected) x 926/CFM)

Glycol ΔT = MBH (corrected) x 2.27/USGPM

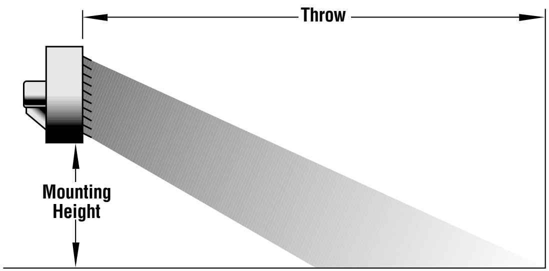
Correction Factors Based on 200°F① Entering 50% Ethylene Glycol, 60°F Entering Air

Entering Glycol Temp. (°F)	Temperature of Entering Air (°F)										
	0	10	20	30	40	50	60	70	80	90	100
160	1.19	1.08	0.98	0.87	0.78	0.66	—	—	—	—	—
170	1.31	1.20	1.09	0.99	0.86	0.75	0.64	—	—	—	—
180	1.42	1.31	1.20	1.10	0.96	0.85	0.74	0.66	—	—	—
190	1.52	1.41	1.30	1.20	1.08	0.97	0.86	0.77	0.68	—	—
200	1.61	1.51	1.39	1.30	1.22	1.11	1.00	0.90	0.80	0.70	—
210	1.70	1.60	1.49	1.39	1.32	1.22	1.10	1.02	0.94	0.86	0.78
220	1.78	1.68	1.58	1.48	1.40	1.31	1.20	1.12	1.03	0.97	0.90
230	1.86	1.76	1.66	1.57	1.49	1.40	1.30	1.22	1.14	1.07	1.00
240	1.93	1.83	1.74	1.65	1.56	1.48	1.40	1.30	1.21	1.13	1.06
250	1.98	1.89	1.80	1.72	1.63	1.54	1.48	1.38	1.30	1.21	1.13

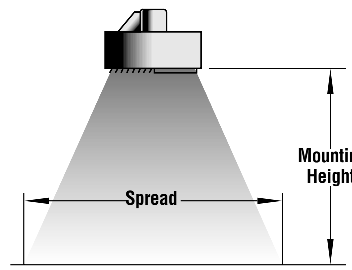
Armstrong® Mounting Heights, Throws and Spreads

The mounting heights, throws and spreads listed below are based on an air temperature rise (ΔT) of 40°F. To arrive at these values for temperature rises other than 40°F, first determine the actual temperature rise from the appropriate performance data page. Then, multiply the values from table below by the correction factors shown.

NOTES:
1. Minimum mounting height is 7 feet.
2. Mounting height is measured from bottom of unit to floor.
3. Values in the table were determined with louvers at 45°.
4. If four-way discharge louvers are used for horizontal applications, multiply throws by 0.8.
5. Values given are based upon average conditions and could be severely affected by such factors as obstructions, cross drafts, etc.

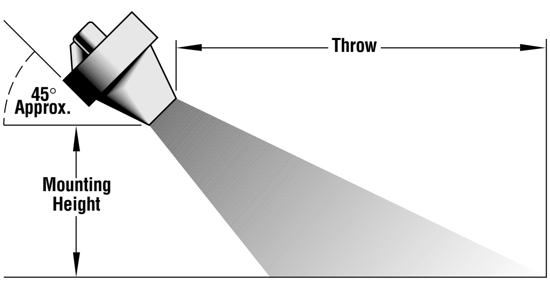


Horizontal Discharge—Standard Louvers

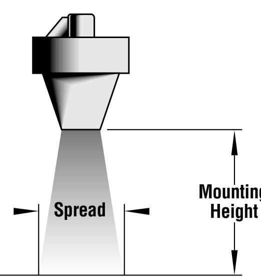


Vertical Discharge—Four-Way Louvers

Discharge Temperature Correction Factors	
Actual ΔT	Correction
10	1.18
20	1.12
30	1.06
40	1.00
50	0.94
60	0.88
70	0.82
80	0.76
90	0.70
100	0.64
110	0.58
120	0.51
130	0.45
140	0.39
150	0.33



Horizontal Discharge—High-Velocity Nozzle



Vertical Discharge—High-Velocity Nozzle

Unit Heater Mounting Heights, Throws and Spreads

Model Size	Horizontal Louvered			Vertical Louvered			Horizontal High Velocity			Vertical High Velocity		
	Outlet Velocity FPM	Max. Mounting Height (ft)	Throw (ft)	Outlet Velocity FPM	Max. Mounting Height (ft)	Spread (ft)	Outlet Velocity FPM	Max. Mounting Height (ft)	Throw (ft)	Outlet Velocity FPM	Max. Mounting Height (ft)	Spread (ft)
101	600	10	30	660	10	25	2,310	12	40	2,310	17	15
121	750	12	44	820	13	38	2,050	14	58	2,050	22	20
141	1,090	14	53	1,200	16	48	2,620	17	72	2,620	27	25
161	1,110	15	66	1,220	17	52	2,290	18	88	2,290	29	27
181	1,200	16	72	1,320	18	55	2,270	19	94	2,270	31	29
201	1,220	17	76	1,340	18	56	2,380	20	101	2,380	31	29
241	1,360	18	82	1,500	19	59	2,340	22	109	2,340	32	30
301	1,340	20	84	1,500	20	62	2,270	24	112	2,270	34	32
361	1,220	21	88	1,340	21	65	2,210	25	122	2,210	36	34
421	1,110	21	118	1,230	21	66	2,180	25	158	2,180	36	34
481	1,140	22	118	1,270	22	70	2,210	26	160	2,210	37	35
102	550	9	22	600	9	24	2,000	11	30	2,000	15	13
122	730	12	37	800	13	38	2,000	14	49	2,000	22	20
142	840	13	45	920	15	46	2,000	16	62	2,000	26	24
162	970	15	56	1,060	17	51	2,000	18	75	2,000	29	27
182	1,050	16	66	1,160	18	55	2,000	19	86	2,000	31	29
202	1,030	16	69	1,130	18	56	2,000	19	92	2,000	31	29
242	1,170	17	73	1,280	19	59	2,000	20	97	2,000	32	30
302	1,180	19	74	1,320	20	62	2,000	23	98	2,000	34	32
362	1,100	20	78	1,210	20	62	2,000	24	110	2,000	34	32
422	1,020	21	110	1,130	21	66	2,000	25	145	2,000	36	34
482	1,040	22	110	1,150	22	70	2,000	26	147	2,000	37	35

Dimensions and Weights

Armstrong®

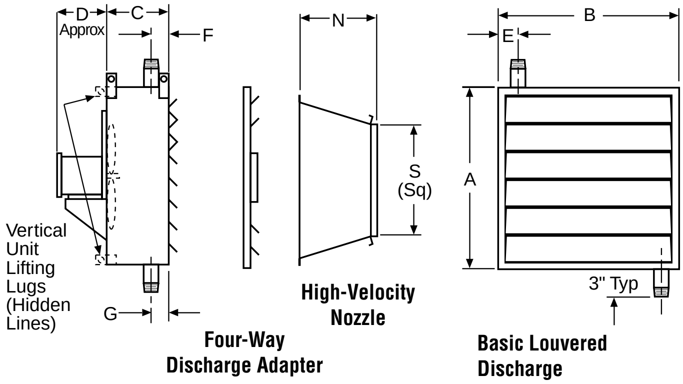
Sound Data

Since unit heaters use fans and motors to move air, sound is a natural result. The sound rating of a particular unit may limit its use in a given application. The following sound rating table is presented to allow you to select a unit based upon an acceptable sound level.

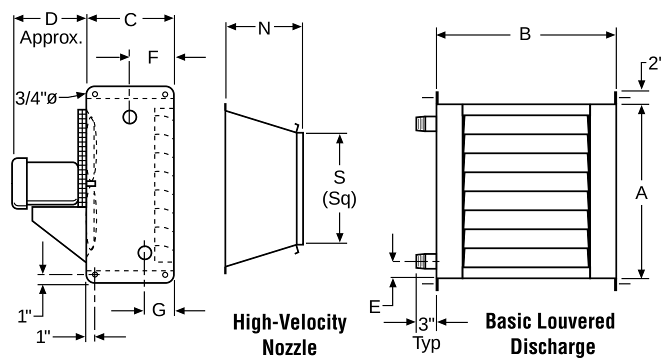
Sound Data

Unit Heater Size	dBA Sound Pressure Level at 3 Feet from Unit
101	63
102	63
121	63
122	63
141	66
142	65
161	74
162	73
181	77
182	76
201	81
202	81
241	82
242	82
301	84
302	83
361	85
362	85
421	84
422	83
481	85
482	85

10" Through 20" Units



24" Through 48" Units



(Four-way louver section *replaces* basic louver section)

NOTE: Connections are MPT

Dimensions and Weights

Model Size	Dimensions (in)										Basic Unit With Horizontal or Vertical Louvers Weights by Core Type (lb)			Additional Weight for High-Velocity Discharge Nozzle (lb)
	A	B	C	D	E	F	G	Conn. MPT	N	S	ST/AL	ST/ST	SS/SS	
101 102	15	17-3/4	12	9	1-3/8	4-1/2	4-1/4	1-1/2	10	7	95 135	105 155	95 145	11
121 122	17-1/4	19-3/4	12	9	1-3/8	4-1/2	4-1/4	1-1/2	10-3/4	9-3/4	105 150	120 180	110 165	14
141 142	19-1/2	21-3/4	12	9	1-3/8	4-1/2	4-1/4	1-1/2	11-1/2	11-3/4	120 175	140 210	125 190	16
161 162	22	23-3/4	12	9	1-3/8	4-1/2	4-1/4	1-1/2	12-1/4	14-1/4	135 195	165 240	145 220	19
181 182	24-1/4	25-3/4	12	9	1-3/8	4-1/2	4-1/4	1-1/2	13	16-3/4	150 220	185 280	160 250	22
201 202	26-1/2	27-3/4	12	9	1-3/8	4-1/2	4-1/4	1-1/2	13-3/4	18	170 245	210 315	180 285	24
241 242	32	34-1/4	18	12	2-7/16	6-3/4	4-1/4	2	14-1/2	20-3/4	290 360	350 470	320 420	17
301 302	39-1/4	40-1/4	18	12-1/2	1-13/16	6-3/4	4-1/4	2	18-13/16	26	360 460	460 650	410 550	31
361 362	45-1/4	46-1/4	18	12-1/2	2-5/8	6-1/2	4-1/2	2-1/2	22-7/8	29-1/2	440 550	560 800	500 680	47
421 422	52-1/4	52-1/4	22	15	2-5/8	6-1/4	4-3/4	3	29-3/8	33	680 830	850 1,150	770 1,010	35
481 482	59-1/4	58-1/4	22	15	2-3/8	6-1/4	4-3/4	3	31-1/4	38	800 990	1,030 1,430	920 1,240	47

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

Installation Guidelines

Below are some abbreviated installation guidelines. Consult Armstrong for more detailed installation, operation and maintenance instructions.

General Piping Guidelines

1. Provide adequate support from the building structure to eliminate piping stresses.
2. Allow movement of the piping to provide for expansion and contraction. Use swing joints where possible.
3. Adequately support all piping. Do not use unit heater for this purpose.

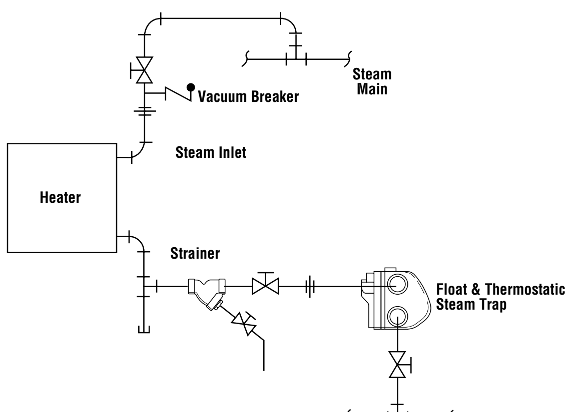
Steam Piping

1. Slope steam piping under 10' long toward the steam main. If steam pipe is longer than 10', slope toward the unit and install a drip trap before the unit.
2. All steam and condensate lines must be of the proper size to carry the calculated loads.
3. Only continuously draining traps such as inverted bucket or float and thermostatic types should be used. If an inverted bucket trap is used, an air vent should be installed downstream of the unit and before the trap.
4. Maintain the unit heater outlet size to the trap takeoff.
5. If condensate is to be lifted or if the return system is pressurized, use a check valve after the steam trap and provide a gate valve on the strainer to drain the heater in the off season.

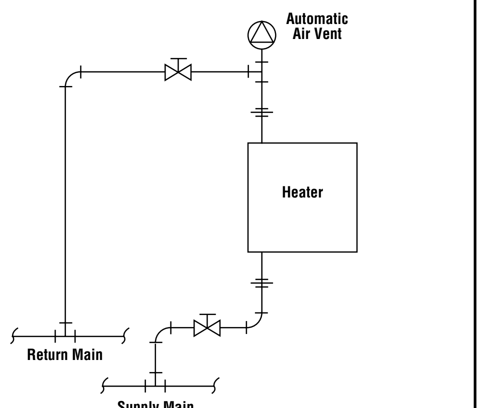
Liquid Piping

1. Supply return mains must be sloped for adequate venting.
2. Provide air vents at all high points.
3. Circulating pumps must be of adequate size to provide the required liquid flow and to overcome the system pressure drops.

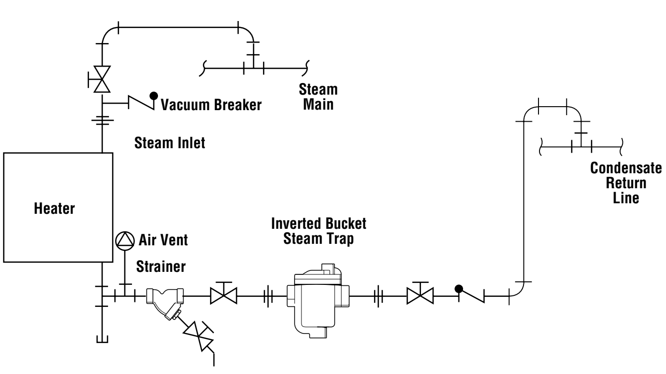
Typical Piping Arrangements



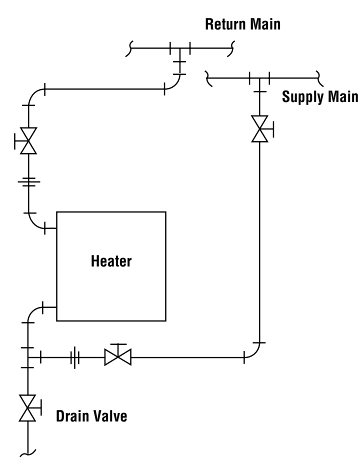
Recommended piping arrangement for steam when draining heater to gravity return.



Recommended piping arrangement for liquids to lower mains.



Recommended piping arrangement for steam when draining heater to overhead return.



Recommended piping arrangement for liquids to overhead mains.

Sample Specifications

Unit heaters supplied shall be manufactured with the methods and materials specified as follows:

General

Enclosures and Louvers—Shall be of minimum 14 ga galvanized steel and finished in gray enamel. (Epoxy coatings and other protective finishes are available.) Fans shall have aluminum alloy blades with steel hubs. (Epoxy coatings and other protective finishes are available.)

Motors—Shall be heavy-duty industrial type TEFC, ball bearing, standard NEMA frame motors. Electrical supply shall be ______ phase ______ volts 60 HZ. (Explosion-proof and other motor types available.)

Fan Guards—Shall be provided with each unit and be OSHA approved.

Core Type Specific

Steel tube/steel fin:

Tubes—Shall be 1" OD 12 ga steel tube. Minimum wall thickness shall be .109".

Fins—Shall be helically wound L-footed and of minimum .024" thick steel.

Headers—Shall be of carbon steel not less than .145" thick.

Connections—Shall be of Schedule 80 carbon steel pipe.

Assembly—Shall be welded to form a monometallic internally wetted surface. Assembly shall be hydrostatically tested to 500 psig.

Steel tube/aluminum fin:

Tubes—Shall be of 1" OD 12 ga steel tube. Minimum wall thickness shall be .109".

Fins—Shall be helically wound embedded type and of minimum .020" thick aluminum.

Headers—Shall be of carbon steel not less than .145" thick.

Connections—Shall be of Schedule 80 carbon steel pipe.

Assembly—Shall be welded to form a monometallic internally wetted surface. Assembly shall be hydrostatically tested to 500 psig.

Stainless steel tube/stainless steel fin:

Tubes—Shall be 304 L (or 316 L) 1" OD 14 ga stainless steel tube. Minimum wall thickness shall be .083".

Fins—Shall be helically wound L-footed and of minimum .020" thick 304 (or 316) stainless steel.

Headers—Shall be of the same stainless steel as the tubes not less than .109" thick.

Connections—Shall be of Schedule 40 stainless steel pipe.

Assembly—Shall be welded to form a monometallic internally wetted surface. Assembly shall be hydrostatically tested to 500 psig.

Stainless steel tube/steel fin:

Tubes—Shall be 304 L (or 316 L) 1" OD 14 ga stainless steel tube. Minimum wall thickness shall be .083".

Fins—Shall be helically wound L-footed and of minimum .024" thick steel.

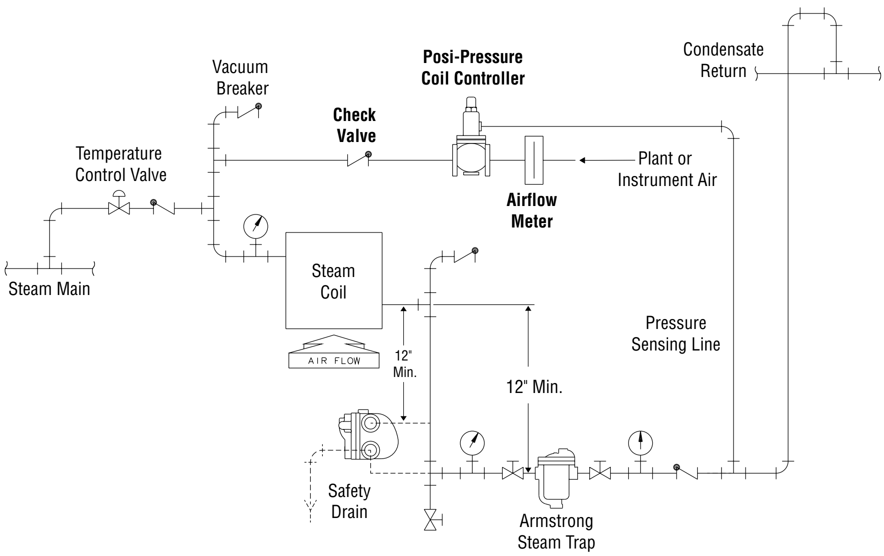
Headers—Shall be of the same stainless steel as the tubes not less than .109" thick.

Connections—Shall be of Schedule 40 stainless steel pipe.

Assembly—Shall be welded to form a monometallic internally wetted surface. Assembly shall be hydrostatically tested to 500 psig.

Armstrong Posi-Pressure Control System

A Revolutionary Way to Provide Positive Condensate Drainage for Heat Exchange Equipment



Posi-Pressure Control System Suggested Installation

Posi-Pressure Control System Kit, consisting of controller, check valve, airflow meter

Forget About Flooded Heat Exchangers

The major cause of flooded heat exchangers is a lack of sufficient pressure differential across the steam trap under modulated steam conditions. With Armstrong's Posi-Pressure Control System, there is always a minimum preset differential pressure between the heat exchanger and the condensate return system. Even if the pressure in the condensate return changes, the Posi-Pressure Controller automatically adjusts to maintain the preset differential.

Forget About Water Hammer

When heat exchangers flood, steam and cold condensate frequently come in contact with each other. When this happens, the steam rapidly condenses, causing water hammer. This water hammer condition can cause damage to heat exchangers, piping and fittings. By eliminating heat exchanger flooding, the Posi-Pressure Control System will solve the problem.

Forget About Frozen Steam Coils

Most steam coils freeze because they are flooded with condensate. Costly—bulky—and high maintenance face and by-pass coil systems were created to solve this problem by maintaining a positive differential steam pressure. Now, with Armstrong's Posi-Pressure Control System, simple and inexpensive modulated control systems can do the same job. However, we must caution that proper steam coil design, steam trapping and venting practices are also required for freeze protection. If assistance is needed, Armstrong's Representatives are trained to analyze your total steam system and offer you solutions to your problems.

How Does the Posi-Pressure Control System Work?

A normal steam system may modulate into a vacuum to control temperature. A vacuum breaker is often installed to prevent this condition. Once the vacuum breaker opens, temperature control is accomplished by mixing the air with the steam. The steam/air mixture results in a lower temperature. However, even a vacuum breaker will not work if condensate has to be elevated to an overhead return, or if the return system is pressurized.

The Posi-Pressure Control System acts as a vacuum breaker. Instead of introducing air at atmosphere pressure, the controller injects air at an elevated pressure into the heat exchanger. The user presets the level of elevated air pressure at the time of installation. Rather than a specific pressure, the controller maintains a specific differential pressure across the steam trap. Even if a steam trap fails or other causes change the condensate return pressure, the controller will sense this difference and maintain the preset differential.

How Much Air Will Be Used?

The Posi-Pressure Control System uses very little air. The amount depends upon the size of the steam trap selected. Air usage can vary from as little as 10 SCFH to 90 SCFH or more on large systems. To put this in perspective, a 27 SCFH parcel of air amounts to a 3-foot cube in one hour! Once the initial air is introduced, only the leakage through the large vent bucket in the steam trap must be added. This air volume is so low that it is practically undetectable in a deareator.

Are There Any Other Advantages?

Yes! It is generally recommended that float and thermostatic traps be used on modulated steam systems because they drain better when there is no motive pressure other than the static head of condensate. With a positive pressure always being maintained by the Posi-Pressure Control System, an inverted bucket steam trap with its inherent longer life expectancy can, and must, be used. Since air is injected at a positive pressure, carbon dioxide (the real cause of corrosion) is diluted and swept clear of the heat exchanger.